

MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT
CENTRAL PROJECTS OFFICE (CPO)

Vietnam Dam Rehabilitation and Safety Project (DRSIP)

SUMMARY
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
(ESIA) OF THE FIRST YEAR SUB-PROJECTS

April, 2015

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LIST OF ABBREVIATIONS

AH	Affected Household
CPO	Central Project Office (MARD)
CSC	Construction Supervision Consultant
DARD	Department of Agriculture and Rural Development
DO	Dissolved Oxygen
DONRE	Department Of Natural Resources and Environment
EMDP	Ethnic Minority Development Plan
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
GOV	Government of Vietnam
HH	Household
IMC	Irrigation Management Company
MARD	Ministry of Agriculture and Rural Development
MONRE	Ministry of Natural Resources and Environment
OP	Operating Policies of the WB
PMU	Provincial Management Unit
QCVN	National Technical Regulation
RAP	Resettlement Assessment Plan
RPF	Resettlement Policy Framework
TCVN	Vietnam Environmental Standards
WB	World Bank
WHO	World Health organization
WUA	Water User Association

PART 1. PROJECT OVERVIEW

1.1. General information

DRSIP is intended to improve the safety of the dams and related works, as well as the safety of people and socio-economic infrastructure of the downstream communities as defined in Decree 72 - governing the management of dam safety in Vietnam. . The project will consist of the following components

- Component 1: Dam safety rehabilitation (US\$ 385 million
- Component 2: Dam safety management and planning (US\$ 60 million)
- Component 3: Project management support (US\$15 million)
- Component 4: Disaster contingency (US\$ 0 million - no fixed allocation, but not to exceed 20% of the total project cost)

DRSIP will be implemented in 31 provinces in the North, Central and Highland regions. Up to 400 dams will be selected for consideration under the project with and will be based on an a priori agreed selection criteria aimed at prioritizing those interventions that address the risks within an explicit poverty and inequality framework.

The proposed project will be implemented over a period of six years – from December 01, 2015 to December 01, 2021. The draft Environmental and Social Impact Assessment (ESIA) of the first year subprojects and the project Environmental and Social Management Framework (ESMF) will be ready by May 12, 2015 for disclosure. These safeguard documents need to be cleared by the Bank before the disclosure. The EIA of the subsequent years' subprojects will be prepared once the EMF has been agreed by the Government of Vietnam and the World Bank.

The Ministry of Agriculture and Rural Development (MARD) will be responsible for overall implementation and management of the project. The Central Project Office (CPO) within MARD would provide the support to all the three Ministries and responsible for overall coordination and monitoring of the project. The implementation of the rehabilitation works and preparation of dam safety plans, including safeguard and fiduciary, would be decentralized to the provincial level authorities. The provincial Department of Agriculture and Rural Development (DARD) would be lead agency at the provincial level. Provincial project management unit (PPMU) of DARD in each province will response to manage and monitor the sub-project under MARD supervisor

The project will support the physical rehabilitation of the existing irrigation dams most of which were built during the 1980s and 1990s. About 90% of the dams to be rehabilitated are earthen structures and are considered as small dams with height of less than 15m and design volume of less than 3 million cubic meters (MCM). The proposed project is not intended to support significant structural modifications or expansions beyond what is needed to ensure safety. The rehabilitation will be limited to reshaping of the main and auxiliary dams, slope stabilization by either concrete slab or in-situ or stone paving, strengthening or expansion of existing spillways to increase the discharge capacity, refurbishment of existing intake structures, replacement of mechanical and electrical systems of intakes and spillways, grouting for seepage control and improvement of existing roads (access and management roads).

1.2. List of sub-projects in the first year

Table 1.1 . List of the first year sub-projects

<i>No.</i>	<i>Dam</i>	<i>District</i>	<i>Province</i>	<i>Command area (ha)</i>	<i>Storage (10⁶m³)</i>	<i>Crest height (m)</i>
1	Ngoi La 2	Yen Son	Tuyen Quang	360	3.24	15.0
2	Ho Ban	Cam Khe	Phu Tho	150	1.68	11.0
3	Dai Thang	Lac Thuy	Hoa Binh	90	0.84	14.5
4	Khe Che	Dong Trieu	Quang Ninh	213	12.00	12.5
5	Dong Be	Nhu Thanh	Thanh Hoa	255	2.29	11.4
6	Khe Gang	Quynh Luu	Nghe An	175	2.15	12.5
7	Khe San	Quynh Luu	Nghe An	120	1.42	14.5
8	Phu Vinh	Dong Hoi	Quang Binh	1056	22.36	24,4
9	Dap Lang	Nghia Hanh	Quang Ngai	100	0.38	13.1
10	Thach Ban	Phu Cat	Binh Dinh	130	0.70	12.8
11	Song Quao	Ham Thuan Bac	Binh Thuan	8120	73.00	40.0
12	Da Teh	Da Huoi	Lam Dong	2300	24.00	27.3

1.3. Approaches and methodology for ESIA implementation

1.3.1 Objectives and methods of environmental and social assessment

- *Objectives*

- The objectives of this ESIA is to carry out the environmental and social assessment of this specific sub-project so as the sub-project's potential social and environmental impacts can be identified at early stage of subproject preparation, the measures to avoid or mitigate the potential negative social and environmental impacts can be proposed for implementation.
- The key contents of this ESIA include assessments on the potential social and environmental impacts of the proposed rehabilitation works; an environmental and social management plan (ESMP) which includes environmental monitoring and supervision plan, and reporting mechanisms. Through the ESIA, communication channels have been established to allow local communities to be informed about sub-project proposals and involve the decision making process

- *Method*

- *Survey and field investigation:* the Consultant team conducted 2 field surveys (*1st phase*) Januray 28th, 2015 to February 12th, 2015 and (*2nd phase*) on March 06th, 2015 to March 15th, 2015

- *Sociological survey*: interview households (affected directly and indirectly, benefit) and local leaders in the level of commune/ ward and city.
- *Statistical method*: data collection, processing and analysis: (i) the meteorological, hydrological and environmental data for many years in the project area; (ii) The reports and data on the socio-economic and gender in 3 consecutive years in the project area.
- *Inherited method*: inherit the research results of the relevant projects.
- *Expert method*: consultancy unit participated and organized the meeting, the exposure to take comments on proposed measures to mitigate the negative impacts of the subproject of environmental experts, sociological experts, dam safety experts and gender experts.
- *Analytic and synthetic method*: analyze and synthesize the impact of the project on the components of the natural environment and socio-economic at the operational area of the project.
- *Rapid assessment method*: use the pollution factors of the World Health Organization (WHO) to estimate the amount of waste and pollution forecasting.
- *Comparison method*: the impacts are evaluated by comparison with the norms and standards for the quality of soil, water, noise, air and other relevant environmental standards.
- *Figure model method*: using Figure model to calculate and forecast the average concentration of pollutants in the exhaust gas of material transports to assess the impact of pollutants on the environment.
- *Matrix method*: to compare each activity of the project with each parameter or environmental and social component (air, water, health, economic, etc.) to assess the relationship of cause-consequences of the subproject implementation.

1.3.2 Approaches and methods of social assessment

To ensure all potential impact could be identified during project preparation, the SA was conducted through series of consultations with various project stakeholders. A particular focus was maintained on households who are potentially affected (both positively and adversely). The research techniques employed for this SA include 1) review of secondary data, 2) field observations; 3) focus groups discussions/ community meetings, 4) key informant interview, and 5) households survey.

PART 2. DESCRIPTIONS OF THE FIRST YEAR SUB-PROJECTS

2.1. Location

The sub-project in the first years belong to 11 provinces and are distributed in the regions: Northern, Central and Tay Nguyen (Table 2.1)

Table 2. 1: Zoning the first year sub-projects

<i>No.</i>	<i>Region</i>	<i>Province</i>
1	Northern (4 sub-projects)	Tuyen Quang, Phu Tho, Quang Ninh, Hoa Binh
2	Central (6 provinces)	Thanh Hoa, Nghe An, Quang Binh, Quang Ngai, Binh Dinh, Binh Thuan
3	Highland (1 province)	Lam Dong

The survey results of the first year sub-projects showed that, the main functions of the dams are build to supply water for domestic users and irrigation. Except Quao Riservoir of Binh Thuan province that was constructed by penetrated asphalt concrete, the rest of dams to be rehabilitated are earthen structures and are considered as small dams. Also, the small and media reservoirs were built since 1970s of the 20th century, some of them (Dai Thang reservoir of Hoa Binh province) were constructed in 1960. The large dams are built in year 1990s such as Song Quao (Binh Thuan province), Da Te (Lam Dong province), Phu Vinh (Quang Binh province) reservoirs, . All the proposed dams are applied the construction techniques since 1975 and manually construction.

The main servicing design of the reservoirs is gravity flows to irrigate the paddy rice cultivation areas with 2 periods per year, so that the location of the dam always located in the areas with high elevation, on the river, stream or narrow valleys. At the time of the dams building, surround areas of the dams is the natural forest areas or densed vegetation covers. However, today, the areas around the reservoir of the sub-projects were affected directly or indirectly by human activities. Most of the reservoir supplies gravity water to surrounding areas and to downstream, some of them are multipurposes use, include aquatic cultivations. Most of the dams are located in a few kilometers to 10km far from the residential areas.

2.2 The financed items

The financed items of the first years sub-projects are summarized in table 2.2

Table 2. 2. The financed items of the first years sub-projects

<i>Sub-Project</i>	<i>Location (province)</i>	<i>Height of dam (m)</i>	<i>The investment items</i>
Repairing and improving the safety of Khe Che reservoir, Dong Trieu District	Quang Ninh	12.5	<ul style="list-style-type: none"> • Concrete dam surface with 658m in lenght 4,2m, in width and keep the height of dam is of 12,5m; • Treat termite • extend spillway from 14m to 24m in width , keep the spillway crest is of 23,7m • Construct/repair the drainage layout at the toe of

			<p>downstream slope</p> <ul style="list-style-type: none"> • Repair the power house (outlet works) and manage house • Hardnose the access and management road with 140m in length, road foundation 5m and road surface is 3,5m in width • Operate the new inner-servicing road with the length is of 2.000m, macadam foundation of road is: 7,5m in width, and surface is 6,5m and off-side: 2x0.5m.; • Construct a new bridge over canal with 5 m in length
Repairing and improving the safety of Ngoi La 2 reservoir, Yen Son District	Tuyen Quang	15	<ul style="list-style-type: none"> • Treat water seepage by using jet grouting technique to embankment with length is 556m, keep originale dam crest is 44,5m. Reinforced and repair upstream slope by concrete palne with inner riprap, reinforce groin,dam surface and grass plantation in downstream slope to prevent erosion • Repair outlet works valves at both side of the outlet works • Extend principal chute spillway from 5m to 17m, remain the spillway crest is of 41,5m. Re-construct the bridge over the spillway with width is of 5,0m 17m in length • Reinforce access and management road by concrete with length is of 1.885m.
Repairing and improving the safety of Ban reservoir, Cam Khe district	Phu Tho	11	<ul style="list-style-type: none"> • Repair 354m in length of the main dam. Levelled the crest of dam from 32,5m to 33,5m but the capacity of the reservoir is not change, extend the dam surface from 4m to 6m, and reinforce the dam surface, both slopes by concrete, plant grass on the downstream slope; • Constructe a new auxiliary dam due to the crest of the main dam levelled, the auxiliary dam is located in the South of the reservoir. • Repair and upgrade spillway with length is of 6,5m, 10m in width,, remain the spillway crest is of 31,5m; • Construct a new outlet works with length is of 35m at the right abutment of dam • Construct a new management house with total areas is of 108m²; • Reinforce the access and management road with 1600m in length and 5 m in width by concrete
Repairing and improving the safety of Dai Thang	Hoa Binh	16	<ul style="list-style-type: none"> • Upgrade 200m in length of the main dam, extend the surface From 3,5m to 10m and reinforce dam by concrete, remain the crest of dam is of 16m,. Reinforce upstream slope by

reservoir, Lac Thuy District			<p>concrete panel, and plant grass on downstream slope to avoid erosion;</p> <ul style="list-style-type: none"> • Construct a new outlet works by tube type D400 (at the same position of the old unit) with length is of 96m, diameter D400; • Concrete the spillway (the existing construction is earthen structure) with 20m in width, principal chute spillway elevation is 33,5m ; • Upgrade the access and management road by concrete with the length is 110m • Construct a new management house with total of the building is 50m²; • Install a new monitoring system at the headwork of dam
Repairing and improving the safety of Dong Be reservoir, Nhu Thanh District	Thanh Hoa	11,4	<ul style="list-style-type: none"> • Increase the crest of dam from 41,4m to 42,3m but the capacity of the reservoir does not change, extend the surface dam from 4,0m to 5m and reinforce it by concrete, • Replace the old spillway by a new one with principal chute is 5,6m, the spillway crest is maintain by 39,4m • Replace the old outlet works by new construction with 52,65m in length (at the same position); • Extend the flooding dyke from 450m to 800m in length • Construct a new management house with total areas of the building is of 60m².
Repairing and improving the safety of Khe Gang reservoir, Quynh Luu District	Nghe An	12,5	<ul style="list-style-type: none"> • Repair and extend the length of embankment from 460m to 487m, remain the spillway crest is of 23,6m, extend the dam surface from 3 ÷ 4(m) to 5m in width, and reinforce it by concrete. Reinforce the upstream and downstream slopes. Seepage treatment at right abutment of dam; • Extend the spillway from 45m to 75m in width,, remain the spillway crest is of 23,6m; • Construct a new outlet works with the length is of 49m, tube type D800 • Construct a new of new management house with an area of 55m²; • Concrete the access and management road with length is of 303,4m.
Repairing and improving the safety of Khe San reservoir, District Quynh Luu	Nghe An	14,5	<ul style="list-style-type: none"> • Repair and upgrade the main dam with length is extended from 320 to 389m, height of crest dam is increased from 46m to 47,6m but the capacity of the reservoir does not change, extend the dam surface from (2,6÷3,2)m to 5m, and reinforce by concrete. Use concrete panel to reinforce the upstream and downstream slopes, plant grass on downstream slope to prevent erosion progress

			<ul style="list-style-type: none"> • Reinforce spillway, extend the principal chute from 23m to 30m, remain the spillway crest id of 45,3m; • Construct a new outletworks by replacement of the old unit (12m from old culvert towards the right abutment of dam) with drain aperture type F500; • Construct a solid water gathering basin with size is $B \times L \times H = (1,0 \times 2,0 \times 1,6)$ m • Construction a new poer house (outlet works) with the size is of $B \times L \times H = (2,6 \times 2,6 \times 3,2)$ m; • Concrete the access and management road with length is of 146m • Construct a new management house with total areas of the building is of $80m^2$ at downstream of dam, 150m to right abutment of dam.
Repairing and improving the safety of Phu Vinh reservoir, Dong Hoi city	Quang Binh	27,6	<ul style="list-style-type: none"> • Upgrade, repair the main dam with the length is of 1.776m, remain the dam crest is of 25m, extend the dam surface from 5m to 6m, and reinforce it by concrete. Construct a new parapet-wall by concrete. Treat water seepage by using Jet grouting technique. fill and earth work to reinforce both slopes of dam • Construct a new outletworks with the length is of 92m, with aperture $1,2 \times 1,2$ (from old drain m to the old unit) • Reinforce the valve of the outlet worksand rainforace the auxiliary spillway • Renovate and upgrade acess and management road by concrete; with599m in length
Repairing and improving the safety of Dap Lang reservoir, Nghia Hanh District	Quang Ngai	13,1	<ul style="list-style-type: none"> • Extend the length of the main dam from from 135,0m to 148,5 m, leveling the crest of dam from $(30,8 \div 31,1)m$ to 32, but the capacity of the reservoir does not change. , extend the dam surface from 3m to 6m, treat water seepage by using Jet grouting technique; • Reinforce the spillway, increase the length of the spillway from 88m to 165m, leveling the spillway crest from 28,5 to 28,8m, the principlal chute is 20m in width. • Construct a new outlet works with the length is of 65m (current unit with length is 45m). Replace the culvert type D800 by steel tube type D400 • Construct a new management house with total areas is of $42m^2$.
Repairing and improving the	Binh Dinh	12,1	<ul style="list-style-type: none"> • Upgrade, repair the main dam with the length is of 897m remain thecrest of dam crest with

safety of Thach Ban reservoir, Phu Cat District			<p>52,5m , extend and reinforce by concrete the surface of dam from 4m to 5,8m; Reinforced upstream slope by slabs concrete, plant grass on downstream slope</p> <ul style="list-style-type: none"> Reinforce and repair the spillway, construct a new section of the spillway crest with length is 5m and spillway with length is 11,10m. Leveling the spillway crest from 50,6m to 50,8m. Construct a new outlet works with the length is of 60m by steel tube type D600 Concrete access and management road with the length is of 845m.
Repairing and improving the safety of Da Teh Reservoir, Da Teh District	Lam Dong	27,3	<ul style="list-style-type: none"> Extend the main dam with the length from 600m to 700m, leveling the crest of dam from 158m to 159m but the capacity of reservoir does not change, Reinforce the dam surface and both slopes by concrete, construct a new parapet wall upto elevation of 159,8m. Treat water seepage at the section with length is of 318m by using jet grouting techniques Reinforce the spillway with the principal chute is 24m, remain the spillway crest is of 151,7m elevation; reconstruct the bridge across spillway with the width is of 5m; Reinforce, repair the outlet works with new power house (outlet works and bridge) Construct a new management house with total areas is of 150m²; Reinforce the access and management road by concrete, the road starts from outlet work position to the spillway with length is of 1,7 km.
Repairing and improving the safety of Song Quao reservoir, Ham Thuan Bac District	Binh Thuan	40	<ul style="list-style-type: none"> Upgrade 886m in length of the main dam, , Reinforce the dam surface and both slopes of the dam extend the berm of dam upto 6m; in width, Reinforce auxiliary dam 1 (with length is 150m) and auxiliary dam 3 (with length is 325m); Construct a new spillway no.2 by concrete, the spillway crest is of 84m elevation; Repair and upgrade access and management road no.1, 2, 3, 4, 5 with total length is of 5 km; Construct a new management house with total areas is of 475m² (2 floors) Repair and upgrade Dan sach embankment Construct a new outlet works at the North of reservoir

2.3. The activities of the first year sub-projects

2.3.1 Activities of subprojects

Each subproject includes some or all of the following activities (Table 2.3):

Table 2. 3 : Synthesis of the activities of the first year sub-projects

No.	Scope of works	Purpose
I	Embankment	
1	Extend dam surface (9 Sub-Projects are : Ngoi La 2, Ban, Dai Thang, Dong Be, Khe San, Khe Gang Reservoir, Phu Vinh, Dap Lang, Thach Ban Reservoir).	Expanded surface dam to facilitate the tlocal transportation and management of operation and quick response to emergency cases, enhance the dam stablization
2	Leveling the crest of dam (7 sub-project: Ban, Dong Be, Khe San, Khe Gang, Phu Vinh, Dap Lang, Da Teh Reservoir).	For ensuring reservoir safety during flooding period, but it does not change the designed capacity of the reservoir.
3	Extend the surface of dam (3 Sub-Project: Khe Gang, Dap Lang, Da Teh Reservoir).	To increase the stable of the dam, increase the resilience of dam during the flood season.
4	Reinforce dam surface (12 Sub-Project: Ngoi La 2, Ban, Dai Thang, Khe Che, Dong Be, Khe San, Khe Gang, Phu Vinh, Dap Lang, Thach Ban, Song Quao, Da Teh Reservoir).	Concreted tham dam surface to increase endurance and avoid the rapid erosion progress and facilitate the local transportation and operation of reservoirs.
5	Reinforce the upstream slope (11 Sub-Project: Ngoi La 2, Ban, Dai Thang, Dong Be, Khe San, Khe Gang, Phu Vinh, Dap Lang, Thach Ban, Song Quao, Da Teh Reservoir).	Reinforced by slabs concrete and stone for controlling erosion, seepage proofing, minimizing the risk of dam failure
6	Reinforce downstream slope(Ngoi La 2, Ban, Dai Thang, Dong Be, Khe San Reservoir, Khe Gang, Phu Vinh, Dap Lang, Thach Ban, Song Quao, Da Teh Reservoir).	Reinforced downstream slope by planting grass plots to reduce erosion and waster seepage.
7	Construction a new drainage layout (12 Sub-Projects: Ngoi La 2, Ban, Dai Thang, Khe Che, Dong Be, Khe San, Khe Gang, Phu Vinh, Dap Lang, Thach Ban, Song Quao, Da Teh Reservoir).	To reduce gully erosion and collect run-off flows
8	Construction of new parapet-wall (7 Sub-Projects: Ban, Dai Thang, Dong Be, Phu Vinh, Dap Lang, Song Quao, Da Teh Reservoir).	Construction of new parapet wall with height from 0,7m to 1m to protect dam surface, reduce erosion and protect the construction incase of heavy rain, strong wind, the water level in the reservoir raises approximatelly of the dam surface.
9	Treatment of water seepage throught the	Tto prevent the water leaking and water

	main construction by using jet grouting (4 sub-projects: Ngoi La 2 Reservoir, Dong Be, Phu Vinh, Da Teh Reservoir) and waterproofing embankment (1 sub-project: Thach Ban Reservoir)	loss, also ensure the reservoirs safety.
10	Termites treatment (4 sub-projects: Dai Thang, Khe Che , Thach Ban, Da Teh Reservoir)	To ensure the safety of dam, reduced risk of incident dam or failure
11	Reinforcing, repairing auxiliary dam (2SUB-PROJECT: Dong Be, Song Quao Reservoir)	To support main dam and to ensure safety for the reservoir, also for the downstream areas during the flooding time
II	Spillway	
1	Extend flood overflow (6 subproject Ngoi La 2, Dai Thang, Khe Che, Da Teh, Khe San, Khe Gang Reservoir).	To increase flooding control and ensure the safety of the reservoir
2	Increasing the length of the spillway(1 subproject Dap Lang Reservoir)	Increasing the length of the spillway to reduce the kinetic energy of the water releasing from reservoir
3	Leveling spillway cres	no sub-project does
4	Reinforces the training walls (10 sub-projects Ngoi La 2, Ban, Dai Thang, Khe Che, Dong Be, Khe San, Khe Gang, Dap Lang, Thach Ban, Da Teh Reservoir) and Fixing Lifting system plates overflows (1 sub-project Phu Vinh Reservoir).	Ensuring the safety of reservoir due to massive water release, facilitate operation task
5	Construction of new a stilling basin (10 sub-projects Ngoi La 2, Ban, Dai Thang, Khe Che, Dong Be, Khe San, Khe Gang, Dap Lang, Thach Ban, Da Teh Reservoir)	To reduce the kinetic of dynamic force of water flowing
6	Construction of the bridge over spillway (3 sub-projects Ngoi La 2, Khe Che, Da Teh Reservoir).	Support to the local transportation.
7	Construction of auxiliary spillway (2 sub-projects Phu Vinh, Song Quao Reservoir).	To support and ensure the safety of reservoirs
III	Management house	
1	Construction a new management house (7 sub-projects Ban, Dai Thang, Dong Be, Khe San, Khe Gang, Dap Lang, Da Teh Reservoir).	Construction new management house to support staffs to manage and operate .
2	Repair the management house (2 sub-projects Khe Che, Song Quao Reservoir).	To support staffs to manage and operate ..
IV	Outlet works	
1	Construct a new outlet works (9 sub-projects Ban, Dai Thang, Dong Be, Khe San, Khe Gang, Phu Vinh, Dap Lang, Thach Ban, Song Quao Reservoir).	Ensuring to water yupply to downstream areas.
2	Repair outlet works (3 sub-projects Ngoi La 2, Khe Che, Da Teh).	To ensure the stable condition of water supply to the downstream areas, reduce

		water loss
3	Construct a new power house of outlet works (4 sub-projects Ban, Dai Thang, Khe San, Khe Gang Reservoir).	To ensure good condition of operational
4	Repairing power house-outlet works (2 sub-projects: Khe Che, Da Teh Reservoir).	To facilitate the operational task
V	Access and management road	
1	repaoring, reiforcing the access and management road (12 sub-projects Ngoi La 2, Ban, Dai Thang, Khe Che , Dong Be, Khe San, Khe Gang, Phu Vinh, Dap Lang, Thach Ban, Song Quao, Da Teh Reservoir)	To facilitate to local transoprtation, to create a good condition of management and operation, to quick response to emergency cases..

2.3.2. Explanation on increasing the technical parameters

a) Elevating the crest of dam

There are 7 subprojects elevating the crest of dam, shown in **table 2.4**.

Table 2. 4: Elevating the dam crest level

<i>Subproject</i>	<i>Exiting the crest of dam (m)</i>	<i>Repairing the crest of dam (m)</i>	<i>Reasons</i>
1. Ban reservoir, Phu Tho	32.5	33.5	Both the designed flood level (DFL) = 32.58m and tested flood level (TFL) = 32.78m indicate that the level of water are higher than current condition of dam (0.08m ÷ 0.28m). Hence with the P=5%, it should increase the height of dam up to prevent overtopping flow
2. Dong Be reservoir, Thanh Hoa	41.5	42.3	Both designed water level (DWL) = 41.56m and designed flood level (DFL) = 42.3m indicate that the level of water are higher than current condition of dam (0.16m ÷ 0.9m). The design consultant unit should raise the dam crest level up to 42.3 m and the height of parapet wall up to 0.7 m to prevent overtopping flow
3. Khe San reservoir, Nghe An	46.0	48.2	Both the designed flood level (DFL) = 46.50m and tested flood level (TFL) = 46.68m indicate that the level of water are higher than current condition of dam (0.5m ÷ 0.68m). Hence with the P=0.01%, it should increase the height of dam up to prevent overtopping flow. The dam crest level is 48.2 m
4. Khe Gang reservoir, Nghe An	26.0	26.5	The width of spillway increases from 45m to 75 m. In 2014, the local extended spillway to the right side. The designed dam crest level(26.5m) is higher than the

			existing dam crest level(26.00 m) 0.5m
5. Phu Vinh reservoir, Quang Binh	24.2	25.0	Both the designed flood level (DFL) = 23.49m (P=1%) and tested flood level (TFL) = 24.02m (P=0.2%); tested flood level (TFL) = 24.8 m (P= 0.01%) indicate that the level of water are higher than current condition of dam (0.6m). Hence with the P=0.01%, it should increase the height of dam up to prevent overtopping flow
6. Dap Lang reservoir, Quang Ngai	30.8 ÷ 31.1	32.7	Both the designed flood level (DFL) = 31.24m and tested flood level (TFL) = 31.67 m indicate that the level of water are higher than current condition of dam (0.14m ÷ 0.57m). Hence with the P=0.01%, it should increase the height of dam up to prevent overtopping flow
7. Da Teh reservoir, Lam Dong	158.5	159	Both the designed flood level (DFL) = 157.38 m and tested flood level (TFL) = 158.32 m indicate that the level of water are higher than current condition of dam (0.18m ÷ 1.12m). Hence with the P=0.01%, it should increase the height of dam up to prevent overtopping flow

b) Extending the length of dam

There are 5 subprojects extending the length of dam, shown in **table 2.5**.

Table 2. 5: Extending the length of dam

<i>Subproject</i>	<i>Exiting length of dam (m)</i>	<i>Reparing length of dam (m)</i>	<i>Reasons</i>
1. Khe Gang reservoir, Nghe An	460	487	Increasing the crest of dam from 26.00 m to 26.50 m, the length of dam should be extended up to 17m to contact with groins
2. Khe San reservoir, Nghe An	320	383	Increasing the crest of dam from 46.00 m to 48.20 m, the length of dam should be extended up to 63m to contact with groins
3. Dap Lang reservoir, Quang Ngai	135.0	146.5	Increasing the crest of dam from 30.8 m to 31.1 m, the length of dam should be extended up 11 m to contact with groins
4. Phu Vinh reservoir, Quang Binh	1,776	1,853	Increasing the crest of dam from 24.2 m to 25 m, the length of dam should be extended up 77 m to contact with groins

5. Da Teh reservoir, Lam Dong	600	700	Increasing the crest of dam from 158.5 m to 159 m, the length of dam should be extended up 100 m to contact with groins
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c) Extending the spillway

There are 6 subprojects extending the spillway, shown in **table 2.6**:

Table 2. 6: Extending the spillway

<i>Subproject</i>	<i>Existing width of spillway (m)</i>	<i>Repairing width of spillway (m)</i>	<i>Reasons</i>
1. Ngoi La 2 reservoir, Tuyen Quang	5	17	Ngoi La 2 reservoir is designed to satisfy the flood frequency ($P= 1.5\%$) and tested flood frequency ($P= 0.5\%$). At the present condition, The flood level is always higher than the designed level from $0.3 \div 0.5$ m, the volume of water release via spillway in flooding is $2\text{-}3 \text{ m}^3/\text{s}$. The spillway extending from 5m to 17 in width will meet the new requirement of dam safety of government regulation, with flood frequency ($P= 0.01\%$).
2. Khe San reservoir, Nghe An	23	30	With the designed flood frequency ($P= 1.0\%$) and tested flood frequency ($P=0.2\%$), the width of spillway is 30m. It is bigger than current width of spillway 7m. It should be extend the width of spillway to ensure drainage
3. Khe Gang reservoir, Nghe An	45	75	The width of spillway increase from 45m to 75 m. In 2014, the local extended spillway to the right side
4. Dai Thang reservoir, Hoa Binh	($15\div 20$)	20	The old spillway is earth dam. The average width is from 15 m to 20 m. It is work level III. According to QCVN 04/05, it is work level II with the designed flood frequency ($P= 1.0\%$) = $51.88\text{m}^3/\text{s}$ and tested flood frequency ($P=0.2\%$) = $65.28\text{m}^3/\text{s}$, it should be 20m in width.
5. Khe Che reservoir, Quang Ninh	14	24	Khe Che reservoir is designed to satisfy the designed flood frequency ($P= 1.5\%$) and tested flood frequency ($P= 0.5\%$). The spillway is 14m in width. The water level inside the overflow spilled roughly, approximately 15cm). In fact, Khe Che dam could be broken because of floods having

			discharge 370m ³ / s. It could be upgrade the designed flood frequency (P= 1.0%) and tested flood frequency (P= 0.2%), hence the width of spillway should be raise up to 24m.
6. Da Teh reservoir, Lam Dong	18	24	With the designed flood frequency (P= 1.0%) and tested flood frequency (P=0.2%), the width of spillway is 24m. It is bigger than current width of spillway 18m. It should be extend the width of spillway to ensure drainage

d) Construct a new auxiliary spillway

The subproject(Quao reservoir - Binh Thuan) constructs a new auxiliary spillway(8m in width) to ensure flood safety, in case:

- +) upgrading Quao reservoir from level 2 to level 1 and P =0.01%
- +) do not extend the crest of dam(reducing the flood levels))

2.4. The work execution methods description

The earth work activities of the construction outlet works, embankment, spillway will be performed by machine and manual. The equipments will be used:

- Removal of top layers of both slopes using bulldozers
- reifoce toe and foundation of dam: Using a combination of machine and manual
- Construction stonewoks facing: tranportmeterial by trucks and, construct the construction by worker
- Embank ment compactoring : jumping compactor
- Construct material (soil and stone): using excavator machine, jumping compactor,
- Reinforvce toe and foundation of dam: by the machine and manual work, use all kinds drilling machines <9T to destroy the old construction unit
- The concrete: used mixer machine and polisch surface by vibrator; Spreading out by bulldozers . Particularly cellar concrete poured by pump.

Regarding to the use of explosive material during construction, the only sub-project Song Quao sub-project (Binh Thuan) will be used to dig foundation of auxiliary spillway no.2.

2.5. Evaluating environmental management capacity and training needs of subproject's PMU

2.5.1. Environmental management capacity of provincial PMU

Most of the dams were built before 1990, at that time the law of environmental protection and the regulations on environmental impact assessment have not been issued. According to survey results of the first 12 subprojects, the construction works aren't archived the reservoir designs, because it were built by local people

Manpower on environmental resources management: According to survey results of the first 12 subprojects, 6/12 subprojects (50%) have not the specialized division or responsible

personal for Environment science and Society. An about 50% of the sub-project has specialized sections for the Environment (the locals have been engaged by ADB projects or World Bank), however, the number of the staffs of environmental and social science is a few number of 16.6%, most of them are come from engineers and irrigation, economy. In some cases, environment personnel are present but level of training and technical capacity on environmental principles and tools of management are not sufficient. Training and awareness creation will be undertaken at different levels of implementation.

Regarding the training program was involved. Although, with 6/12 subprojects have involved the implementation of projects related to the World Bank's safeguard policies through the funded by WB and have been participating in training programs as: environmental safety policies, involuntary resettlement, gender and gender equality; However, knowledge and experience about the safety requirements of the World Bank on issues of environment and society are limited. The projects with capital budget have no training programs on environmental safety policies

2.5.2. Contents of building capacity on environmental management for PMU of subproject

The environmental and social impact mitigation measure are sound technical measures, the training should focus on the following contents:

<i>No</i>	<i>Contents</i>	<i>Subjects</i>
1	Environmental and social safety policies	PPMU
2	Environmental management capacity improvement	PPMU and contractor
3	Environmental and society monitoring skills improvement	PPMU, construction consultant; environmental consultant, local authority
4	Training on environmental health and occupational safety measures, prevention of communicable diseases, infectious	Contractor
5	Training on dam safety awareness	Project operation agency
6	Training and raising awareness on gender equality	Local authority

Based on the number, feature and location of the TDA, at least 4 training session can be carried out for the first year subprojects. The first round of training will focus on the knowledge, policies and procedures related to land acquisition, resettlement, ethnic minorities and other social sectors to ensure that resettlement plan can perform effectively before construction. The key project staffs who are responsible for implementation of the above activities should be involved in training. Training contractor monitoring skill should be conducted at least one month before the construction. The staffs of PMU, representatives of local organizations, local communities and / or social organizations need to be involved in this training

PART 3. STATUS OF NATURAL ENVIRONMENT AND SOCIETY

3.1. Natural Environment

3.1.1. Climatic and hydrological conditions

The province projects in the Northern, central and Tay Nguyen, each region has different characteristics in meteorology, hydrology. The Northern region of the tropical monsoon climate. The total annual rainfall in this region fluctuated from 1400-1800mm in flood season accounts for 70 - 80%. The rainy season usually lasts 5 months, from May to September, in which, in June, July, August are the months with high rainfall. Only 3 months of this precipitation has captured 50 -55% of the total annual rainfall.

Central region is divided into two regions: North Central Region includes the province of Thanh Hoa, Nghe An and Ha Tinh, Quang Tri, Quang Binh, Thua Thien Hue under the tropical monsoon climate, abundant rainfall regimes, with annual rainfall fluctuations from 1,500 – 2,300mm, but unevenly distributed over time and space. Flood Season from July to November. Dry Season from December to June next year. Accounting for 80-85% of rainfall floods the total annual rainfall. Central and South Central stretches from Quang Ngai province, Quang Ngai, Phu Yen, Khanh Hoa, Binh Dinh in climates divided into two seasons: dry and rainy season. From the dry season begins in January to August, during this period in May and June, appear heavy rains caused floods freshes called. The rainy season begins in September to December. From the rainy season at this area is only 4 months but rainfall accounted from 70% to 80% of annual rainfall.

Tay Nguyen region of the tropical monsoon climate and plateau divided into two seasons: the dry season From November last year to April of next year. The rainy season From May to October. Balmy climate is very favorable for crop development. The annual average temperature is 24 degree C; the amount of light is abundant, stable strength. The total amount of solar radiation annual average 240 - 250 kcal / cm². Average number of sunshine hours is 2200-2700 hours / year. Vibration amplitude between day and night temperatures is quite large (dry season range 15-20 degree C, the amplitude rainy season from 10-15 degree C). Average annual rainfall is about 1,900-2,000mm, concentrated mainly in the rainy season.

3.1.2 .Topographic characteristics

The sub-projects located in different regions with natural conditions and the topography are relatively diverse, complex with many rivers, streams, steep, both highlands and small plains but mostly is hilly. However, about the area of the hills, mountains, highlands and plains are not the same between regions; this makes the relatively large differences in population distribution, economic-social development investment between regions.

The topography of sub-projects in the northern area is the mountainous region transition to delta so steep terrain dominates. The sub-projects in the northern mountainous zone, such as Ngoi La 2 Reservoir (Tuyen Quang), Dai Thang Reservoir (Hoa Binh), etc reservoir located in mountainous terrain midland interspersed delta. The topography of irrigated area is generally not big difference in the surface elevation but alternating high mound. Khe Che Reservoir, Quang Ninh province is located in the North Eastern region of low hills; Ban

Reservoir (Phu Tho) terrain is divided by low hilly bowl shape forming narrow subregion with terraced fields.

The topography of sub-project located in the North central region as Dong Be Reservoir, Thanh Hoa , Khe Gang Reservoir, Khe San Reservoir in Nghe An province , etc the reservoirs located in the semi-mountain is surrounded by low hills , medium and small reservoirs are usually full in the flat valley. The vegetation of the reservoir basin in the form of forest regeneration and plantation trees like eucalyptus, acacia , etc The topography is relatively flat irrigation.

The topography of the sub-projects in Central and South Central area, upstream area around the reservoir has the surface topography divided relatively strong by regional river systems. Natural vegetation cover had been largely replaced by crops in upland fields. Reservoir area and downstream reservoirs typically have relatively flat shape; riparian areas are often shaped valley extends towards the downstream. Surface soil around the reservoir and downstream reservoirs often have a little terraced area. The main irrigation area of reservoirs have relatively flat topography.

The topography of the sub-projects in Tay Nguyen, the medium-scale irrigation reservoir in the Tay Nguyen has topography around the reservoir in the form of high-mountainous terrain. With vegetation mainly of dense forest regeneration and bamboo. Reservoir enclosed in valley.

3.1.3 . Environmental incidents have occurred in history

Most of the reservoir dam of Sub-projects implemented in the first year are construction From 60-80 years of the 20th century, due to limited funding, mostly soil dam, no suitable design, embankment not homogeneous, due to the impact of climate change , etc may lead to some dams has happened some incidents after the occurred to secure for downstream areas. Some sub-projects in the early years, there was 7/12 SUB-PROJECT such incidents happen such as reservoir overflow, overflow flood burst causing flooding downstream areas and mainly affects to production, only the Ban Phu Tho Reservoir sub-project, 2003 incidents broke overflow flood that killed 1 person. The survey of incidents that happened in history is summarized in Table 3.1.

Table 3. 1: Synthesis of environmental incidents have occurred in the history of 12 sub-projects in the first year

<i>No.</i>	<i>Name of the reservoir and the main information</i>	<i>The incident occurred in history</i>
1	Ngoi La 2, Tuyen Quang, $V_{tb}=3.31 \times 10^6 \text{ m}^3$, $H_{max}=15,30\text{m}$, was constructed in 1973, was repaired in 1999 and 2012	Until now, the reservoir has not any major incident, not impact on environment and society, but the flood has caused deterioration of some components of dam.
2	Ban Reservoir, Phu Tho, $V_{tb}=1.68 \times 10^6 \text{ m}^3$, $H_{max}=11.00\text{m}$; was Constructed in 1976.	<ul style="list-style-type: none"> - In 1996, outlet works was broken causing loss of water, can not control and regulate, it was repaired temporarily. - In 2003, the incidents of broken spillway caused

		seriously consequences including 01 dead people and loss of assets, in 2003 flood also caused incident of spillway crest but it was repaired by local people
3	Dai Thang, Hoa Binh, $V_{tb}=0.48 \times 10^6 \text{ m}^3$, $H_{max}=16.00\text{m}$, was built in 1960	1978: heavy rain caused flood in 1 – 2 days that leading to extensive damage to crops. - 1986: Large floods was higher than spillway crest from 60-80 cm, caused flood in 2 -3 days, affected directly 3 households at Duc Binh commune - 1996: overflowing caused flood in 12 hours.
4	Khe Che, Quang Ninh, $V_{tb}=12.00 \times 10^6 \text{ m}^3$, $H_{max}=20.00\text{m}$, was built in 1970	- 2000: The first repairing. - 2005: Large floods have led to the evacuation alert for 3000 local people at downstream.
5	Dong Be, Thanh Hoa, $V_{tb}=2.29 \times 10^6 \text{ m}^3$, $H_{max}=11.40\text{m}$, was built in 1989	There were 02 incidents due to heavy rain, storm, caused flood, damage to assets and crops of local people in 1991 and 1996
6	Khe Gang, Nghe An, $V_{tb}=2.15 \times 10^6 \text{ m}^3$, $H_{max}=12.50\text{m}$, was constructed in 1991	2005: water overflowed dam causing erosion in some locations on the dam body and about 80 hectares of arable land of the village 4A, 4B, 8, 9, 10; Water spilled the house of 130 households within 1 day. although there is no damage to people, some area of paddy field and crop land were submerged and death of livestock
7	Khe San, Nghe An, $V_{tb}=1.42 \times 10^6 \text{ m}^3$, $H_{max}=14.50\text{m}$, was constructed in 1980	2005 and 2011: water overflowed some locations on the dam body and causing damage dozens of hectares of arable land of the people of the village: 4, 6.7, 9 and 11, however no damage to people.
8	Phu Vinh, Quang Binh, $V_{tb}=22.36 \times 10^6 \text{ m}^3$, $H_{max}=28.40\text{m}$, was constructed in 1992	There is no incident of cracking, broken dam, or related to dam safety. However, some components of dam have been deteriorating, if they are not repaired
9	Dam Lang, Quang Ngai, $V_{tb}=0.46 \times 10^6 \text{ m}^3$, $H_{max}=13.30\text{m}$, was constructed in 1978	No incidents were reported related to Dam Village, until now the building has severely deteriorated.
10	Thach Ban, Binh Dinh, $V_{tb}=0.70 \times 10^6 \text{ m}^3$, $H_{max}=12.80\text{m}$, was constructed in 1978	No major incidents such as dam broken, flooding downstream. However, the components of dam have been deteriorating seriously
11	Song Quao Reservoir, Binh Thuan, $V_{tb}=73.00 \times 10^6 \text{ m}^3$, $H_{max}=40\text{m}$, was constructed in 1988	2000: due to releasing water, 3 hectares of paddy fields and 2 ha shrimp aquaculture in Phan Thiet were lost totally - 2011: because of heavy rain and releasing water from Song Quao reservoir, approximately 1.360 ha (593 ha rice, 221 ha of dragon trees and perennial tree, 546 ha of crops) were damaged; 6,000 m of rural roads were broken and approximately 214 m ³ of canal were eroded - 2013: releasing water of Song Quao reservoir caused loss totally of 80 ha (rice + dragon + vegetables) in Ma Lam town- Ham Thuan Bac District

		in October 2014: Heavy rains in several days and releasing water from Song Qua reservoir caused flood that damage to 400 hectares of dragon fruit and rice, significant damage
12	Da Teh, Lam Dong, Vtb=24.00x10 ⁶ m ³ , Hmax=27.00m, was Constructed in 1995	Da Teh Reservoir has not a major incident, not affect the environment and society, but the flood has caused degradation of several components of dam

3.2. Natural and socio-economic characteristics of project areas

According to social assessment report of the sub-projects, project areas generally is where have difficult living conditions, often in the remote areas, vulnerable areas to natural disasters and climate change, storms, floods .., where there is a relatively low income, poor people and economy is mainly based on agriculture. The main socio- economic features of project areas are summarized as follows:

3.2.1. Demography

According to survey data of sub-projects, persons per household in project areas are higher than persons per household of the country of 3.89 (Statistical yearbook, 2013), ranging from 4.4 to to 4.8. Particularly, sub-projects in Quang Ninh and Tuyen Quang provinces persons per household in the sample is less than persons per household of the country, that are 3.4 to 3.7, respectively. Persons per household between regions, ethnic groups, income groups, female householder groups and male householder groups are different. Most of cases, male are householder; only some cases of female householders are almost ethnic group and single female householders.

3.2.2. Occupation, labor

In the occupational structure of the family members who involve in labor and have income in the survey sample of the project areas, agriculture-forestry-fishery are still predominant occupation with the highest percentage rate ranged from 42.5% to 76.1%, particularly areas reach to 96% (Thanh Hoa sub-project). Particularly, in Quang Binh sub-project, business and services account for high proportion of 30%. These results partially confirm that forestry-fishery sector is dominant in the economy of the project areas where focus most of the agricultural labor force.

3.2.3. Income, Poverty

The survey and assessment results show that income of people in the subproject areas is not high. Most of the households have medium income, accounting from 28% (Nghe An) to 80% (Quang Ngai); the rate of households have income of higher than average level ranges from 12% (Binh Thuan) to 40% (Nghe An). Besides, the poverty rate in the surveyed households is low, ranging from 1% to 6%. Especially, subprojects of Phu Tho Province and Thanh Hoa province have high poverty rate of 12.6% and 22.9%, respectively. One important point is that propotion of household income comes from argiculture, for instance, in Thanh Hoa subproject, income from agriculture is as high as to 96% of total income.

3.2.4. Education

The education level of the population in the survey area is allocated as follows: people with education levels from elementary school to college / university or higher education have relatively high proportion in most locals (approximately 90.0%), but male rate is higher than female rate. In some provinces, this rate is lower, such as Thanh Hoa sub-project (40%). Average illiteracy rate in the locals ranges from 0.1% to 3% and preschool rate ranges from 3.5% to 8%. This rate is significant difference between the project areas and is average rate of the country according to the Statistical Yearbook of 2013 (6%).

3.2.5. Disease and impact factors

Survey results show that common diseases in this area include flu, respiratory diseases, malaria, cholera / dysentery, hepatitis, etc. In which the number of people suffering from colds have relatively high proportion, ranging from 49% to 65%. The percentage of surveyed people who get sick in the North Central region is higher than in other regions such as Thanh Hoa sub-project (86%), Nghe An sub-project (68.5%), while in other areas ranges from 18.7% in Quang Ninh sub-project and 30.5% in Phu Tho sub-project.

5 main factors creating negative impacts on the health situation from high level to low level are water contamination, pollution, unsafe food, disease and lack of clean water for domestic use.

3.2.6. Domestic water

In 9 over 12 sub-projects, people have to use domestic water from boreholes and dug wells. In Quang Ngai sub-project, 99% of households surveyed use water from boreholes. Besides, up to 60% of residents in Thanh Hoa sub-project suggest that the factor that directly affects people's health is contaminated water, especially water from boreholes and dug wells which are not been sampling to ensure that its quality meets the standard for domestic water.

3.2.7. Infrastructure

100% of the sub-project communes have roads to the town center, 100% of communes have the health stations; 100% of communes have lower secondary schools and primary schools; households use hygienic water reached over 65%. The households have hygienic latrines at around 80%, while some sub-projects in Phu Tho province reached 90%. The main roads, communal roads have about 50% of the road is concrete was constructed under the "Government and citizens work together," the rest is still dirt road so it is difficult to go in the rainy season because the road is slippery and sliding. In the dry season the road is dusty. Electronic road activities were connected to all neighborhoods. All households in the commune have been using electricity. In addition, there are other technical infrastructures such as irrigation works. The majority of households in sub-projects use of water boreholds and water deep wells (90%), while 2 sub-projects Ngoi La 2, Tuyen Quang province are 95% of the population in the commune have been piped (tap water), some of which use the water form ponds to for washing remain around 5-10%.

3.2.8. Physical and non - physical cultural assets

Survey results in 12 sub-projects in the first year are not historical relics, famous landscape in

the sub-project area.

3.2.9. Gender features

Results of the survey showed that most of cases, male are householders; only some cases of female householders are almost ethnic group and single female householders, husband dead or divorced.

In term of labor, female mainly engaged in agricultural production activities, and this is the main source of income for female; while male participate more in non-agricultural activities, especially male working away, seasonally working at the construction site and in the big cities. Generally, in agriculture, female participate more than male but get lower income, while activities of recreating labor (housework, childcare, etc.) are primarily undertaken by female, the proportion of male engaged in this field is very low. In social activities, female also have been involved more than before, however, women still have to take on 2 roles of recreating labor and labor, so there still exist the barriers of time, opportunities and conditions for participation in social activities. For ethnic groups, proportion of women participating in community activities higher than men in some areas surveyed due to matriarchy. However, women in these areas have low education, limited access to social services, new production methods, so there are still girls dropping out of school due to economic hardship and poverty. Therefore, reducing the economic burden for female through increased income from productive activities, thereby increasing the position and condition of participation in community management activities of female is the objectives that the project aims to.

3.2.10. Ethnic minorities

Among sub-projects implemented in the first year, 4/12 sub-projects have ethnic minorities living in the project area. However, according to social assessment results and IOL results, in 4/12 sub-projects, ethnic residents can be affected by the activities of the project, those are Thanh Hoa, Hoa Binh, Binh Thuan and Lam Dong.

In Thanh Hoa sub-project, the project area is habitat of Muong, Thai, Turkish, Tay ethnics. In Hoa Binh sub-project, the project area is habitat of Kinh and Muong ethnics with the beneficiary rate of 71% of Muong ethnic, poverty rate of more than 20%. In Lam Dong sub-project, the project area is habitat of Kinh and Chau Ma ethnics, ethnic groups such as Tay, Nung are negligible. Kinh people live in most of the villages in the project area, with 1,472 households accounted for 91.2%. Ma Chau people focus on hamlet 8 of My Duc commune with a total of 134 households, 521 people accounted for 8.3%. Other ethnic groups such as Tay, Nung are negligible due to delivered from other locations to do business with a total of about 8 households, accounting for 0.05%. In Song Quao sub-project (Binh Thuan), 2 communes surveyed are inhabited by the Kinh, Cham, K'ho and Raglai people, of which only the Kinh are under patriarchy, other ethnics are under matriarchy.

Results of the consultation show that the main source of income of ethnic minority households depends primarily on agricultural activities. Some ethnic minority households are poor, lack of capital, lack of experience in the production, so that efficiency of agriculture production is not high. Income of ethnic minority households is low. The lack of water for agricultural production is one of the reasons for the ethnic minority difficulties in the process of raising living standards as well as many obstacles in the process of changing the structure of plants and animals. In many places, due to lack of water for production and livestock,

people have to move to where have water for the production and livestock. This has influenced policy of the Government on the settlement for ethnic minorities.

3.2.11. Structure management features

Most reservoirs are now the main task to store water for irrigation demands for agriculture, flood control. In addition, some reservoirs have task to supply, for domestic use and aquaculture. Management of dams and head works in the local are implemented in accordance with Decree No.72/2007/NĐ-CP, Decree No. 67/2012/NĐ-CP and guidelines of Ministry of Agriculture and Rural Development, Ministry of Natural Resource and Environment, Ministry of Industry and Trade. Currently, for dams assigned to the Department of Agriculture and Rural Development/ IMC in the provinces, EVN, annual management, operation, maintenance and security fully compliant. However, for small reservoirs assigned to the district, commune or cooperative organizations, due to lack of human resources, finance, skills so regular monitoring, maintenance is not taken care, leading to serious degradation, increasing the risk of unsafety of downstream, reducing the effective use of water resources of reservoirs.

3.2.12. Loss of construction's safety features

Through field works and surveys in the reservoirs of sub-projects in the first year and research relating documents and records provided by locals, most dams are in the project were proposed dam safety rehabilitation and improvement plan under the National Dam Safety program due to critical degradation of items of reservoirs, along with complexity of climate change, change of basin cover, water sources in the upstream, limitation of resources in annual maintenance, repairmen, leading to high possibility of unsafety for communities in the downstream as the people lives, infrastructure and cultivated land. Dams with high unsafety concentrate in dam groups managed by community and commune, because the living conditions of people in the region is very difficult, reservoirs associated with the lives of people such as water supply and production activities but lack the conditions to repair and upgrade.

According to the results of field surveys and consultations in the sub-projects shows that most of the dam structure currently eroded, slided, protection roofs are collapsed, no longer safe, reservoirs are limited ability to regulate, just keep the water level lower than the standard design. Some spillway of reservoirs are deteriorated, but is not reinforced. Intakes are infiltrated, caused infiltration in dam body. Bridges on the intake are damaged or lack of valve of intake, no bridge over spillway, management road is damaged. The irrigation systems behind intake were old and seriously degraded, eroded positions, hydraulic conductivity is less, plus the amount of leaking intakes, so not guaranteed water supply for irrigation in the last months of the dry season.

The repairing and upgrading the dam, reservoir will be implemented to ensure structure safety, safety of neighborhoods, infrastructure of economic zones, flood control, reducing downstream flooding, water supply for multiple purposes, limit vulnerabilities caused by the unsafe conditions of structures for community and economic infrastructure. Most communities are consulted are aware of the significance of the investment in repairing, upgrading reservoir safety and support them. The project investment will solve practical and urgent problem of the local in disaster prevention and mitigation and irrigation water supply,

creating a stable and psychological motivation for social and economic development for communities in beneficial areas.

3.3. Environmental status

3.3.1. Current status of water environment

Survey results of field investigation and taking samples for analysis of water quality in 12 sub-projects show that both surface water and groundwater in all sub-projects are no signs of contamination.

About surface water quality: Surface water in the project area are mainly water from the river, natural streams flowing into the reservoir, canals downstream areas. In no industrial zones, residential areas concentrated so the water quality is relatively good. Compared with QCVN 08: 2008 / BTNMT, column A2 - surface water quality in the project area are still meeting the requirements of water for domestic purposes by the majority of the targets are within the permitted standards. Particularly some samples analyzed several levels of suspended solids, turbidity, COD higher than acceptable standards at negligible levels due to the impact of domestic waste or breeding. Compared with QCVN 39: 2011 / BTNMT - National Technical Regulation on the quality of water used for irrigation, all the indicators analyzed are within the permissible standards and quality assurance for irrigation.

About underground water quality: Underground water in the area is contained in rocks and gravel layers, supplementary source of underground water mainly from water surface. Regional underground water sources of sub-projects relatively stable from 5-15 m depth; People exploited to serve the domestic and breeding in the form of wells and boreholes; Underground water serve agricultural production, industrial is considerably less. The results of analysis of 15 targets physicochemical, include 3 heavy metal indicators and 02 micro indicators in the areas of sub-projects in the South Central region are within the limits permitted by the National Technical Regulation on substances underground water (QCVN 09: 2008 / BTNMT).

3.3.2. Current status of air environment

The indicators analysis result (vibration, noise, dust, total, SO₂, NO₂, CO) showed air quality in regions of sub-projects are quite good because not affected by the industrial action , transportation and services. According to the reports of current environmental status of the province with 2014, the value of the parameters controlling the air quality as CO, SO₂, NO₂, dust in the area of the sub-projects are valuable in regulation allows (QCVN 05: 2009 / BTNMT), the noise level is below the threshold allowed by QCVN 26: 2010 / BTNMT.

3.3.3. Current status of soil environment

The sub-projects are all located on low hills, sloping terrain convenient for the runoff, soil erosion, nutrient-poor lands, thin soil layer. However, most of the soil in the project area are not polluted by toxic substances. Concentrations of heavy metals such as Zn, Pb, Cu, As, Cd in soil and sediment are within the permissible standards of QCVN 03: 2008 / BTNMT- national technical regulations on limits of heavy metals in soil.

3.3.4. Current status of biological environment

Natural vegetation at sub-projects area mainly consists of secondary vegetation and shrubs. Besides, the area around the dam reservoir has a ratio of species planted mainly eucalyptus, acacia. Some sub-projects are located in the basin of the reservoir industrial crops and fruit trees and other crops dispersed.

All sub-projects are located away from protected areas, biosphere reserve areas, national parks and other protected areas in 5 km. SUB-PROJECT in the region are not rare animals and plants, included in the IUCN Red List and Vietnam.

PART 4. SUMMARY OF ENVIRONMENTAL AND SOCIAL IMPACTS

4.1. Potential positive impacts

a) Common benefits

The proposed project intends to improve the safety of the dams and related works, as well as the safety of people, socio-economic development and local infrastructures. Support the Government of Vietnam's Dam Safety Program. This will be achieved by supporting both the structural safety of the dams and reservoirs themselves, along with the operational safety required to safeguard the populations at risk and downstream socio-economic infrastructure. The project will also support Government to ensure a more holistic, basin level integrated development planning to improve institutional coordination, future development and operational safety

DRASP project is directly aligned with the Government definition of dam safety outlined, the hazard reduction and mitigation and environmental protection programs

b) Protection for people and their properties

This is one of the prominent positive impacts of the project. According to statistics of 12 sub-projects in the first year, most of these dams have deteriorated and their safety is below accepted international safety standards, presenting a substantial risk to human safety and economic security. If the project implement on time, it will protect 207,000 person (47,000 households), include 9.2% indigenous and ethnic minority: Tay, Cao Lan, Thai, Hmong, Dao, San Chay, San Diu, Thoi, Son Chay, San Diu, Muong, Hoa, Nung, Giay, Lao, Kho Me, Thai, Tho, Chau Ma. (Table 1.2, annex 1)

c) Protection for rural infrastructures.

According to statistics of 12 sub-projects, the rural infrastructures that are protected when implementing the sub-projects include: transportation roads (400 km), canals (200 km), school (60), health clinics (23), public areas (26), water supply stations (3), power transformer station (24) in down stream of the dam (table 1.3, annex 1).

d) Increase the yield of productions.

As the surveying results of the first year sub-project, the damaged dam lead to decrease of the irrigate areas, thereby not storing enough amount of water according to the design (there is only 40-50% of irrigation areas that can be covered by the certain reservoirs). Also, water supplying is not actively stable, which leads to unstable production. 12 subprojects implementation will supply water for 17,037 ha agricultural land; 12,618 ha forest land; 1.666 ha of surface water for aquaculture; 2,171 ha of fruit tree and prevent the fire forest for 4,000 ha of forest land (table 1.4, annex 1). In addition, it can indirectly increase job opportunities for manual labors in the areas, increase the household income which leads to improving living standard for the community.

e) Health improvement, reduction of labor force and community risk

The project will help reducing labor force of people and implement well settlement policy of the Government. Due to prolonged water shortages in some provinces such as Binh Thuan province, to ensure the safety of livestock and people, especially ethnic minority groups, they have to move to place where water is available. On the one hand, This causes difficulty for people in movement, settlement; on the other hand, the situation of migration may occur

In addition, when project is implemented, taking water into the field as well as domestic use water becomes easier, thereby reducing time and effort of people (especially for women) ¹ and the project contributes to solve problems of unsafety due to taking water at night, far away from house and in difficult conditions.

After repairing irrigation structures, they will provide hygienic water for surroundings. In particular, those which are used water from rivers, reservoirs, the water quality has a great influence on the health of the people. For example, people around Khe Gang sub-project (Nghe An province) nearly 4% of people still use water from river for living (bathing). The Vinh Phu sub-project, Quang Binh province, is expected to supply water for approximately 30,000 households in Dong Hoi city (75% of the population). Or, in Song Quao sub-project (Binh Thuan province), water shortages, droughts are resolved to help the people having water for drinking, living, bathing, thereby reducing diseases arising due to lack of water.

f) Improving economic development conditions for ethnic minorities

In the 12 sub-projects of phase 1, some sub-projects implemented have positive impacts on livelihoods and incomes of ethnic minorities. For example, in Hoa Binh sub-project, with the proportion of beneficiaries is 71% of Muong ethnic, more than 20% of poverty rate; sub-project implementation also contributes to improve community living in the area. The project implementation will contribute to overcoming the shortage of irrigation water for annual production, which is one of the reasons for the minorities meet many difficulties in process of raising living standards as well as meeting many obstacles in the process of changing the structure of crops, livestock, reasonable production methods.

g) Empowerment of women and vulnerable groups

According to survey results, women, vulnerable groups living in the project area depends mainly on agricultural activities. Women have fewer opportunities to participate in non agricultural activities than men. Therefore, when the project was implemented, some locals expand cultivated area, increase the rotation, intercropping, crop raising, and thereby creating jobs in the agricultural sector where the beneficiaries are female. When women have jobs, income, position in the family and society is raised.

The water source initiative will help women reduce their labor, effort to take water into the field, instead of resting or participating in other economic activities. Many females said that when have more agricultural production areas, males (husbands) will not have to work away (employees, workers), they feel "peace of mind" because no fear of unwanted consequences

¹ Women in particular and people of Binh Thuan province in general have to spend much time and effort for taking water for domestic use and in the fields, especially in period of 2014-2015 with long drought situation.

such as HIV, not "managed" husband, and at the same time the husband is not working away from home to support female working in the fields, taking care children.

Besides, action plans of the project such as gender action plans, ethnic minorities development plan (including female of ethnic minority), capacity building, communication, mobilization of people involvement, including female will be an opportunity for female to have opportunity to improve the position, voice and contribute to development of community. In addition, female have the opportunity to learn about gender policy and social security of international organizations and the Government of Vietnam. The female of ethnic minority will have the opportunity to become familiar with the issues relating to community management, community monitoring when establishing user organizations to preserve water resources and on-farm irrigation systems. Female and male will have more knowledge regarding the production, or new skills to create products through rehabilitation programs in the community. Participating male in community activities of the project will help them become more aware of their rights and responsibilities to the community

h) Increase community awareness and building capacity to dam safety management

The project supports the people to increase their awareness on dam safety management. People living in the areas could change their behaviors to the environment protection and social improvement due to the project implementation, is the main driven of DRASP

i) Improve local living standards.

When incidents of broken dam, broken spillway leading to flood at downstream occur, they causes water pollution, increased disease (as pinkeye, dermatology, diarrhea ...), landscapes is deteriorated seriously (garbage, mud, dead animals, plants ...), air pollution due to unpleasant smell ... Repairing activities will limit the effects mentioned above and improved ecological environment in downstream areas.

After the repairing, the management and operation of the facility will be improved, which resulting in the activities of discharging waste, polluting the local environment to be minimized, contributing to improve the landscape and environment, decreasing the risk of pollution and disease to surrounding communities. Good performance of management, operation of reservoir also contributes to limit the risks of drowning risk, especially for women and children around the construction area thanks to strict supervision, regulation on safe corridor for works

4.2. Potential negative impacts on environment and society in the construction preparation and construction phases

4.2.1. Potential negative social impact

1. Resettlement impact

Implementation of all sub-projects in Phase 1 affects land acquisition and resettlement, but in different levels. Specifically, land area of temporal acquisition is 123.811m² in construction process at 6 sub-projects in Tuyen Quang, Phu Tho, Hoa Binh, Thanh Hoa, Nghe An and Quang Ngai provinces. Land area of permanent acquisition is 313.266 m² in 08 sub-projects of Tuyen Quang, Phu Tho, Hoa Binh, Nghe An, Quang Binh, Quang Ngai, Binh Dinh, Binh

Thuan provinces. Approximately 3,000 m² of acquisition land area at 3 subprojects of Tuyen Quang, Nghe An and Binh Thuan provinces.

Almost acquisition land area is cultivation and production land, affecting structures, etc. This has an impact on livelihoods, income of AHs when implementing project, as well as material damage to AHs. However, some sub-projects such as Binh Thuan, Tuyen Quang sub-projects, land acquisition for construction is not large, acquisition land area belongs irrigation works protection corridor, items investment is small and far away from residential areas.

2. Affected households

Total number of affected households of sub-projects are estimated to 206 households, with 944 persons, belonging provinces of Tuyen Quang (12 households), Phu Tho (15 households), Hoa Binh (70 households), Thanh Hoa (13 households), Nghe An (02 households), Quang Binh (27 households), Quang Ngai (23 households), Binh Dinh (23 households), Binh Thuan (18 households). 13 resettlement households belong sub-projects of Hoa Binhe (02 households), Tuyen Quang (01 households) and Binh Thuan (10 households), with 50 persons. In the 12 subprojects, ethnic minority households are not affected with acquiring residential and production land.

3. Impact on income and economic growth

Land acquisition for construction of project impacts on acquisition of residential land, production and business services land. Most of the trees, crops were affected, including fruit trees, timber, food crops. The risk for income reduction due to the negative impacts of land acquisition activities can be seen by many households will lose the income resources such as land, fish ponds.

Implementation process of construction of the sub-projects also impact negatively households who have production land depending only source of irrigation water from irrigation works. Although most of sub-projects has solutions for construction to minimize the damage caused water storage when constructing such as constructed in accordance with the time of production, taking temporally water from other irrigation works serving agriculture or construction solutions which can be construction and also can supply irrigation water, etc. However, for Hoa Binh sub-project, irrigation areas of 223 households suffered water cut in construction process without any other solution to overcome. Therefore, it needs policies to support AHs by reasonable programs, action plans.

In addition, some households lost income from business services in the project area (Quang Ngai province). However, this is not the main income source of the household, so economic impact is negligible. Due to project activities just are repairing, but not new construction, therefore negative impacts on income, production activities, and economic development is not much. This will be overcome through policies of resettlement and compensation of the project. Basically, when project is implemented, economic impacts are in the short term and are entirely possible corrective measures, support for affected communities.

4. Conflict on benefits in water resources exploitation

Conflict on benefits in groundwater extraction can happen but only for a short time, which in construction process, water resources is scarce, conflicts of benefits can be happen when there

is not sufficient uneven distribution of water for irrigation zones. Upstream area takes usually water adequately and sooner than downstream area, causing conflict of interest for water consumption. This requires solutions that minimize conflicts may occur. Besides, there may be conflict arising between the affected households with those not affected if affected households said that they were not adequately compensated while other households are not affected by project but have benefit of extraction and using water sources equally or even more favorable than AHs. Therefore, benefits of project need to ensure minimum damage as well as fairness and equality among households in the water supply.

5. Impact on cultural and spiritual structures

Impact assessment reports of the sub-projects show that there is no impact on graves or cultural facilities, local beliefs during the project implementation

6. Impact on vulnerable groups

In short-term, land acquisition activities in the sub-project might reduce areas of agricultural land and crop land, effecting to income for agriculture activities, especially female group that depend mainly on agriculture. Reduction of irrigation water in the construction process leading to taking water for production and domestic use of female will also harder. For ethnic minority households who have income depending primarily on acquisition land area and have to move, look for new place for cultivation, etc., risk of income reduction is high if not timely support of cultivated land or create suitable livelihood opportunities.

7. Impacts on ethnic minority groups

Because the project's features are repairing and improving safety of hydraulic works, no new construction, impacts on ethnic minority are not much. There is no ethnic minority household displaced and production land acquisition. However, the process of consultation and impact assessment of the sub-projects showed 223 ethnic minority households under Dai Thang reservoir sub-project (Hoa Binh province) are affected when water cut during project construction due to no plan of water supply during construction (in 07 months). This is a wide-ranging impact but in a short-term but can be overcome by means of assistance to stabilize their lives through development and full implementation of development plans of ethnic minority at sub-project level (local) under ethnic minority development framework of project approved in accordance with OP. 4.10 policy requirement of the World Bank.

In general, most of ethnic minorities of the whole project around structures are to benefit when project is implemented and gone into operation, land acquisition and resettlement is not significant for ethnic minority groups. For ethnic minority groups affected by water cut in construction process, they are supported through ethnic minority development plan at sub-project level.

8. Impact on gender

Unexpected impacts include production land acquisition in some sub-projects, interrupting small trades in construction site may affect livelihoods, lack of job for female, thereby leading to increase economic dependence on male because male are capable of participating in non-agricultural activities, such as construction, carpentry, mechanics, etc or work away from house. Female in rural areas who depend on income from agricultural production might

have to be responsible for more burdens on economy, income, child care and reduce position in the family and community. They may have to look for other jobs in difficult conditions of awareness, health, knowledge and expertise.

9. Impacts of searching and removing bombs and mines.

Vietnam is a country that suffered long war periods, so the possibility of bombs and mines left underground is very high. Although main activities of the project is repairing on existing construction, supporting constructions such as mining in uncultivated lands require site clearance before implementing the project. Removing bombs and mines, in spite of being implemented by certified organizations, has high fire hazard that can cause accidents to workers and requires plans to avoid risk. Impacts of searching and removing bombs, mines are estimatedly low.

10. Impacts on infrastructure and traffic in project area.

These impacts might happen to all sub-projects. Because transporting materials, wasted soil requires heavy vehicles, inter-village and inter-communal transport routes might be downgraded. Soil roads, concrete roads and paved roads can be subsided or cracked. The construction phase requiring a huge amount of workers as well as vehicles at the same time might create traffic jam, which affects transportation and production of local people. These impacts are estimatedly high and need solutions to reduce.

11. The negative impacts to water supply and production of the agriculture, aquaculture, tourism industry

Aquaculture is not allowed at whole the first year subproject (only at Ngoi La 2 subproject, is testing aquaculture in cage but this activity will finish at the end of 2015), there is no tourism activity, navigation of households for production is only, so there is no negative impact. 02 subprojects using water for domestic supply are Phu Vinh reservoir with supply for 3,000 households at Dong Hoi city and Song Quao reservoir with supply for Phan Thiet city. However, in construction time, these subprojects have alternatives for water supply, so there is no negative impact.

Cut – off water for construction affects agricultural production at downstream at the following subproject: Dap Lang reservoir subproject (Quang Ngai), Thach Ban reservoir subproject (Binh Dinh), Dai Thang reservoir (Hoa Binh) (table 4.1). These impacts are temporary in construction time and they can be resolved by compensation for the affected households.

Table 4. 1: List of construction's impacts on agricultural production at downstream

<i>Subproject</i>	<i>Number of affected households</i>	<i>Affected area (ha)</i>	<i>Affected time</i>
1. Thach Ban reservoir, Binh Dinh	355	75	01 summer – autumn crop
2. Dai Thang reservoir, Hoa Binh	244 households, trong đó, 223 ethnic households	57.1	01 winter crop
3. Dap Lang reservoir,	266	43.2	01 winter crop

Quang Ngao			
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12. Increasing potential conflicts between workers and local people.

Rapid the numbers of workers in the local to serve the construction leading the relationship issues between worker and local resident due to different from cultural, exhorted food, service and employment. Therefore, project owner and/or constructor consultant have to prepare a plan to solve the problem if occurs or manage the worker during the construction phase.

13. Risks of accidents to workers and community

During material construction transportation, local road is inapplicable to the heavy vehicle and the density of vehicle will increase the accident in the local, specially in the vulnerable areas (school, hospital, resident areas, etc.). Wrong operation of machine causing accident to workers working on site. This impact assessing at high level but can be minimised by applying an appropriate mitigation measures.

14. Spreading diseases from worker to local person (vice versa)

The majority and the most immediate adverse health impacts are expected to occur where construction workers and camp followers concentrate. These impacts would consist of communicable diseases (food- and water-borne, sexually transmitted diseases and HIV/AIDS), road traffic and construction-related accidents. Social impacts have the potential to cause social, psychological, physiological stress among affected people, particularly those who need to be relocated. Local communities face the risk of losing their cultural and ethnic identities due to increased fluctuation of construction workers and camp followers. Higher concentrations of people may result in prostitution, drugs, gambling, trespassing, theft and other social disturbances, altering community dynamics and straining relationships among ethnic minority groups. As the survey results to the first year sub-projects, an about ...% of the households around the construction site and pits have problems with their health. According to the result of social surface (medical sector) in the addressed areas, the numbers of local people..... have problems of breathing, diarrhea, skin diseases, HIV, hepatitis higher than before the project implementation. Water, air, or contacts between worker and local person are most likely transmitters' agency

15. Risks to people's health and safety.

Domestic waste generates from the camping site and constructing site without proper management and treatment is the main issue to local health (mosquitoes, flies). The hazardous material such as termite chemicals, oil leaking can direct affect to and water resources. Residents living around transporting road and constructing site can be affected by dust and vibrant, also workers can be affected by this issue. In addition, infectious diseases could break out if the conditions in the area of environmental sanitation are not control properly. These impacts can be eliminated by applying appropriate mitigation measure.

16. Impacts on social unions.

Social unions (women unions, youth unions, former soldier unions, etc) in the project areas have to involve in monitoring the contractors implementing Environment Management Plan. They need to immediatly give feedback about the project's impacts on environment and society. social unions have meditation roles when conflicts arise between workers and local

communities. In addition, social unions support the contractors in managing workers, promoting to raise awareness for their communities. Youth unions can volunteer in traffic management. These impacts can take place in all sub-projects.

17. Impact on public utilities.

The construction dam could dramatically affect the existing infrastructure and community services. The dramatic increase in population levels, or “boom-town” effect, will increase the demand for additional services such as community services and staff (medical, emergency, safety, etc.), markets, education centre, wastewater production and sanitation services, power/fuel and potable water (drinking, food preparation etc.). These services may cause social conflicts with local villagers as the demand increases. However, the services will also benefit local villagers and people inhabiting adjacent communes.

4.2.2. Negative impacts on environment during pre- construction and construction phases

1. Landscape change and modification, especially at borrow pit and disposal site.

Especially, occurrence while operating soil stockpile and disposal site and site clearance. The constructions or repair the appurtenant structures requires a large of soil, stone materials and hence, it generates a huge amount of solid waste from digging, excavating and exploiting. Each subproject would require to use 2- 5 hectares of land for soil stockpile exploiting or waste disposal site. The exploitation of soil and dumping waste site are the main results of land landscape change cause. Moreover, it can contribute significant change to water resources, land and soils pollutions. The permanent landscape change is not only impact on landscape, but also on natural environmental and wide lifes, which increases erosion progress, landslide and others. Also, it harms to local community living around the pits or downstream. The assessment concluded that the potential negative impacts of these activities will be moderate, and the proposing mitigation measures can apply to reduce these impacts.

2. Changing water flow or water quality.

During construction phase, water in a reservoir should release (drainage) until below the range of reservoir function, leading to environmental flow and hydraulic pattern change in the local, increasing water turbidity, micro-organisms community, and organic matter in water due to lacking water dilution. Generating solid waste, debris from constructing areas and camping site will block water flow and add more contamination into water body. The affected objectives are: eco-tourist agencies, people living around the constructing site or at the downstream areas of the reservoirs, water resources (surface and ground water resources). But these impacts are most likely to be localized and temporary and close monitoring and immediate suspension of the construction works in case of the abnormality would be adequate

3. Increased levels of noise, dust and contaminations to the air.

During the phase, a volume of dust will increase by material transportation, Clearing, grading, excavation, levelling, blasting, truck hauling, stockpiling, waste disposal, road development, and transport vehicle gas burning (includes toxic gases of NO₂, CO, CO₂), dust from unclean machine and transportation vehicles, specially in a sunny days or drying season the dust clouds can upraise to 200m height in the air. Project owner and construction consultant should

take into account the impact and have to follow QCVN05: 2013/BTNMT to monitor and apply a suitable mitigation measure to reduce the negative impacts.

4. Increasing noise and vibration.

This impacts generating from clearing, grading, excavation, leveling, blasting, truck hauling, stockpiling, waste disposal, road development, and transport vehicle, and on site construction. It contributes an inconvenience condition to the people living around the sites and to the workers. If high frequency and high level of noise in long time explosion, some negative impacts will occur to the people and worker, such as reduce the yield of words, causing fatigue, stress, insomnia, deaf phenomena, etc. The area affected by noise and vibration are roadwork. But these impacts are most likely to be reduced by applying an appropriate mitigation measures.

5. Impact on dam/reservoir safety

During construction phase, if it did not apply an appropriate construction method or did not follow the regulation, it would easily damaged the dam safety condition and economic lost to downstream

6. Risk of fire explosion.

Fire hazards could happen in the case of transport, storage of fuel operations which serve construction work items of dam reservoirs or lack of safety of the power supply system. When the air temperature combined with high hydrocarbon concentration in the air is the agent causing potentially fire fuel areas seriously affect workers directly involved in the labor and environment of sub-projects construction area. When fire related to the issue of gasoline leads to a high risk of loss of human assets and economic, dangerous to human life, generating toxic gases to affect water quality air.

7. Impacts of quarrying and blasting.

Some sub-projects involve activities of quarrying and blasting to create construction materials, transporting roads, etc. These activities create negative impacts such as noise, dust, vibration, emissions that cause environmental pollution. Soil, rock dispersion can cause accidents for workers and residents in the areas, obstructing traffic as well as affecting living areas of animals and trees in neighbourhood.

8. Negative effects caused by water stored in the reservoir after construction

Repairing dams, flood spillway, water intake are all related to lowering or removing water in the reservoirs. In construction sites that generates organic materials caused by cutting trees, destroying vegetation and creatures growing in nonflooded areas, construction waste such as concrete packages, etc, if they are not cleaned up, when water is retained again, the decomposition of organic matters in anaerobic conditions will pollute the reservoir water. Wasted soil will increase water turbidity in the early stages when water is retained.

9. Negative impacts of demolition of ancillary works after construction.

After construction, contractors must tear down the temporary works and camps that can cause

negative impacts such as generating emissions, obstructing traffic. Soil and stone quarries and dumps, if not restored to the previous stages properly, will cause soil erosion, subsidence and environmental pollution, leading to incapability to produce.

10. Impact of biological environment.

Clearing, grading, excavation, levelling, blasting, truck hauling, stockpiling, waste disposal, road development, and transport vehicles. Are expected to alter plant species composition, structure and abundance and modify their habitats. Clearing of vegetation will lead to loss of biodiversity and habitat. The impact to the threatened species is considered minimal due to their distribution pattern. Another issue from clearing will be the debris resulting from unsalvageable wood, vegetation and weeds. The waste produced may lead to disruption of local ecosystems (water, soil, and vegetation). This may result in the loss of endemic species, contributing to biodiversity degradation.. Another significant impact is the presence of worker camps. Construction workers may exploit forest products and wildlife for their food. Some sensitive species could be affected and lost due to construction activities in the areas. Construction activities shall be minimized during sensitive breeding and nesting periods. Apart from trees removed in reservoir clearance, trees in other areas shall be re-established after construction or compensated for at some other location.

4.3. The negative impacts during operation phase

Beside the positive impacts of the project, some negative impacts in the operation phase can be addressed and need an appropriate plan to manage, are:

1.Sedimentation. Most of reservoirs are located in steep areas, therefore, the sedimentation process is easy occur. The main physical reasons of the issue are erosion progress in upper stream of the reservoir. There fore, the project owner has to consider the problem and make a plan to remove sediment out of the reservoir.

2.Polluting water. in reservoir due to re-establish aquatic cultural and agricultural practices in upper stream of the reservoirs, such as nutrient, chemical use, fertilizers, etc. These impacts have to control by planning a suitable development plan to aquatic and agricultural cultivations.

3.Domestic waste: Generating from worker and people living around a dam. The impact is not significant and can be handled.

4.Negative impact due to extension of spillway. There 6 subproject carry out extending spillway and 1 subproject (Song Quao reservoir) builds a new secondary spillway to ensure quick and safe flood discharge for the headworks. Besides the positive impacts of extending spillway, they may cause flooding for downstream areas. The subprojects of Ngoi La2, Dai Thang resevoir, Khe San reservoir, Khe Gang reservoir are assessed that extending of spillway do not affect downstream areas of river systems and streams. The new construction of a spillway at Song Quao reservoir may cause flood for 20 households and infrastructure at down stream but the frequency occurs only once in 100 years, so the impact is negligible

5.Water lost. Water lost due to seepage via embankment or foundation of dam. This reduce water supply to downstream, especially in dry period. And It lead to economic lost to local

communities, however this impact assessed at low level due to the reservoir is upgraded or repaired in the past, but inadequacy method.

6. *Risks of dam/reservoir safety*: Dam breaking will impact to hydrology pattern of the local, to the ecology systems, biological, soil environmental and to water supply to domestic users and agricultural cultivation. This impact is extremely difficult to recover to the receivers.. Therefore, the dam/reservoir manager must to follow a operation plan and monitoring the compliance during construction phase, if it did not apply an appropriates construction method or did not follow the regulation

PART 5. MITIGATION MEASURES FOR ENVIRONMENTAL AND SOCIAL NEGATIVE IMPACTS

5.1. Environmental and social impact mitigation measures in preparation phase

Table 5. 1: Summary of environmental and social impact mitigation measures in preparation and construction phase of 12 subprojects

<i>Issue/ Negative impact</i>	<i>Mitigation measure</i>
1. Land acquisition and resettlement	All subprojects have developed Resettlement Action Plan (RAP) to support and compensate for households who are acquired land and impacted on their crops according to the resettlement policies of project
2. Impact on vulnerable people	<ul style="list-style-type: none"> • In addition to compensation, support in line with RPF, all subprojects have proposed to support for life stability and projection for vulnerable households, damaged households (loss of greater than 20% of arable land and >10% for vulnerable households). • Contractors are suggested to arrange the affected households participating in unskilled works and food supply services in order to increase their income
3. Impact on ethnic people, only at Dai Thang subproject (Hoa binh), cut – off water for construction impacts on production of 223 ethnic households	<ul style="list-style-type: none"> • Dai Thang reservoir subproject (Hoa Binh) has developed Ethnic minorities development plan to support the ethnic households for production and life stability in order to meet the requirement of ethnic development policies frameworks of project
4. Impact on traffic in project area	<p style="text-align: center;">The subprojects have proposed the following measures:</p> <ul style="list-style-type: none"> • Before construction, carry out consultations with local government and community and with traffic police. • Significant increases in number of vehicle trips must be covered in a construction plan previously approved. Routing, especially of heavy vehicles, needs to take into account sensitive sites such as schools, hospitals, and markets. • Installation of lighting at night must be done if this is necessary to ensure safe traffic circulation. • Place signs around the construction areas to facilitate traffic movement, provide directions to various components of the works, and provide safety advice and warning.
5. Impact due to blasting for construction (only in Song	Song Quao reservoir subproject has proposed the following mitigation measures: Compliance with national technical standard

<i>Issue/ Negative impact</i>	<i>Mitigation measure</i>
Quao subproject – Binh Thuan)	in blasting; making safety corridor for blasting to ensure safety for local people; blasting is only allowed if a design blasting plan is available and safety measures in blasting has been approved by competent agency
6. Impact due to mine clearance.	<p>Most of sub-projects related to bomb disposal activities these activities were carried out according to regulations and mitigation measures from survey step, project design, and site clearance, ensuring compliance with safety procedures, regulations, and rules.</p> <ul style="list-style-type: none"> • Decision No. 96/2006 / QD-TTg dated 05/04/2006 of the Prime Minister on the management and implementation of demining explosives • Establish regional corridors cleared to ensure the safety of people. • The bombs, mines located in the clearance plan and build infrastructure and implemented prior to the leveling; • Conduct surveys and plans for construction techniques to detect and handle mines and explosives; plans to organize the construction and construction plans; deployed forces demining until done canceled mine explosion must comply with the procedures, rules, safety rules.
7. Negative impacts on production and domestic water supply.	<p>The subprojects implemented the impact mitigation measures as follows:</p> <ul style="list-style-type: none"> • Making a coffer dam for construction of new outlet works, old one still operates normally, has been applied. The old outlet works will be demolished when the new one is completed, so there is no impact on water supply for downstream. • The subprojects with minor repairing (working bridge, valve) such as Ngoi La 2 (Tuyen Quang), Khe Che (Quang Ninh), Da Teh (Lam Dong) and short construction time (half of month to 01 month) have arranged construction time in less water use period to avoid impacts • At Song Quao subproject (Binh Thuan) has diverted water flow from Dai Ninh hydro power plant to supply water for domestic use of Phan Thiet city and production in construction time • 3 subprojects without alternatives are Thach Ban (Binh Dinh), Dap Lang (Quang Ngai) and Dong Be (Hoa binh) have deloped a compensation plan for the affected households according to the Resettlement policies of project
8. Impact on affected people's income and life	<ul style="list-style-type: none"> • Besides compensation for the damage following to project policies, all subproject also support to stabilize people's life. • Employing the local labour to work in the project such as food supply service, participating in unskilled works
9. Potential conflict between workers and local	<ul style="list-style-type: none"> • Develop a worker management regulations and median

<i>Issue/ Negative impact</i>	<i>Mitigation measure</i>
residents	<p>resolution mechanisms</p> <ul style="list-style-type: none"> • Register temporary resident permit for workers • Employ local people to work in the project • Increase local people's awareness about the conflicts and resolution
10. Risk of accidents to workers and community in construction phase	<ul style="list-style-type: none"> • Train workers about working safety and provide personal clothing according to current regulations of Vietnam • Install barrier, fence, warning boards, restricted areas, illuminating systems to protect local people and warning potential dangers and may have. • Contractor will implement the safety mitigation measures such as install protection fence, warning signs, traffic lights to avoid accidents in local as well as vulnerable areas
11. Disease spread from workers to local people (and vice versa)	<ul style="list-style-type: none"> • All subprojects have developed a community health protection plan. • Check the worker physical and local community frequency. • Hygiene and sanitary the constructing site and camping site.
12. Damage local roads and infrastructures	<p>The subprojects have proposed the following mitigation measures:</p> <ul style="list-style-type: none"> • Using material trucks which are suitable with road structure\ • Provide information of construction schedule and time of cut off water/ power before at least 2 days to the affected households • Compensation for damage to road and rural infrastructure.
13. Impact on gender	<ul style="list-style-type: none"> • All subproject carried out gender analysis and develop Gender Action Plan • Use local labour maximise to increase household incomes, especially women in the local involves to the works of the sub-project.
14. Impact on social unions.	<ul style="list-style-type: none"> • Train the staffs of the social unions on the right and their responsibility to the ESMP monitoring and the contractor compliant • Train staffs on the monitoring skills, reflecting information skill regarding social and environmental impact of construction activities • Develop information systems between Social union and local authority, PMU, construction contractors and supervision contractor in order to receive and process information on time.
15. Impact of public services.	<ul style="list-style-type: none"> • Provide information for the affected households regarding on construction time and cutting off water/electricity at least 2 days before the work taking place. • Any damage to public service has to report to relevant agencies and should be repaired as soon as possible. • Compensate damaged due to construction activities
16. Changes landscape due to borrow pit exploitation	<p>Earth works; camp building and construction of items will change the landscape of construction area and increase</p>

<i>Issue/Negative impact</i>	<i>Mitigation measure</i>
and disposal areas operations	<p>erosion progress. Contractor should follow:</p> <ul style="list-style-type: none"> • The solid waste such as wood shall be collected for reuse or buried at dumping site. • Reuse the removed soil layer to plantation and ground leveling • Contractor will clear away and remove all materials and rubbish and temporary construction after complete work
17. Changing Water quality or flow patterns	<ul style="list-style-type: none"> • Minimize the solid or rocks falling to reservoir • Install collection and treatment system domestic wastewater that meet discharge criteria and transport to the treatment facilities or discharge to city sewage systems. • Wastewater must be collected in specific tanks and have to get permission to transport. • The septic pits will be covered and sealed after finishing construction • The hazardous wastes such as waste oil, chemical termite must be collected and processed according to the management of hazardous waste • Hazardous waste must be labelled and stored in separate containers with appropriate labelling. Containers are located away from riverbank and domestic water source in order to avoid making bad affects on water quality
18. Dust/ air pollution	<p>The Contractor implements dust control measures to ensure that the generation of dust is minimized and is not perceived as a nuisance by local residents, maintain a safe working environment, such as:</p> <ul style="list-style-type: none"> - water dusty roads and construction sites; - covering of material stockpiles; - Material loads covered and secured during transportation to prevent the scattering of soil, sand, materials, or dust; • Exposed soil and material stockpiles shall be protected against wind erosion.
19. Increase noise and vibration	<ul style="list-style-type: none"> • All vehicles must have appropriate “<i>Certificate of conformity from inspection of quality, technical safety and environmental protection</i>” following Decision No. 35/2005/QD-BGTVT; to avoid exceeding noise emission from poorly maintained machines • All vehicles avoid transport materials in rush hours and at night time • Alignment traffic road. Organize the working time to avoid all activities happen in same time
20. Reservoir sedimentation	<ul style="list-style-type: none"> • The earthwork operations of repairing dams, spillways, demolist the old construction must be covered to prevent landslides and

<i>Issue/Negative impact</i>	<i>Mitigation measure</i>
	soil erosion <ul style="list-style-type: none"> • Quarry material areas need cover or installation fence to avoid material fall down • Material, soil, rock and waste are not allowed to storage in reservoir area
21. Impact on dam safety	<ul style="list-style-type: none"> • All construction activity must be in the dry season • Speed up construction progress
22. Impact on biological environment	Activities of the project just occur at construction site, site clearance area, some mitigation measure can be <ul style="list-style-type: none"> • Limit the land occupation to site clearance • Wash vegetation cover and plant around the transportation road • The application of chemicals for vegetation clearing is not permitted. • Do not remove or damage vegetation without direct instruction. Or cut trees for any reason outside the approved area • Plantation at affected area
23. The negative impact after completing construction	<ul style="list-style-type: none"> • After completing the work, the contractor have to clean and remove all materials, rubbish and temporary works out of the site.
24. The negative impact of the demolition phase construction	<ul style="list-style-type: none"> • The disposal areas, land mines, workers' camping site, materials storage areas, and other area used to build temporarily construction have to recover to original state. Develop a pant banks and construct a water drainage and sewage systems • Earth re- fill to borrow pit and quarry material site, plantation on open land areas • Chemical contaminated soil will be moved, transported and buried in the indicated area • Disposal areas must be covered by clay on top, leaching treat and by plant

5.2. Environmental and social impacts mitigation measures in operation phase

The negative impacts would be considered in operation phase such as sedimentation, water pollution, extending spillway may be increased sand transportation into reservoir or causing more water releases to downstream area during flooding period. A The mitigation measure can be contributed to reduce impacts, are (*Table 5.2*):

Table 5. 2: The mitigation measures of the negative impacts in operation phase

<i>Issues/ negative impacts</i>	<i>Mitigation/ remedy measures</i>
1. Sedimentation	<p>Management unit of reservoir need to implement a mitigation measures in order to minimize the erosion progress or landslide occur during this phase. There are:</p> <ul style="list-style-type: none"> • Planting a tree bank in bared land area and slope areas to reduce the risks. • Limiting the actives on slope areas and within reservoir
2. waste from agriculture, forest, tourism, and fishery activities impacts to water quality	<ul style="list-style-type: none"> • Train to local community about the law of environmental protection and sustainable development • Develop a regulations, sanction to violated person or household to environmental protection such as person discharge hazard chemical into reservoir or discharge waste without treat direct to • Install the waste collector and treatment system around the reservoir • Assign an organization or individual to manage wastes or related material to protect local environment. • Strengthening staffs capacity on environmental protection • The subproject with reinstating irrigation area as design will carry out the program of IPM
2. Domestic waste impacts to water quality	<ul style="list-style-type: none"> • The households, servicers and tourist agency have to response to manage domestic wastes. Waste treatment plant have to compliance with QCVN on waste treatement
3. Negative impacts due to extending spillway and new construction of spillway	<p>This takes place at Song Quao subproject (Binh Thuan), low impact level, the subproject has proposed the mitigation measures as follows:</p> <ul style="list-style-type: none"> • Announce the potential negative impacts to residents and local authority in affected area.
4. Impacts due to unexpected releasing water	<ul style="list-style-type: none"> • Announce water release schedule to downstream on the public media to local authority about the volume of water will be release potential negative impacts • Develop evacuate and rescue plans, provide shelter and water supply facilities plan to protect downstream resident if necessary.
5. Involve risk related to safety of dams	<ul style="list-style-type: none"> • Assess to effectiveness of the project on dam safety. • Capacity building to staffs on the reservoir/dam management • Regularly inspect and detect incidents lead to unsafe dams and the authority competent to handle • Maintenance frequency and early detect mechanisms • Budget allocation to maintain and repair the appurtenant structures if necessary

- 2
- Summary of key impacts and mitigation measures for each subproject shown in Annex
 - Summay of ESIA of each subproject is listed in Annex 3

5.3. Implementation cost for mitigation measures (table 5.3)

Table 5. 3. Cost for project preparation and implementation of safeguard policies of subproject

<i>No.</i>	<i>Subproject name</i>	<i>Compensation, site clearance</i>	<i>Implementation of environmental impact mitigation measures</i>	<i>Environmental monitoring</i>	<i>Training, building capacity</i>	<i>IPM training</i>
1	Repairing and safety improvement of Ngoi La 2 reservoir, Tuyen Quang	815,542,000	626,000,000	436,735,000	1,000,000,000	
2	Repairing and safety improvement of Ban reservoir, tỉnh Phú Thọ	2,500,000,000	636, 000,000	300,000,000	200,000,000	
3	Repairing and safety improvement of Dai Thang reservoir, Hoa Binh,	5,266,003,000	458,700,000	126,811,833	48,000,000	
4	Repairing and safety improvement of Khe Che reservoir, Quang Ninh,	2,500,000,000	300, 564,000	993,491,281	52,000,000	
5	Repairing and safety improvement Dong Be reservoir, Thanh Hoa,	654,672,000	1,396,000,000	821,116,000	45,000,000	
6	Repairing and safety improvement of Khe Gang, Nghe An	438,000,000	825,000,000	112,729,000	500,000,000	
7	Repairing and safety improvement of Khe San reservoir, Nghe An	1,793,800,000	626,000,000	105,087,000	500,000,000	
8	Repairing and safety improvement of Phu Vinh reservoir, Quang Binh	1,360,000,000	152,395,000	145,000,000	12,000,000	
9	Repairing and safety improvement of Dap Lang	4,144,553,000	265,250,000	287,710,000	28,000,000	

<i>No.</i>	<i>Subproject name</i>	<i>Compensation, site clearance</i>	<i>Implementation of environmental impact mitigation measures</i>	<i>Environmental monitoring</i>	<i>Training, building capacity</i>	<i>IPM training</i>
	reservoir, Quang Ngai province,					
10	Repairing and safety improvement of Thach Ban reservoir, Binh Dinh	3,374,022,000	1,464, 000, 000	1,044,000,000	590,000,000	280,000,000
11	Repairing and safety improvement of Song Quao reservoir, Binh Thuan	8,821,000,000	1,113,000,000	1,803,000,000	62,000,000	
12	Repairing and safety improvement of Da Teh reservoir, Lam Dong	1,000,000,000	551,000,000	342,144,000	1,000,000,000	
Total		32,667,592,000	7,777,909,000	6,517,824,114	4,037,000,000	280,000,000
Average		2,722,299,333	648,159,083	543,152,010	336,416,667	

PART 6. THE COMMUNITY CONSULTATION AND AGREEMENT OF THE INVESTORS

6.1. The community consultation.

In the process of preparing the ESIA report, The sub-projects have been made two community consultations include:

a) Sub-projects preparation consultation: Project Management Unit has coordinated with environmental consultant, organized consultative meetings to share information about the project and the impacts to the environment and society. The composition consultative meetings include: i) Representatives of departments: Agriculture and Rural Development, Department of Natural Resources and Environment, Department of Construction, Department of Transport, Department of Education and Training, Department of Health; Department of Culture, Sports and Tourism. ii) Representative People's Committee of District, People's Committee of commune in the project area; iii) Irrigation Exploitation Construction., Ltd; iv) Representatives of affected households; v) The relevant consultants: consultants prepare investment projects, social counseling and counseling dam safety assessment

Consultation content for project preparation include: i) Introduction of objectives, the main items of sub-projects, scope and objects was affected by the project; ii) Environmental Consultants share the request of the World Bank and the Government of Vietnam on safety policy and social environment of sub-projects; iii) The participants discussed the agreement for the implementation of the project, provide information about the risks / incidents which occurred in history (From the dam construction), discover the positive and negative impact can occur when implementing projects and proposal on measures to minimize environmental and social impacts and proposals to investors

b) Consultation on measures to minimize environmental and social impacts of sub-project

Consultation meeting on measures to minimize environmental and social impacts of sub-projects was held after the draft of ESIA report was completed. Participants include: People's Committee of commune, Fatherland Front Committee of communes in the project area, the organizations include: Veterans Union, Women Union, Youth Union, farmers' associations, cooperatives, village heads, the affected households in the project area.

Content of consultations on the expected negative impacts to the environment and society can occur during project implementation, determine the object and scope of influence, the proposed measures to mitigate these impacts. Delegates suggested the discussions, consulting and investors receive and additional appropriate information to the ESIA report. In addition to organizing meetings, the Management Board of Binh Dinh Irrigation Project has sent a letter attached the document summarizes the main investment categories, the environmental problem, the solution of environmental protection of project to the People's Committees and Fatherland Front Committee of Cat Son commune on applying for consultations during making report about environmental and social impact assessment sub-projects, fixing and improving safety Thach Ban Reservoir and Phu Cat, Binh Dinh

The reviews of delegates in the meeting will be made in the written response of the CPCs. Simultaneously, sub-project owners also get a lot of opinions from the affected communities,

local authorities and other organizations in the consultation process.

After the consultations, some investors collect the ideas, adjust the construction plans to reduce to the minimum the environmental and social impacts. Ngòi La 2 (Tuyen Quang) sub-project moved schemes from the road construction cross to residential areas to under the mountains. Although transport distance is further but it avoided road damage which impact and influence people. Thach Ban Reservoir (Binh Dinh) sub-project change the disposition of land mines in the reservoir area to the disposition of land mines in the downstream area. Although the transport distance is further, it avoid the effects of erosion, sedimentation reservoir. Also at the request of the local government, investors have chosen measures water from the Hoi Son Reservoir to irrigate 40ha arable land and does not have to stop production when cutting out water construction

6.2. Responses and commitment of investors

After receiving opinions from the People's Committee and Fatherland Front consultations and affected households in the project area. Most investors have committed to:

- Commitment to compensate for damage to households with land recovery and production affected by the construction according to Word Bank policy and the Government of Vietnam
- Commitment to compensate for damage to infrastructure, rural transportation construction by sub-projects
- Commitment to always perform the remedies and reduction of pollution as presented in ESIA Report.
- Commitment regularly coordinate with local governments and contractors to manage staff and workers during sub-project implementation to avoid conflicts with the locals, avoid the occurrence of incidents of traffic accidents, labor accidents, and other incidents to endanger locals;
- Commitment to ensure smooth traffic on the roads during the construction period;

CONCLUSIONS

ESIA reports have successfully described sub-projects' activities and identified status of natural, social and economic environment of the sub-projects areas. Social screening process as well as the survey process, consultations of stakeholders has full assessment of the scope and scale of impacts in term of enviromental and social aspects

Project implementation is expected to bring more social, economic and environmental benefits of local, especially for vulnerable groups such as women, ethnic minorities, the poor. Key objective is to bring safety for dams and downstream flood control, ensuring safety of community in downstream. In addition, project also improve possibility of water regulation, ensure water supply for agricultural and domestic use activities, contributing to job creation and income generation for people, thereby promoting social and economical development of the project area.

The project implementation has negative impacts, but they are mostly temporary and not much. Some sub-projects have resettlement impacts but mostly temporary or permanent acquisition of production land, public land, protective area of structure. Structures on acquisition land are temporary, not a serious impacts on the lives, livelihoods of people of project area. Land acquisition households also support for project to bring more benefits to the development of production, improve later life when access to irrigation water. However, policies on resettlement, community consultation, communication need attention and fully implemented to ensure the interests of people, and maximizing investment efficiencies of project.

The sub-projects have fully implemented requirements for social impact analysis of project to ensure that social issues have been given sufficient attention in the selection and decision to implement project. Besides, solutions to maximize positive impacts, as well as measures to minimize the negative impacts of the project have also been proposed.

APPENDIX 1: GENERAL INFORMATION OF THE SUBPROJECT

Table 1.1: Benefitted household in the project areas

<i>Subproject/ Province</i>	<i>Household</i>	<i>Number of people</i>	<i>% Ethnic Minority</i>	<i>Ethnic minority people</i>
1. Ngoi La 2 reservoir, Tuyen Quang province	500	2,000	20	Kinh, Tây, Cao Lan
2. Ban reservoir , Phu Tho province	1,161	5,225	0	Kinh
3. Dai Thang reservoir, Hoa Binh province	372	1,402	64	Kinh, Muong
4. Khe Che reservoir, Quang Ninh province	15,305	52,149	7.48	Kinh, Tay, Thai, Hmong, Dao, San Chay, San Diu, Thoi, Son Chay, Son Dou, Muong, Hoa, Nung, Giay, Lao, Kho Me.
5. Dong Be reservoir, Thanh Hoa province	2,495	24,716	24.17	Kinh, Muong, Thai, Tay, Tho.
6. Khe San reservoir, Nghe An province	400	1,800	0	Kinh
7. Khe Giang reservoir, Nghe An province	800	2,500	0	Kinh
8. Phu Vinh reservoir, Quang Binh province	4,600	27,600	0	Kinh
9. Dap Lang reservoir, Quang Ngai province	346	1,651	0	Kinh
10. Thach Ban reservoir, Binh Dinh province	355	1,460	0	Kinh
11. Quao reservoir, Binh Thuan province	19,094	79,613	5	Kinh, Gialay, Khome, Tay
12. Da The reservoir, Lam Dong province	1,614	6,606	8.35	Kinh, Chau Ma, Tay, Nung
Total	47,042	206,722	9.92	Kinh, Tay, Cao Lan, Thai, Hmong, Dao, San Chay, San Diu, Thoi, Son Chay, Son Dou, Muong, Hoa, Nuung, Giay, Lao, Kho Me, Thai, Tho, Chau Ma.

Table 1.2: Local infrastructure will be protected by the projects implementation

<i>Subproject/ Province</i>	<i>Protect construction</i>						
	<i>Traffic road (km)</i>	<i>Cannal (km)</i>	<i>School</i>	<i>Medicine centre</i>	<i>Administrattion office</i>	<i>Domestic water supply facility</i>	<i>Power systems</i>
1. Ngoi La 2 reservoir, Tuyen Quang province	20	68	07	01	01	0	2 power grids of 35 Kv
2. Ban reservoir , Phu Tho province	6.2	8.1	01	01	02	0	0
3. Dai Thang reservoir, Hoa Binh province	06	05	03	01	01	0	0
4. Khe Che reservoir, Quang Ninh province	66.2	39.2	04	01	01	0	7 power stations
5. Dong Be reservoir, Thanh Hoa province	15	07	11	04	04	0	0
6. Khe San reservoir, Nghe An province	123.26	6.8	03	01	01	0	<ul style="list-style-type: none"> • 6 power stations • 53.6 km of power grid
7. Khe Giang reservoir, Nghe An province	01	3.5	04	01	01	0	0
8. Phu Vinh reservoir,	87	03	09	02	02	01	02 power stations

<i>Subproject/ Province</i>	<i>Protect construction</i>						
	<i>Traffic road (km)</i>	<i>Cannal (km)</i>	<i>School</i>	<i>Medicine centre</i>	<i>Administrattion office</i>	<i>Domestic water supply facility</i>	<i>Power systems</i>
Quang Binh province							
9. Dap Lang reservoir, Quang Ngai province	26	12	03	01	03	0	<ul style="list-style-type: none"> • 02 power stations • 15km of power grids
10. Thach Ban reservoir, Binh Dinh province	60	21	03	01	01	0	<ul style="list-style-type: none"> • 28,895.4 km of power grids(22kV). • 7 power stations.
11. Quao reservoir, Binh Thuan province	01	-	11	07	07	01	0
12. Da The reservoir, Lam Dong province	-	-	04	02	02	01	0
Total	411.66	173.6	63	23	26	03	

Table 1.3: Benefited objects by sub-project implemetation

<i>Subproject/ Province</i>	<i>Protect areas</i>					
	<i>Agricultural cultivation (ha)</i>	<i>Forest land (ha)</i>	<i>Aquatic cultural (ha)</i>	<i>Fruit/ industry plants</i>	<i>Forest fire reduction</i>	<i>Others</i>
1. Ngoi La 2 reservoir - Yen Son district, Tuyen Quang province	351.24	257	15	0	275.2	0
2. Ban reservoir - Cam Khe district, Phu Tho province	75	742.57	22	284.67	742.57	0
3. Ho Dai Thang reservoir - Lac Thuy district, Hoa Binh province	130	1,600	96	-	1,600	-
4. Khe Che reservoir – Dong Trieu district, Quang Ninh province	1,000	-	-	-	-	-
5. Dong Bereservoir - Thanh Hoa province	255	3,051.94	107.46	-	-	-
6. Khe San reservoir - Quynh Luu district, Nghe An province	300	1,625.5	126	709.9	1,317	350
7. Khe Gang reservoir - Quynh Luu district, Nghe An province	175	1,439.3	160.72	182	0	1,325
8. Phu Vinh reservoir - Dong Hoi city, Quang Binh province	1,041	0	80	0	0	0
9. Dap Lang reservoir - Nghia Hanh district, Quang Ngai province	160	30	12.9	0	0	0
10. Thach Ban reservoir - Phu Cat district, Binh Dinh province	130	7,138.7	0	995.27	0	0
11. Quao reservoir - Binh Thuan province	11,120	-	1,154	-	-	0
12. Da Teh reservoir - Da Teh district, Lam Dong province	2,300	12,618.07	25.1	0	0	0
Total	17,037.24	12,618.07	1,666.18	2,171.84	3,934.77	1,675

Table 1.4: Negative impacts related on land acquisition and resettlement of the the first year sub-projects

Note:

AH: Affected household

AP: Affected person

<i>Sub-project</i>	<i>Province</i>	<i>AH</i>	<i>AP</i>	<i>Reallocation or resettlement Household/person</i>	<i>Displacement or resettlement Household/person Indig./ethnic</i>	<i>Permanently land acquisition (m²)</i>	<i>Temporarily land acquisition (m²)</i>	<i>Affected Resident areas (m²)</i>	<i>Affected Agricultural land (m²)</i>	<i>Grave relocation</i>	<i>Affected Infrastructures</i>
1. Ngoi La 2	Tuyen Quang	12	51	01/02	0	22,100	2,000	300	0	0	77 m ² concreted construction house
2. Ho Ban	Phu Tho	15	78	0	0	15,000	11,000	0	15,000	0	0
3. Dai Thang	Hoa Binh	12	45	0	0	15,935	4,438	500	19,373	0	60 m ² house and 40 m ² cooking house + 70m brick wall.
4. Khe Che	Quang Ninh	0	0	0	0	0	1,000	0	0	0	0
5. Dong Be	Thanh Hoa	13	78	0	0	49,900	10,800	0	4,910	0	0
6. Khe San,	Nghe An	02	05	0	0	12,200	10,000	0	0	0	0
7. Khe Gang	Nghe An	01	04	0	0	5,000	10,000	0	0	0	0
8. Phu Vinh	Quang Binh	24	105	0	0	12,179.7	0	0	0	0	0

<i>Sub-project</i>	<i>Province</i>	<i>AH</i>	<i>AP</i>	<i>Reallocation or resettlement Household/person</i>	<i>Displacement or resettlement Household/person Indig./ethnic</i>	<i>Permanently land acquisition (m²)</i>	<i>Temporarily land acquisition (m²)</i>	<i>Affected Resident areas (m²)</i>	<i>Affected Agricultural land (m²)</i>	<i>Grave relocation</i>	<i>Affected Infrastructures</i>
9. Dap Lang	Quang Ngai	23	119	0	0	13,778	39,875	0	13,778	0	0
10. Thach Ban	Binh Dinh	17	68	0	0	1,500	75,000	0	76,500	0	0
11. Song Quao	Binh Thuan	18	77	10/39	8/32	164,332	0	2,332	162,000	0	298m ² house (IV) + 154m ² unconcreted construction house
12. Da Teh	Lam Dong	0	0	0	0	10,000	0	0	0	0	0
Total		137	137	630	11/43	8/32	321,924.7	164,113	2,332	291,561	0

Table 1.5: List of subproject'activities

No	Activites	Subproject												Total
		Ngoi La2 reservoi r	Ban reservoi r	Dại Thang reservoi r	Khe Che reservo ir	Dong Be reservo ir	Khe San reservo ir	Khe Gang reservoi r	Phu Vinh reservoi r	Dap Lang reservo ir	Thach Ban reservoi r	Quao reservo ir	Dạ Teh reservoir	
I/	Repair the embankment dam													
1	Extent the embankme nt in length	0	0	0	0	0	0	from 460m to 487m	0	from 135m to 151,5m	0	0	from 600m to 700m.	3
2	Levelling the crest of dam	0	from 32.5m to 33.5m	0	0	from 41.5m to 42.3m	from 46m to 47.6m	from 26m to 26.5m	from 24.2m to 25m	from (30.8÷31. 1) m to 32.7m	0	0	from 158.5m to 159m.	7
3	extent the crest of dam in width	from 3m to 5m	from 4m to 6m	from 3m to 10m	0	from 4m to 5m	from (2.6÷ 3,2)m to 5m	from (3÷4)m to 5m	from 5m to 6m	from 3m to 6m	from 4m to 5.8m	0	0	9
4	Reinforce the crest of dam	reinforc e surface by concret e	reinforc e surface by concret e	reinforc e surface by concret e	reinforc e surface by concrete	reinforce surface by concrete	reinfo rce surfac e by concr ete	reinforc e surface by concret e	reinforc e surface by concrete	reinforce surface by concrete	reinfo rce surfac e by concr ete	reinforc e surface by concret e	reinforce surface by concrete	12
5	Reinforce the upstream slopes	reinforc e by road metal	reinforc e by concret e	reinforc e by concret e	0	road metal + concrete	reinfo rce by concr ete	reinforc e by concret e and rubble	reinforc e by concrete	reinforce by concrete	reinfo rce by concr ete	reinforc e by macada m	road metal i + concrete	11

No	Activites	Subproject												Total
		Ngoi La2 reservoir	Ban reservoir	Dai Thang reservoir	Khe Che reservoir	Dong Be reservoir	Khe San reservoir	Khe Gang reservoir	Phu Vinh reservoir	Dap Lang reservoir	Thach Ban reservoir	Quao reservoir	Dạ Teh reservoir	
6	Reinforce the downstream slopes	reinforce by grass	reinforce by grass	reinforce by grass	0	Reinforce by grass.	reinforce by grass	Reinforce by grass.	reinforce by grass	reinforce by grass	reinforce by grass	Reinforce by grass.	reinforce by grass	11
7	Construct an new drainage systems of the embankment dam at downstream slope	Construct an new drainage	the section (30x30) cm	the section (20x20) m.	Construct an new drainage systems	Construct an new drainage	the section (25x25) cm.	Construct an new drainage	Construct an new drainage systems	Construct an new drainage	Drainage water in downstream.	Construct new drainage systems.	Construct an new drainage systems	12
8	Construct a parapet wall	0	scantling	h = 1m	0	h = 0.7m	0	0	Extent 0.8m.	h = 33.5m.	0	h = 1m	h = 159.3m.	7
9	Seepage treat	jet grouting	0	0	0	jet grouting	0	0	jet grouting	0	backfill	0	jet grouting	jet grouting: 4 subproject. backfill: 1 subproject
10	Termite treatment	0	0	Termite treatment	Termite treatment	0	0	0	0	0	Termite	0	Termite treatment	4

No	Activites	Subproject												Total
		Ngoi La2 reservoir	Ban reservoir	Dai Thang reservoir	Khe Che reservoir	Dong Be reservoir	Khe San reservoir	Khe Gang reservoir	Phu Vinh reservoir	Dap Lang reservoir	Thach Ban reservoir	Quao reservoir	Dạ Teh reservoir	
				nt	nt						treatm ent			
11	The auxiliary dam	0	0	0	0	Extent the levees up to 400m length	0	0	0	0	0	repair auxiliary 1 and 3	0	2
II/ Repair the spillway														
1	Extent the spillway in height	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Extent the spillway in width	from 5m to 17m	0	from (15÷20) m to 20m	from 14 to 25m	50m	from 23m to 30m	from 45m to 75m	0	0	0	0		6
3	Extent the spillway in length	0	0	0	0	0	0	0	0	from 88m to 177m	0	0	0	1
4	Reinforce the spillway.	reinforce by concrete	reinforce by concrete	reinforce by concrete	reinforce by concrete	reinforce by concrete	reinforce by concrete	reinforce by concrete	upgrade the lifting system	reinforce by concrete	reinforce by concrete	0	reinforce by concrete	reinforce by concrete(10 subproject)

No	Activites	Subproject												Total
		Ngoi La2 reservoir	Ban reservoir	Dai Thang reservoir	Khe Che reservoir	Dong Be reservoir	Khe San reservoir	Khe Gang reservoir	Phu Vinh reservoir	Dap Lang reservoir	Thach Ban reservoir	Quao reservoir	Dạ Teh reservoir	
														+ repair the lifting system(1 subproject)
5	Construct a new a stilling basin system	the dimension : B×H = (10×10) m	the lenth of chute: 10m, the length of stilling basin: 9m, the width of stilling basin: 10m	the lenth of stilling basin; 33m+ 15m(chute)	reinforce a stilling basin system	reinforce a stilling basin system	construct the wing wall by concrete	Reinforce 15m stilling basin by concrete, reinforce 10m infront of stilling basin by concrete	0	length: 27m	Construct 11,1m by concrete , reinforce 38,9m by concrete	0	reinforce the chute and	10
6	Construct a new the bridge over the	width: 5m length: 17m	0	0	width: 5m	0	0	0	0	0	0	0	width: 5m	3

No	Activites	Subproject												Total
		Ngoi La2 reservoir	Ban reservoir	Dai Thang reservoir	Khe Che reservoir	Dong Be reservoir	Khe San reservoir	Khe Gang reservoir	Phu Vinh reservoir	Dap Lang reservoir	Thach Ban reservoir	Quao reservoir	Dạ Teh reservoir	
	construction													
7	Construct a new the auxiliary spillway.	0	0	0	0	0	0	0	reinforce by concrete	0	0	Construct a new the auxiliary spillway.	0	2
III/ outlet works														
1	Repair the outlet works	Repair 2 valves (outlet works).	0	0	Repair the valve (outlet works).	0	0	0	0	0	0	0	Repair the valve (outlet works).	3
2	Construct a new outlet works	0	Length: 49.6m, D600mm.	Length: 96m D400mm.	0	D80cm.	the dimension: F500	Length: 49m, D800	length 92m, the dimension (1.2×1.2)m	length 66m, D400mm	Length 60m, D600.	the dimension : B×H = (2×2.5)m.	0	9
3	Construct a new the power house (outlet	0	hollow block wall	B×L×H =(3.5×3.6×4.7)m	0	0	B×L×H = (2.6×2.6×3.2)m	B×L×H = (3×3×3.7)m	0	0	0	0	0	4

No	Activites	Subproject												Total
		Ngoi La2 reservoir	Ban reservoir	Dai Thang reservoir	Khe Che reservoir	Dong Be reservoir	Khe San reservoir	Khe Gang reservoir	Phu Vinh reservoir	Dap Lang reservoir	Thach Ban reservoir	Quao reservoir	Dạ Teh reservoir	
	works)													
4	Repair the power house (outlet works)	0	0	0	Add the valve (outlet works).	0	0	0	0	0	0	0	Repair the power house (outlet works)	2
IV/	power house													
1	Construct a new power house	0	house areas: 50m ²	Floor areas: 50m ²	0	Construct a new power house with total service areas is 60m ² .	Construct a new power house with total service areas is 80m ² .	Construct a new power house with total service areas is 55m ² .	0	Construct a new power house with total service areas is 42m ²	0	0	Construct a new power house with total service areas is 150m ² .	7
2	Repair a power house	0	0		Repair a power house	0	0	0	0	0	0	Repair the power house with total service areas is 475m ² .	0	2

No	Activites	Subproject												Total
		<i>Ngoi La2 reservoir</i>	<i>Ban reservoir</i>	<i>Dai Thang reservoir</i>	<i>Khe Che reservoir</i>	<i>Dong Be reservoir</i>	<i>Khe San reservoir</i>	<i>Khe Gang reservoir</i>	<i>Phu Vinh reservoir</i>	<i>Dap Lang reservoir</i>	<i>Thach Ban reservoir</i>	<i>Quao reservoir</i>	<i>Dạ Teh reservoir</i>	
V/	The access road													
1	Construct a new access road	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Repair a new access road	Reinforce 1,885m length by concrete	Reinforce 1,600 m length by concrete	Reinforce 110 m length by concrete	Reinforce 110 m length by concrete	Reinforce 1,000 m length by concrete	Reinforce 146 m length by concrete	Reinforce 303.4 m length by concrete	Reinforce 599 m length by concrete	Reinforce 700 m length by concrete	Reinforce 845,4 m length by concrete	Reinforce 5,12 k m length by blacktop	Reinforce 1,7 km length by concrete	12
VI/	Power system													
1	Construct a new power system	0	0	0	0	0	0	0	Construct a new low voltage power grid at the crest of dam	0	0	Construct a new illuminating system.	Construct a new low voltage power grid :1,8km	3

APPENDIX 2: SUMMARY OF IMPACTS AND MITIGATION MEASURES OF 12 SUBPROJECTS

Table 1: Summary of negative impacts on environment, social and mitigation measures of the first 12 subprojects

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
1. Ngoi La 2, Tuyen Quang, - Vtb=3,31x10 ⁶ m ³ , Hmax=15,30m, Built: <ul style="list-style-type: none"> • Treat water seepage by using jet grouting technique to embankment with length is 556m, keep original dam crest is 44,5m. Reinforced and repair upstream slope by concrete pile with inner riprap, reinforce groin, dam surface and grass plantation in downstream slope to prevent erosion • Repair outlet works valves at both side of the outlet works • Extend principal chute spillway from 5m to 17m, remain the spillway crest is of 41,5m. Re-construct the bridge over the spillway with width is of 5,0m 17m in length • Reinforce access and management road by concrete with length is of 1.885m. 	<ul style="list-style-type: none"> - There are no graves, temples and PCR. - There are no protected areas. - No ethnic minority households will be affected. - The repair outlet works take place in time of no cultivation activity in the areas, therefore the works did not impact to cultivation 	1. Land acquisition of 24.100m ² (garden land), of which 22.100m ² permanent acquisition and temporary acquisition 2,000m ² . 12 households in the local affected by land acquisition, included 01 households displaced	1. RAF and compensation method have been established following the RPF of the sub-project.
		Construction activities, transporting materials, waste will impact to 30 employees and 5 households living along the transportation roads, particularly impact to kindergarten of village 15	2. Apply mitigation measure that's mentioned in ESMP
		3. The construction period will take 18 months causing soil erosion and reservoir sedimentation	3. The construction done in dry season, therefore the negative impacts to environment and social considered as minimum level.
		4. Impact by expand the principal spillway from 5m to 17m (increasing flood in	The water discharge into Ngoila 2 streamline, as calculation, the volume of water did not impact to

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
<p>to the crest of the main dam levelled, the auxiliary dam is located in the South of the reservoir.</p> <ul style="list-style-type: none"> • Repair and upgrade spillway with length is of 6,5m, 10m in width,, remain the spillway crest is of 31,5m; • Construct a new outlet works with length is of 35m at the right abutment of dam • Construct a new management house with total areas is of 108m²; - Reinforce the access and management road with 1600m in length and 5 m in width by concrete 		areas, 1.5 km inner-road	construction process. Applying the mitigation measures have been defined in the ESMP
		3. Impact by extend the dam surface may increase the soil erosion and reservoir sedimentation	3. The construction should be in dry season. However the impacts assessed at low level due to the outer layer of embankment was build by concreted.
		4. Interruption of waste irrigation due to outlet works repairing	4. The construction contractor cofferdam will be built for the work, the water drainage from reservoir is unnecessary. In addition the old outlet works is still operate. Simultaneously, the outlet works repairing in one month (From March to April), at the time, water demand for irrigating is lowest
		5. UXO, mines clearance	5 . Investors will make a contract with the military command to land mines clearance - Announce to public about the time and place of work
		6. Dam safety risk during operation phase.	6. Local dam management unit should inform about the time of water release to downstream areas on time. - In the rainy season, LDM should monitoring water level regularly to ensure the safety of dam
3. Dai Thang, Hoa	There are no graves, temples	1. Land acquisition of 20.373 m ² , of	RAP has been established to compensate and support

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
<p>Binh, $V_{tb}=0.48 \times 10^6 \text{ m}^3$, $H_{max}=16.00\text{m}$, was built in 1960</p> <ul style="list-style-type: none"> • Upgrade 200m in length of the main dam, extend the surface From (3 ÷ 3,5)m to 5m and reinforce dam by concrete, remain the crest of dam is of 16m,. Reinforce upstream slope by concrete panel, and plant grass on downstream slope to avoid erosion; • Construct a new outlet works by tube type D400 (at the same position of the old unit) with length is of 96m, diameter D400; • Concrete the spillway (the existing construction is earthen structure) with 20m in width, principal chute spillway elevation is 33,5m ; • Upgrade the access and management road by concrete with the length is 110m • Construct a new management house with total of the building is 50m²; <p>Install a new</p>	<p>and PCR.</p> <p>- Neither natural forest, wild lifes and dangerous species or defensive forest areas is exist in the areas</p>	<p>which, permantly 15.935 m², temporally 4.438 m² of arable land. there are 12 affected households of the sub-project implementation. There is no household resettlement or displacement</p>	<p>to affected households, this follows by RPF of the sub-project</p>
		<p>2. Construction activities, transporting materials, waste will impact to 50 workers, 3 resident areas, 2km of congested inner-road damage</p>	<p>2. Limitation of vehicle load rate (7 to10 tons of load); The contractor have to response for nay road damage and have to develop a plan to maintaining and repairing damaged roads during the construction process. Applying the mitigation measures have been defined in the ESMP</p>
		<p>3. Water interruption will impact to cultivation areas of 03 villages: Thang Loi, Dai Thang and Daidong with 571.297m² cultivation areas of 244 households, included 223 EM households. This impact happens only 1 cultivation period</p>	<p>3. The owner project developed the compensation plan to 244 affected households. Total estimate compensation cost is VND 816,959,000. Simultaneously, the project owner develop the EMDP to support the ethnic minority group, there are the Muong covers > 70% of total ethnic minority group.</p>
		<p>4. Impacr due to extent the principal spillway from 15m to 20m causing flooding to</p>	<p>4. Anouncement plant to inform local resident of Dai Dong, Dai Thang and Thang Loi at least 3 day before the work taking</p>

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
monitoring system at the headwork of dam .		downstream areas. This works also impacts to cultivation areas of local residents. However, in the areas do not have the local resident areas, the water can discharge to Hoang Long river directly, therefore, the impact assessed at low level	place , it means that to minimise impact to 100ha paddy rice areas and 30ha of annual crops land in downstream areas. + Building the safety corridor for releasing water in flooding period based on the estimation of impact of dam failure scenarios
		5. Dam safety risk during operation phase.	5. Local dam management unit should check the physical condition of dam regularly, detect termite caves and apply method to treat the termite caves in embankment
4. Khe Che, Quang Ninh, $V_{tb}=12.00 \times 10^6 \text{ m}^3$, $H_{max}=20.00\text{m}$, was built in 1970 <ul style="list-style-type: none"> Concrete dam surface with 658m in length 4,2m, in width and keep the height of dam is of 12,5m; Treat termite extend spillway from 14m to 25m in width , keep the spillway crest is of 23,7m Construct/repair the drainage layout at the toe of 	<ul style="list-style-type: none"> The location of sub-project is not related to vulnerable areas, wetland, national part, biosphere conservation and protected areas No dangerous or rare species exist in the areas No PCRs No EM households impacted by project. The construction activities do not impact on agricultural 	1. Land acquisition of 15.935 m ² , of which permanently 46.460 m ² , temporarily 4.438 m ² of arable land of 10 local households. No households in areas displacement or resettlement	1. RAP has been established to compensate and support to affected households, this follows by RPF of the sub-project.
		2. Construction activities, transporting materials, waste will impact to 50 workers and indirect impact to 3000 inhabitants of 03communes: An Sinh, Tan Viet and Viet Dan	2. Apply mitigation measure that's mentioned in ESMP

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
<p>downstream slope</p> <ul style="list-style-type: none"> Repair the power house (outlet works) and manage house Hardnose the access and management road with 140m in length, road foundation 5m and road surface is 3,5m in width Operate the new inner-servicing road with the length is of 2.000m, macadam foundation of road is: 7,5m in width, and surface is 6,5m and off-side: 2x0.5m.; - Construct a new bridge over canal with 5 m in length. 	cultivations.	3. Impact due to extent the principal spillway from 14m to 24m causing flooding to downstream areas. Water can discharge to Ho La streamline therefore, the impact of flooding is minimise or can be negligible. In addition, there are no household impacting by the flooding issue.	3. Local dam management unit should inform about the time of water release to downstream areas at least 3 days before the work taking place. Building the safety corridor for releasing water in flooding period based on the estimation of impact of dam failure scenarios
		4. Soil erosion and landslide threatened to 10 local households in areas. Reservoir sedimentation, water pollution and hydrological pattern change, river or streamline are narrow	4. Collect the trunk, branches of tree, residual biomass in reservoir, afforestation in upper stream of reservoir to minimise soil erosion and increase water storage. Reducing the human activities in upper stream of reservoir.
		5. Termite cave risk, seepage and unstability of embankment	5. Physical dam check regularly, termite cave treatment.
<p>5. Dong Be, Thanh Hoa province</p> <ul style="list-style-type: none"> Dong Be, Thanh Hoa, Vtb=2.29x10⁶ m³, Hmax=11.40m, was built in 1989 Extend the length of the embankment from 734m to 758m, Increase the 	<p>- - No PCR or graves</p> <p>- No protection or conservation areas</p> <p>- No EM households impacted by project..</p>	1. Land acquisition of 1,65 ha, of which permanently 5.721m ² temporally of 10.815m ² of 13 local households. No household resettlement or displacement	1. RAP has been established to compensate and support to affected households, this follows by RPF of the sub-project.
		2. The activities of construction	2. The construction should be in dry season. New

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
<p>crest of dam from 41,5m to 42,8m but the capacity of the reservoir does not change, extend the surface dam from 4,0m to 5m and reinforce it by concrete,</p> <ul style="list-style-type: none"> • Replace the old spillway by a new one with principal chute is 5,6m, the spillway crest is maintain by 39,4m • Replace the old outlet works by new construction with 52,65m in length (at the same position); • Extend the flooding dyke from 450m to 800m in length <p>- Construct a new management house with total areas of the building is of 60m².</p>		<p>impact to water supply to 120 ha of cultivation land in the areas</p>	<p>cofferdam construction to construct new outlet works. After finish the work, the old outlet works will be removed</p> <p>The removal of old outlet work will take place in dry season and therefore it not impact to cultivation areas.</p>
		<p>3. Construction activities, transporting materials, waste will impact to 50 workers, 50 households living along the road to reservoir, specially the road via Xuan Du of Nhu Thanh district.</p>	<p>3. Apply mitigation measure that's mentioned in ESMP</p>
		<p>4. The construction period will take 20 months causing soil erosion, water pollution and reservoir sedimentation.</p>	<p>4. The construction should be in dry season, hence the impacts assessed at low level,</p>
		<p>5. Dam safety risk during flooding period</p>	<p>5. Local Dam management of Dong Be sub-project developed the cooperation with the local authority of Trieu Son, Nhu Thanh district, Xua Du, Trieu Thanh, Hop Thanh, Phuong Nghi in case of dam unsafety;</p> <p>Local Dam management of Dong Be sub-project have to assign the staff to monitor water level in reservoir and flow regulation in flooding time.</p>

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
		6. Flooding control may impact to downstream areas	6. Flooding areas mapping. Annaouce to local about release water atleast 3 day before. Building the safety corridor for releasing water in flooding period based on the estimation of impact of dam failure scenarios
<p>6. Khe Gang, Nghe An, Vtb=$2.15 \times 10^6 \text{ m}^3$, Hmax=12.50m, was constructed in 1991</p> <ul style="list-style-type: none"> Repair and extend the length of embankment from 460m to 487m elevation, remain the spillway crest is of 23,6m, extend the dam surface from 3 ÷ 4(m) to 5m in width, and reinforce it by concrete. Reinforce the upstream and downstream slopes. Seepage treatment at right abutment of dam; Extend the spillway from 45m to 75m in width,, remain the spillway crest is of 23,6m; Construct a new outlet works with the length is of 49m, tube type D800 Construct a new of 	<ul style="list-style-type: none"> - Subpkjorect located in mountain areas - No national park, biodiversity conservation areas or important ecological system exist. - No PCRs. - No EM household impacted by the sub-project. 	<p>1. Land acquisition of 15.600 m2, of which Permantly 5.600 m2 arable land of 1 house, temporally 10.000 m2 of public land managed by CPC</p> <p>2. <i>The activites of construction impact to water supply to</i> 120 ha of paddy rice cultivation land, 55 ha of annual crop land, reduce yield of crops and platation structure.</p> <p>3. Construction activities, transporting materials, waste will impact to 7km of Ngoc son inner-roads.</p>	<p>1. RAP has been established to compensate and support to affected households, this follows by RPF of the sub-project..</p> <p>2. Building cofferdam, therefore, drainge water in reservoir is unnecessary during construction - Contruction activity will operate in between cultivation periods, at this time, the demand of water for irrigation is minimum</p> <p>3. . Limitation of vehicle load rate (7 to10 tons of load); The contractorhave to response for nay road damage and have to develop a plan to maintaining and repairing damaged roads during the construction process. Applying the mitigation measures have been defined in the ESMP</p>

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
<p>new management house with an area of 55m²;</p> <ul style="list-style-type: none"> - Concrete the access and management road with length is of 303,4m. 		4. Construction activities, transporting materials, waste will impact to 20 workers, 20 household living around the road	4. The construction contractor have to response to minimise the impacts of safety and local health following regulation that mentioned in ESMP
		5. Impact due to extent the principal spillway from 45m to 75 m causing flooding to downstream areas..	5. The extension of spillway does not impact to residential areas, because after stilling basin is the low hill land and there is no household located in areas.
		6. Impact due to emergency water release.	6. Flooding areas mapping. Announce to local about release water at least 3 day before. Building the safety corridor for releasing water in flooding period based on the estimation of impact of dam failure scenarios.
		7. Impacts of reservoir sedimentation, water pollution, flow pattern and hydrological regime changes.	7. afforestation in upper stream of reservoir to minimise soil erosion and increase water storage. Planning and management the protection forest around the reservoir
<p>7. Khe San reservoir, Nghe An, V_{tb}=1.42x10⁶ m³, H_{max}=16.70m, was built in 1980</p> <ul style="list-style-type: none"> • Repair and upgrade the main dam with length is extended from 320 to 389m, height of crest dam is increased from 46m to 47,6m but 	<ul style="list-style-type: none"> - There is no natural reserve area, protected area, biodiversity area, precious species, endangered species. - There is no archaeological area or cultural relic works in 	1. Land acquisition: total land acquisition is 20,679 m ² . of which, permanent land acquisition is 79.6m ² of public land and 10,600m ² of agricultural land of 2 households and temporary land acquisition is 10,000m ² of public	1. Resettlement Action Plan has been developed to compensate, support to households who are acquired with land according to the Resettlement policies frameworks of project

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
<p>the capacity of the reservoir does not change, extend the dam surface from (2,6÷3,2)m to 5m, and reinforce by concrete. Use concrete panel to reinforce the upstream and downstream slopes, plant grass on downstream slopew to prevent eriosion progress</p> <ul style="list-style-type: none"> • Reinforce spillway, extend the principal chute from 23m to 30m, remain the spillway crest id of 45,3m; • Construct a new outlet works by replacement of the old unit (12m from old culvert towards the right abutment of dam) with drain aperture type F500; • Construct a solid water gathering basin with size is $B \times L \times H = (1,0 \times 2,0 \times 1,6) \text{ m}$ • Construction a new poer house (outlet works) with the size is of $B \times L \times H = (2,6 \times 2,6 \times 3,2) \text{ m}$; • Concrete the access and management road with length is of 146m • Construct a new 	subproject area (Quynh Thang commune). There is a temple, a pagoda located in affected area by subproject	land	
		2. Construction of new outlet works and demolition of old one will affect 120 ha of irrigated area at downstream .	<p>2. Building coffer dam for construction of new outlet works, so cut- off water is unnecessary and old outlet works still operates as normal in construction time. After new outlet works finishing, the old will be destroyed .</p> <p>The construction time is determined when water level in reservoir is the shallowest and when harvesting time is finished that no impact on production.</p>
		3. Overload trucks may cause damage to 25km of road from Quynh Xuan quarry to construction site and may obstruct traffic and affect traffic safety for Quynh Thang commune's people	<p>3. Using vehicles with capacity 7 – 10 tones and meet the environmental safety standard</p> <p>+ Timely repairing the road section to be damaged by transportation of subproject</p>
		4. Air and noise pollution in construction phase	<p>4. Watering on road surface to reduce dust concentration on transportation road and using the vehicles met the environmental safety standard</p>
		5. Production activities cause soil erosion and sedimentation which lead to decrease water quality and life span of reservoir during	<p>5. Limit activities at slope area, reservoir;</p> <p>+ Plantation at watershed of reservoir to increase water storage and decrease erosion and sedimentation</p>

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
management house with total areas of the building is of 80m ² at downstream of dam, 150m to right abutment of dam		operation phase	
		6. Increasing use of fertilizer and pesticide due to increasing irrigation area from 60 ha to 120 ha after completion of project	6. Implement training and educating about harmful effected of excessive use of agricultural chemicals, which are in list of banned chemicals, - Implementing programs of integrated pest management
		7. Risks of dam failure or flood discharge emergency in operation phase	7. Reservoir management unit and local authority have to collaborate together to implement the following measures: + Develop a plan of water storage and discharge + Check regularly reservoir to have treatment, recovery measure timely. + Implement annually maintenance and management. + Monitor the current situation and provide the mitigation measures, and resolve timely the incidents in stormy season. + Find and treat timely the case of encroaching protection corridor of construction . + Mobilize human resource, materials to protect construction is case of emergency.
8. Phu Vinh reservoir, Quang Binh , Vtb=22.36x10 ⁶ m ³ , Hmax=28.40m,	- There is no natural reserve area, protected area, biodiversity area, precious	1. Land acquisition: total permanent land acquisition is 6.78 ha ; 7 households are	1. Resettlement Action Plan has been developed to compensate, support to 24 affected households according to the

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
<p>was built in 1992</p> <ul style="list-style-type: none"> • Upgrade, repair the main dam with the length is of 1.776m, remain the dam crest is of 25m, extend the dam surface from 5m to 6m, and reinforce it by concrete. Construct a new parapet-wall by concrete. Treat water seepage by using Jet grouting technique. fill and earth work to reinforce both slopes of dam • Construct a new outlet works with the length is of 92m, with aperture 1,2×1,2 (from old drain m to the old unit) • Reinforce the valve of the outlet work and reinforce the auxiliary spillway • Renovate and upgrade access and management road by concrete; with 599m in length 	<p>species, endangered species in range of 20 km from Phu Vinh dam .</p> <ul style="list-style-type: none"> - There is no non – physical cultural property, no architectural construction or cultural historical relic - There is no important cultural heritage in subproject area. - There is no ethnic households to be affected 	<p>affected due to loss of land, 24 households are affected with standing crops and 719 m² of pond</p>	<p>Resettlement policies frameworks of project</p>
		<p>2. Transporting materials may cause damage, deterioration of local road: 700m length of Dong Son ward and 2500 m length of Thuan Duc commune; increasing risks of traffic accidents in region</p>	<p>2. Using vehicles meet the technical standard and environmental safety standard with capacity of 7 – 10 tons</p>
		<p>3. Cut – off water for construction of new outlet works will affect water irrigation of 1672 ha of crops at downstream and domestic water supply for 30,000 households of Dong Hoi city</p>	<p>3. Building a coffer dam for construction of new outlet works to not cut – off water and the old one still operates as normal in construction time. After finishing new outlet works, the old will be destroyed.</p> <ul style="list-style-type: none"> - The construction time is determined when water level in reservoir is the shallowest and when harvesting time is finished; thus, there is no impact on water supply for production and domestic use
		<p>4. Increasing use of fertilizer and pesticide due to increasing irrigation land to 1,153 ha after subproject finishing (irrigated area before project is 1,672 ha and after</p>	<p>4. Implementing program of integrated pet management in subproject</p>

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
		project is 2,825 ha)	
		5. Construction activities impact on natural environment, affect 40 workers and 43 households living near construction site and 80 households living along transport road	5. Applying mitigation measures regulated in ESMP
		6. Grouting waterproof for dam and foundation, (318m length) risks of occupational accidents	6. Civil contractors have to train worker and monitor occupational safety for this issue
		7. Risk of mine clearance at disposal site of 70,000 m ²	7. Project owner will sign contract with Quang Binh Military command for mine clearance; - Collaborating with local authority to inform local residents about time of mine clearance
		8. Emergency flood discharge will affect 230 households living near dam far from 600 – 700 m and cause damage to infrastructure at downstream	8. Develop a proper operation procedures; + Inform timely local residents and local authority time of flood discharge, flood level and potential negative impacts. + Develop a plan of evacuation, protection of assets for residents in case of flood discharge if necessary.
		9. Dam safety in operation phase	9. Reservoir owner has to : + Check regularly reservoir safety for proper treatment and timely recovery.

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
			<p>+ Implement annually maintenance.</p> <p>+ Monitor the current situation and provide the mitigation measures, and resolve timely the incidents in stormy season.</p> <p>+ Find and treat timely the case of encroaching protection corridor of construction.</p> <p>+ Control sources of waste and manage water quality of reservoir</p>
<p>9. Dap Lang reservoir, Quang Ngai, Vtb=0.46x106 m3, Hmax=13.30m, was built in 1978</p> <ul style="list-style-type: none"> - Extend the length of the main dam from 135,0m to 148,5 m, leveling the crest of dam from (30,8÷31,1)m to 32, but the capacity of the reservoir does not change. , extend the dam surface from 3m to 6m, treat water seepage by using Jet grouting technique; Reinforce the spillway, increase the length of the spillway from 88m to 165m, 	<ul style="list-style-type: none"> - There is no cultural relic at subproject area - There is no natural reserve area, national forest, precious species, endangered species. - There is no ethnic households to be affected 	<p>1. Land acquisition: total area of permanent land acquisition is 13,778 m2 including, of which, agricultural land is 7,758 m²; water surface for aquaculture is 6,020 m²; 21,146 eucalyptus trees with 2-3 ages were cut ; number of affected households due to loss of land are 23 households at Tan Phu 2 village, Hanh Tin Tay commune</p>	<p>1. Resettlement Action Plan has been developed to compensate, support to 23 affected households according to the Resettlement policies frameworks of project</p>
		<p>2. Cut – off water for construction will affect agricultural production of 266 households at downstream, total affected area is 431,920 m²</p>	<p>2. A compensation plan for damage has been developed based on replacement cost, to meet the requirement of World Bank. The estimated cost for compensation is VND 653,184,000</p>

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
<p>leveling the spillway crest from 28,5 to 28,8m, the principal chute is 20m in width.</p> <ul style="list-style-type: none"> Construct a new outlet works with the length is of 65m (current unit with length is 45m). Replace the culvert type D800 by steel tube type D400 Construct a new management house with total areas is of 42m² 		3. Impact on erosion, sedimentation in operation phase	<p>3. Exploitation of soil, rock, tree cutting are forbidden at surrounding area of reservoir.</p> <p>– Reservoir management unit will monitor, check plantation and forest protection regularly and collaborate with local authority investment in, encouraging people to carry out continuously plantation, contributing to increase coverage capacity, preventing erosion and increasing income for local people.</p>
		4. Increasing use of fertilizer and pesticide due to increasing of 31 ha after project finishing (recovery designed irrigation area)	<p>5. Control collecting and treating fertilizer and pesticides' containers, residual materials, to avoid uncontrolled discharge or prolonged collection</p> <p>+ Implement training program for farmer about environmental safety cultivation ; develop model of green – clean production in fishery and forestry</p> <p>+ Implement program of integrated pest management</p>
		5. Risk of unsafe dam and incidents in operation phase	6. Operation unit is responsible for implement management, monitoring dam safety program according to the Decree no. 72/2007/NĐ-CP
10. Thach Ban reservoir, Binh Dinh,	- There is no cultural works, or	1. Total area of land acquisition is	1. Resettlement Action Plan has been developed to

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
<p>Vtb=0.70x10⁶ m3, Hmax=12.80m, was built in 1978</p> <ul style="list-style-type: none"> • Upgrade, repair the main dam with the length is of 897m remain the crest of dam crest with 52.5m , extend and reinforce by concrete the surface of dam from 4m to 5,8m; Reinforced upstream slope by slabs concrete, plant grass on downstream slope • Reinforce and repair the spillway, construct a new section of the spillway crest with length is 5m and spillway with length is 11.10m. Levelling the spillway crest from 50.6m to 50.8m. • Construct a new outlet works with the length is of 60m by steel tube type D600 • Concrete access and management road with the length is of 845m. 	<p>archaeological relic .</p> <ul style="list-style-type: none"> - there is no reserve area and protected area by traditional community . - Upstream area is new forest with eucalyptus mostly; - There is no precious species or endangered species - There is no ethnic people to be affected by project 	<p>144,504 m2 belonging to 23 households, of which, area of permanent land acquisition is 1,611m2 of arable land and temporary land acquisition is 142,893m2 production land</p>	<p>compensate, support to affected households according to the Resettlement policies frameworks of project</p>
		<p>2. Cut – off water for construction of outlet works will suspend water supply for 75 ha of 355 households of Cat Son commune in one planting summer – autumn season.</p>	<p>2. Project owner calculated compensation plan for damage of 355 households due to cut - off water for construction. The estimated cost for compensation is VND 623 mil.</p>
		<p>3. Transporting materials with volume >100.000 m3 from Quy Nhon city to construction site with distance of 30 km may cause damage to inter – villages road</p>	<p>3. Using transport vehicles with capacity 7 – 10 tons to avoid damage to road structure</p> <p>+ Selecting the less damage solution</p> <p>+ Compensation for damage to road and infrastructure</p>
		<p>4. Impact on income and life of the affected people by project, including 23 households who are acquired land and 355 households are affected with their production due to cut – off water for</p>	<p>4. Compensation for damage according to resettlement policies framework of project</p> <p>+ Arrange the households who are acquired land, affected their production to take part in construction activities for increasing</p>

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
		construction.	their income and occupation
		5. Potential conflict between workers and local people due to 80 workers at construction site	5. Develop worker regulation management and force to implement; Register temporary accommodation for workers and collaborate with local authority and leaders of villages in workers management ; Maximize use the unskilled workers; educate local workers to support workers in construction time
		6. Risk of water pollution due to construction waste and approximately 12 tons of domestic solid waste and 1,153 m ³ of domestic wastewater from camps and construction site in construction time	6. Minimize amount of soil, rock dropping into reservoir by covering construction site as well as waste transportation - Install 5 – 7 mobile toilets at construction site for workers
		7. Risk of air pollution due to 19 tons of dust generated from construction activities, transporting material and waste in construction time	7. Watering road surface and construction site to reduce dust concentration; + covering warehouse, material storage to avoid wind; + Covering material truck and ensure safety during transportation to limit soil, sand and material spreading out;
		8. Increasing fertilizer and pesticide due to increasing 55 ha	Implement program of integrated pest management proposed in ESMF
		8. Emergency flood discharge cause	8. FS consultant calculated that in case emergency

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
		flood, damage to assets	flood discharge , La Tinh river ensures flood discharge, it does not cause flood in downstream area. However, operation unit also need to develop a plan and train local people adapting to case of emergency flood discharge; Inform early local people and authority time of flood discharge, flood level and potential negative impact ; a plan of evacuation, protection of assets at downstream area should be available .
		9. Risk of water lost and dam safety in operation	9. Regular inspection and detection of incidents resulting in loss of water and announcing to authorized to handle; Enhancing the capacity of the dam management unit; Perform proper operating procedures to ensure the safety of reservoirs
11. Song Quao reservoir, Binh Thuan, $V_{tb}=73.00 \times 10^6 \text{ m}^3$, $H_{max}=40\text{m}$, was built in 1988 <ul style="list-style-type: none"> Upgrade 886m in length of the main dam, , Reinforce the dam surface and both slopes of the dam extend the berm of dam up to 6m; in width, Reinforce auxiliary dam 1 (with lenght 	<ul style="list-style-type: none"> - There is no cultural works, or archaeological relic . - There is no reserve area and protected area by traditional community . - Upstream area is new forest with eucalyptus mostly; - There is no precious species or endangered 	1. Total area of land aquisition is $534,320 \text{ m}^2$, of which, permanent land acquisition is $162,000 \text{ m}^2$ of arable land and $2,332 \text{ m}^2$ of residential land. Temporary land acquisition is $37,000 \text{ m}^2$ for auxillary construction . 18 households have to relocate, of which 3 households are vulnerable	1. Resettlement Action Plan has been developed to compensate, support to affected households according to the Resettlement policies frameworks of project;

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
<p>is 150m) and auxiliary dam 3 (with length is 325m);</p> <ul style="list-style-type: none"> • Construct a new spillway no.2 by concrete, the spillway crest is of 84m elevation; • Repair and upgrade access and management road no.1, 2, 3, 4, 5 with total length is of 5 km; • Construct a new management house with total area is of 475m² (2 floors) • Repair and upgrade Dan sach embankment • Construct a new outlet works at the North of reservoir 	<p>species</p> <ul style="list-style-type: none"> - There is no ethnic people to be affected by project - Not increase irrigation area after finishing project 	2. Impact on gender and income of the affected households : total affected households are 18 households (34 male and 43 female) . 04 households are female householder and 1 household is single mother with two children; these households are affected significantly with loss of 70% arable land	<p>2. Resettlement plan also proposed a support plan to restore people's life and production stability of 03 vulnerable households</p> <ul style="list-style-type: none"> - Civil contractors have to arrange the affected households to participate in unskilled works at construction site and women take part in food supply service for workers
		3. Cause damage to rural road and infrastructure due to transporting 88,794 tons of materials	3. Compensation for damage to road and infrastructure
		4. May cause conflict between workers and local people due to large number of workers at construction site (220 workers)	4. Implementation of mitigation measures proposed in ESMP
		5. Blasting impact for construction of spillway no. 2's foundation which may endanger workers and cause environmental pollution.	5. Comply with national technical standard in blasting; establish corridor for blasting to ensure safety for local people ; blasting is allowed only when blasting plan is available and safety measure during blasting has to be approved by the competent agency .,
		6. Disposal site may destroy landscape,	6. Disposal site is located far from water resources;

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
		cause environment, and when it rains, erosion may occur resulting in sedimentation at low- lying land because the volume of waste soil is large, approximate 40,043 m ³	making embankment around disposal site and compacting waste soil carefully ; covering a organic soil layer to reinstate site and vegetable on disposal site
		7. Impact on air, soil and water environment due to construction activities generating approximately 28,5 tons of dust, 44,2 tons of domestic waste, 4,248 m ³ wastewater and 12, 330 liters of waste oil	7.Implemt the mitigation measures proposed in ESMP
		8. Impact on biological environment due to site clearance activities at borrow pit and disposal site	8. Restrict clearance and prohibit use toxic chemicals in construction; Do not allow blasting in areas near the forest; Do not allow uncontrolled waste dumping
		9. Impacts in operation phase due to new construction of spillway no.2; in case of flood discharge, 20 households at downstream will be submerged and access road to sub dam 1 and canal will be affected	9. Flood discharge at spillway no. 2 only occurs when fre quency is P=1% (1 times/100 year). When flood discharge at spillway no. 2 is available, local authority should be informed; the evacuation plan for households in case of flood discharge should be available. In long term, the households have to be relocated out of affected area
		10. Increasing soil	10. Forest plantation at

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
		erosion and land slide which result in sedimentation in reservoir	downstream area to increase water storage capacity and decrease erosion and sedimentation; Limit exploitation activities at slope area and in reservoir area; Strictly controlling the cultivation at surrounding area of reservoir and controlling the use of fertilizers and plant protection chemicals to avoid sedimentation and protect water quality.
		11. In case of emergency flood discharge, 233,600m ² of arable land of Ham Tri commune will be submerged (3m higher than normal water level).	11. Develop a plan and train local people adapting to case of emergency flood discharge; Inform early local people and authority time of flood discharge, flood level and potential negative impact ; a plan of evacuation, protection of assets at downstream area should be available if necessary.
		12. Risk of dam safety lost in operation phase	12. Regular inspection and detection of incidents resulting in loss of water and announcing to authorized to handle; Enhancing the capacity of the dam management unit; Perform proper operating procedures to ensure the safety of reservoirs.
12. Dã Teh reservoir, Lam Dong, Vtb=24.00x106 m3, Hmax=27.00m, was built in 1995 <ul style="list-style-type: none"> Extend the main dam with the length 	- Subproject is located in village no.8, My Duc commune; there is no vulnerable area such as: reserve area, protected area by traditional	1. Repairing outlet works, dam and spillway interrupts irrigation water supply for 2,300 ha of arable land	1. when outlet works is constructed, a coffer dam is built at downstream and water diversion is carried by installing a uPVC D150 pipe to downstream to ensure irrigation water supply.

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
<p>from 600m to 700m, levelling the crest of dam from 158m to 159m but the capacity of reservoir does not change, Reinforce the dam surface and both slopes by concrete, construct a new parapet wall up to elevation of 159,8m. Treat water seepage at the section with length is of 318m by using jet grouting techniques</p> <ul style="list-style-type: none"> • Reinforce the spillway with the principal chute is 24m, remain the spillway crest is of 151,7m elevation; reconstruct the bridge across spillway with the width is of 5m; • Reinforce, repair the outlet works with new power house (outlet works and bridge) • Construct a new management house with total areas is of 150m²; • Reinforce the access and management road by concrete, the road starts from outlet work position to the spillway with length is of 1,7 km. 	<p>community, etc ...</p> <ul style="list-style-type: none"> - There is no cultural/ historical relic - there is no ethnic people to be affected by project - There is no resettlement, no impact on residential land, arable land as well as assets of local households . (subproject acquires temporarily 1 ha of land for borrow pit, but this land is managed by People's Committee of My Duc commune and were compensated in 2010 completely) 	2. Material trucks affect 1.7 km of road and rural infrastructure	<p>2. There is no power line and information cable in materials transportation road.</p> <p>Using transport vehicles with capacity of 7 – 10 tons to avoid damage to road structure</p> <p>Project owner will compensate for damage of road</p>
		3. With total volume of earthwork is 69,548 m ³ which cause soil erosion, sedimentation in reservoir if construction activities take place in rainy season	3. Construction positions are higher than water level and take place in dry season. Dam toe is concrete , so erosion and sedimentation hardly occur
		4. Impact on air, soil and water environment due to construction activities generating 29,565 m ³ of wastewater and 45 tons of waste and 1.4 tons of dust	4. Implement mitigation measures proposed in ESMP
		5. Occupational accidents may occur in operation of machine, excavation, site clearance or material transportation process	<p>5. – Assign staffs with expertise in occupational safety to implement safety measures at construction site and train workers the first aid;</p> <ul style="list-style-type: none"> - Provide fully personal safety equipment for workers and instruct them to use; - Install occupational safety regulations at

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
			construction site; - Make fence around construction site
		6. Conflict between local people and workers may occur due to number of workers at construction site (150 workers)	6. Using approximately 30% of local workers; civil contractors have to register temporary accommodation for workers for closed management and collaboration with local authority in educating local people to support workers in construction time
		7. Water pollution in reservoir and sadimentation due to erosion and landslide attached with non – point sources pollutants	7. Planting protection forest at upstream area to increase water storage capacity and decrease soil erosion and sedimentation; Limit exploitation activities at slope area and in reservoir area; Strictly controlling the cultivation at surrounding area of reservoir and controlling the use of fertilizers and plant protection chemicals to avoid sedimentation and protect water quality.
		8. Risk of dam failure or emergency flood discharge threaten downstream in operation phase	8. Reservoir management unit needs to inform timely, exactly flood discharge for adapting and actively prepraring. - In time of stormy season, assigning staff for monitoring, checking regularly to ensure water regulating properly
		9. Extending spillway from 18 to 24m may cause flood at residential area after spillway.	9. A plan to inform local people before discharging flood at least 03 day should be available and flood discharge plan (if

<i>Summary of subproject and key activities</i>	<i>Environmental screening</i>	<i>The key negative impacts on environment and social</i>	<i>The recovery/ mitigation measures</i>
		Downstream area is forest; there is no people living and cultivating at this area. Water flow through Đa Têh stream with width of 20m, connected with Dong Nai river. Thus, flood discharge capacity is relatively good, risk of flood at downstream is low	necessary) to avoid and mitigate the damage to life and crop also should be available. + Identify safety corridor of flood discharge based on predicted scenarios about effect level and space in case of dam failure.

APPENDIX 3: SUMMARY ESIA OF 12 SUB- PROJECT

3.1. SUMMARY ESIA OF NGOI LA 2 RESERVOIR, TUYEN QUANG PROVINCE

1. **Background:** Ngoi La 2 reservoir is located in Trung Mon commune, 7km far from Tuyen Quang city in the south. The reservoir was built in 1973, the most recent repair and upgrading was conducted in 1999 with the budget from the former Ministry of Water Resources. The catchment area of the reservoir is of 16.7 km², water volume of 3,24x10⁶ m³. The headwork cluster and auxiliary works of the Ngoi La 2 reservoir are consist of following categories:

- **Dam:** It is homogeneous earth dam with the maximum height of 15m, length of 556 m. Crest elevation is at +44.5m; width of 3.5m;
- **Spillway:** Spillway width Btr = 5.0m; covered by reinforced concrete with thickness of 10cm; following by a chute and cushioning pool;
- **Water intake:** reinforced concrete structure, located on the right side of the dam; dimension b×h = 0.8×0.8 m. It is box sewer with regulator tower gate in upstream;
- **Management and operation route:** (i) Route to Ngoi La 2 from National road No. 2: already improved with asphalt road surface, width is of 3.5m; length L = 2,430m; (ii) Route from Ngoi La 1 reservoir to Ngoi La 2 reservoir: earth road, length L = 1,885m; steep slope, is slip in rainy season, difficult to travel.

2. The main purposes of subproject

The main purposes for upgrading and improvement safety of dam and reservoir are: (i) Ensure the safety of the reservoir during operation and exploitation process, adapting to climate change and meeting the increasing demands for water of people in the downstream area, mitigating the negative impacts on the environment, landscape of reservoir foundation and downstream; (ii) Ensure original design goals of supplying water for 1,054 ha of rice and crop plants in current irrigated areas of communes named Trung Mon, Kim Phu of Yen Son district and wards named Y La, Tan Ha, Hung Thanh of Tuyen Quang city; and (iii) Ensure water supply for area of 15ha for aquaculture production. The subproject “**Repair and Improvement for Safety of Ngoi La 2 Reservoir, Tuyen Quang province**” was proposed for investment funded by the World Bank, under Dam Rehabilitation and Safety Project (DRSP)

3. Due to long time use, the construction has seriously degraded. The problems of erosion, water leakage recorded in the construction system of Ngoi La 2 reservoir are included: the upstream face erosion, section from the upper water level is dropped by waves and is seriously eroded; There is more erosion places with depth of 70 – 80 cm; The downstream toe is leaking, water seepage through the dam body caused local erosion on the dam face; The spillway eroded the concrete structures, damaged drainage facilities formed the seepage flow along both inside and outside of the wall; curved upstream canal has width of 7-10m, is incapable to take flood water. Water intake is still manually operated, the operation bridge and covering house are damaged, operation gate is leaking, etc. Although several facilities had been reinforced, but many items of the work have been degraded, capability to store water is low, and unsafety during operation process may happen.

4. **Description of the project:** The activities under the project include: (i) fix seepage in dam body and foundation, fix local erosion places; (ii) change the valve and gasket of water intake; (iii) expand spillway and build new bridge across the spillway; and (iv) upgrade management and operation route. The project has been designed and implemented in lines with environmental and social management framework (ESMF) and dam safety framework of WB, assuring to comply strictly with administrative regulations as well as criteria of Social Republic of Vietnam. The potential impacts during preparation and implementation periods of project has been assured sufficient determination, strictly supervision and management by detail plans and periodical reports submitted to management organizations.

5. **Environmental and social impacts and mitigation measures:** The project implemented will bring in considerable benefits to local community, such as: (i) Stabilize water supply, facilitate agriculture production and improve the life of local people; (ii) Dam safety improved will be secure about the life and production of people in downstream; (iii) Improve the landscape, ecosystem and microclimate conditions of the reservoir. However, the project implementation will be results of some potential adverse impacts and risks of natural and social environment, relating to: (i) Land acquisition and clearance, (ii) construction activities, and (iii) operation of the reservoir.

6. Detailed plan to prevent or mitigate the adverse impacts are described Environmental and Social Management Plan (ESMP).

7. 95% of affected people in sub-project area are Kinh people. There is no ethnic minority HH affected by the project.

8. For Ngoi La 2 sub-project implementation, total land of 22,100 m² will be permanently recovered, including: 300 m² of residential land of 01 household, 2,245 m² of garden land owned by 11 HHs and 19,555 m² of public land managed by commune; and 2,000 m² of land managed by commune will be temporary recovered for construction purpose. Only one HH has to move to another place. The affected household will be compensated and supported sufficiently complying with resettlement policy framework (RPF). The details are stated in project's RAP report. There are no grave, temple or any culture, belief, religious structures affected in the project area.

9. As calculated, 44,314 m³ of excavated soil and 9,501 m³ of filled soil will be used for all the construction activities. Because all filled soil can be utilized from excavated soil, there is no need to exploit other soil bank for the construction. Surplus excavated soil, covering plant and waste materials are dumped in disposal site area reserved of about 50,000 m³. It is low-lying area which has been exploited soil in village No. 1, Trung Mon commune, about 2.5km far from the construction site. Other construction materials are purchased in center of Tuyen Quang city, transport distance is of about 7-15km. Around 20-30 workers will be mobilized in the short time (1 month) for preparation and land clearance period. The maximum of workers will be mobilized for the intensive construction. The number of workers is 50 people for this stage. 27 set of machines and vehicles will be used for the construction including: bulldozers (110 Cv), excavators, trucks, mixers (250litre), concrete pavers, generators, water pumps.

10. The project construction may arise negative impacts to natural environment (such as: increasing pollution of air, water, soil, noise, vibration, etc.) and social environment (traffic jam, social security, etc.). However, these impacts are partial, temporary with small sphere and can be prevented/minimized via:

- (i) Ensuring to comply with Environmental and Social management plan of project,
- (ii) Consulting with local authorities as well as local residents from project preparation period and maintain during project construction period,
- (iii) Supervising closely project's implementation.

11. Environmental and Social Impacts Assessment (ESIA) report aims to make detail implementation plan in order to ensure natural environmental and social quality in project area. The entire process of project implementation will be closely monitored by the Provincial management unit (PMU), Department of Natural Resources and Environment (DONRE), construction supervision consultants (CSC), environmental management consultants and local communities. Monitoring process will be recorded and publicly periodically reported.

12. ***Plan to manage and mitigate impacts during project implementation process:*** To minimize potential adverse impacts during project implementation period, the following measures need to be done adequately under the close, uninterrupted and open consultancy with local authority and community, especially with AH:

- (iv) Make sure that the environmental protection criteria will be stated in contract's terms of project and make clear with the contractors.
- (v) Implementing mitigation measures adequately with the observation and modification suitably to actual conditions to achieve the highest minimization.
- (vi) Supervising and monitoring closely the implementation of safety measures to ensure the mitigation measures should be sufficient and effectively implemented during project's implementation.
- (vii) Planning and performing completely the stakeholder consultation during project's preparation and implementation.

13. ***Responsibility:*** Central Project Office (CPO) takes responsibility for supervision overall project and progress of the subproject: ***“Repair and Improvement for Safety of Ngoi La 2 Reservoir, Tuyen Quang province”***, including the implementation of environmental protection measures proposed in ESMP.

14. Tuyen Quang irrigation management and exploitation unit takes responsibility for preparing detail bids/tenders information, selecting contractor suitably, preparing contracts and ensuring effective implementation and close supervision of ESMP of project. The contractor takes responsibility implementing project as planned, periodically report to CPO. CPO will associate closely with local authority to ensure the effectiveness of stakeholder consultation and promote minimized measures effectiveness. Department of Natural Resources and Environment of Tuyen Quang province will bear responsibility of supervising the implementation of environmental policies as per regulated by Vietnam Government. After project completed, the operation organization will take responsibility of maintenance and periodic inspection project's works.

15. ***Budget allocation:*** Both ODA fund and Counterpart fund of Vietnam Government are used for sub-project investment. Total budget estimation is: **59,500,000,000 VNĐ**.

Budget for ESMP implementation including:

- Implementing ESMP: 626,000,000 VNĐ,
- Implementing ESMoP: 453,925,000 VNĐ

3.2. SUMMARY ESIA OF THACH BAN RESERVOIR, BINH DINH PROVINCE

1. Background: Thach Ban reservoir is located in Thach Ban Dong-Cat Son commune- Phu Cat district, Binh Dinh Province. It is 7.5km far from national highway 1A in the West and 40km to Qui Nhon City in the North. The reservoir was built in 1978 with small scale; the designed water store in the reservoir is 772,000m³. The catchment's area of the reservoir is of 3.0km², the construction classified in category II by Vietnam dam classification. The headwork cluster and auxiliary works of Thach Ban reservoir are consisted of four main components including:

- **Dam:** It is homogeneous earth dam with the height of 12.1m, Crest elevation is at +52.50m, length and width at dam crest are 897 m and 4.0m, respectively.
- **Spillway:** principal spillway with B=30m, following by a chute with 50m and riprap stilling basin
- **Outlet works:** it was built in 1990, the location is on the middle of the embankment, at elevation +43.50m and made of reinforced concrete structure. It is box sewer with regulator tower gate in downstream slope
- **Access and management road:** Route to the dam from Son Loc bridge, current width is of 2.5m; length L = 845.4m. It is earth filled, is slippery in rainy season and difficult to travel.

2. The main purposes of the subproject

The main purposes of upgrading and improvement safety of dam and reservoir are: (i) Ensure the safety of the reservoir during operation, protect 80 households and local infrastructure of Thach Ban Dong village-Cat Son commune; (ii) Ensure original design goals of supplying water for 130 ha of rice and crop plants in current irrigated areas of villages Thach Ban Dong, Thach Ban Tay-Cat Son Commune, modernization of operational management;. The subproject "Repair and Improvement for Safety of Thach Ban Reservoir, Binh Dinh Province" had been proposed for investing and funding by the World Bank, under Dam Rehabilitation and Safety Project (DSRIP)

The subproject has been designed and will be implemented in lines with environmental and social management framework (ESMF) and dam safety framework the Dam Rehabilitation and Safety Project. The Project will also comply with applicable regulations as well as criteria of Vietnam. This Environmental and Social Impacts Assessment (ESIA) report is prepared to assess the project's potential impacts and propose the measures to avoid or mitigate these impacts. Accordingly, an Environmental and Social Management Plan (ESMF) is prepared with proposals on institutional arrangements for impacts management, environmental monitoring and supervision, reporting requirements, capacity building as well as budgeting for implementation

3. The existing headwork conditions

Due to long time use, the construction has seriously deteriorated. The problems of erosion, water leakage of Thach Ban reservoir included (i) the downstream slope is facing gully erosion, water seepage through the embankment, the left and right abutment of dam and main structure are seriously damaged (ii) The shape of upper stream slope is dramatically distorted, localised

erosion on the top of the dam made dam narrowed; (iv) sedimentation of the stilling basin; (v) the outlet works are not working and causing water lost, the valve to control water flow has been corroded and difficult to operate. (vi) The 845.4 m earthen access and management road (2.5m wide) is difficult to travel and slippery in rainy season. Although several items had been reinforced, many items of the work have been degraded, capability to store water is low, and there is safety risk during operation.

4. Sub-project description: the proposed civil works under the subproject are: (i) fix seepage in embankment and foundation; (ii) Construct new training spillway walls and rehabilitate concrete spillway; (iii) Replace the old outlet works with a new concrete structure which is 60m long; (iv) upgrade the 845 access and management road. Material such as cement, steel, etc will be purchased from warehouses in Quy Nhon City, 30-40km distance from the construction site. Around 20-30 workers will be mobilized in the short time (1 month) for preparation and land clearance period. The maximum of workers will be mobilized for the intensive construction. The number of workers is 80 people. 53 set of machines and vehicles will be used for the construction including: bulldozers (110 Cv), excavators, trucks, mixers (250litre), concrete pavers, generators, water pumps, etc.

5. The potential impacts of the sub-project:

The project will bring in considerable benefits to local community, such as: (i) Stabilize water supply, facilitate agriculture production and improve the life of local people; (ii) Dam safety improved will be secure about the life and production of people in downstream; (iii) Improve the landscape and microclimate conditions of the reservoir.

However, the subproject will also cause some potential adverse impacts and risks of natural and social environment relating to: (i) Land acquisition, and trees are cut off and vegetation cover are removed during site clearance, (ii) impacts of construction activities such as impacts on agricultural production due to water supply interruption, waste generation, dust, noise and vibration from excavation, compaction and transportation, water pollution, disturbance to drainage, sedimentation, increased erosion potentials, water supply interruption, safety risks for the workers and community etc. and (iii) operation of the reservoir such as reservoir sedimentation, water polluted by substance degradation or pesticided use, risk of dam safety or water lost, etc.

Land Acquisition. One commune, the Cat Son would be affected by the proposed project. The commune comprises of three villages including Thach Ban Dong, Thach Ban Tay and Hoi Son villages. 23 households (98 people) will be affected by the proposed sub-project due to land acquisition. In which, 1,611m² of land (including: 677m² garden land, 588m² annual crops land owned by 12 households and 346m² public land managed by Cat Son commune) will be acquired permanently for widening the access road. 142,893m² of land (including 132,893m² crop land owned by 11 households and 10,000m² paddy rice managed by Cat Son commune) will be temporally acquired for other construction activities; No households are displaced. The subproject would not affect any business, shops, physical cultural resources or ethnic household. Two household will be affected with land acquisition for widening the access road. (Total land acquisition less than 10%). The affected households will be compensated and supported sufficiently according to the project's resettlement policy framework (RPF) and detailed in project's RAP report.

In addition, owned by 355 households (1226 person) will be affected by water interruption in Summer-autumn cultivation period 2016.

99.2 % of people in sub-project area are Kinh people. There is only 0.8% is ethnic minority people. There is no ethnic minority household affected by the project.

Crop trees and plants to be removed: 14,843 Eucalyptus and Acacia trees, twelve coco nut-trees and 96 peach trees will be cut down. In addition, 15,348m² of cassava cultivation; 425 m³ of paddy rice field and 49,389 m² of annual crop land (ground nuts, water melon, etc)... will be temporarily affected

Water Supply Disruption. 355 households (1,226 people) will be affected with with one crop cultivation in 2016 due to water supply interruption during dam rehabilitation. Cultivation land to be affected including 447,774m² of paddy rice land and 299,991m² crops land (bean, watermelon, chilli...)

6. Common Construction Impacts

Waste generation. 120,314m³ of soil will be excavated and 113,767m³ of soil will be used for filling in all the construction activities. The borrow pit with capacity of 180,000 m³ is located at 1 km from construction site. Some of the excavated materials will be used for filling, the unused excavated soils and solid waste will be disposed off in the disposal areas which is 100m from construction site

Some potential negative impacts in the construction phase: An estimation of 19 tons of dust arising from the operation and reparation of headwork. This can pollute to air quality and impact to the 80 worker's health on site, also impacts to 10 households living around the waste or material transportation roads. Noise: the residential area located 1km away from the construction site and then the noise generated from machine operations can not be impacted to the location, only workers on site can be direct impacted by this issue. Wastewater. About 3m - 5m³ of wastewater generating perday, as the results of wastewater samples analysed show that, TSS, pH and other concentrations in wastewater are low concentration, so that the pollutant is insignificant impact to surrounding environmental. The amount of waste oil generated: approximately 8,478 liters of waste oil can impact to environment, the impacts of this issue assessed at high risk to environment but the impact on the environment can limit if it applying a good hazardous waste management plan on the site. When construction is taking place in rainy season, it will increase erosion progress and increase the amount of sewage overflows in the construction area. However, the construction activities are operating in the dry season, so the impact is expected to low level. The activities of excavation, leveling, drainage water in reservoir, spillway construction, waste generation and oil leaking are impact to water quality and increase water turbidity, and expected to aquatic species and their habitats changing. However, the aquatic cultural in Thach Ban reservoir is prohibited, so that this impact assessed at low level.

The potential operation Impacts: Increased sedimentation behind impoundment will lead to downstream impacts. However, this process takes a long time, it can be monitored and limited through the control activities and in creas the protective afforestation areas to reduce erosion and sedimentation by plant trees in watershed of the reservoir, limiting activity on slope land in upper stream. The risk of water loss due to seepage of the reservoir will reduce the water

supply for 130ha of paddy rice in drying season. However, after completion of repairs, reinforced dam this issue can be negligible.

7. As the assessment and evaluation, these impacts are temporally and localized influenced, therefore it can be minimized and mitigated by the following measures:

- Social impact mitigation measures: the compensation of land acquisition of 23 households and disruption of irrigation and other public service: 75 ha/355 HH of Thach Ban Dong and Thach Ban Tay have to follow the RAF of the sub-project. Creation of temporary jobs or business opportunity to the affected households to increase income. Limit speed and avoid the transportation activities in rush hours and at vulnerable areas (resident living areas and schools). Using local labour and develop a worker management plan. Restrict the use of trucks with load up to 7-10 tons to avoid local road damage.
- Environment impact mitigation measures: install mobile toilet on site, cover the transportation vehicles, material storage areas to avoid dust partial spreading out, Often watering on surface roads. Arrange for regular waste collection and disposal following regulation. Retain waste soil for reinstatement at the heardwork and other disturbed areas. The transportation vehicles, equipment must be maintained periodically. Workers using adequate protective clothings while working.

8. Implementation Arrangements

Central Project Office (CPO) takes responsibility for supervision overall project and progress of the subproject. Including the implementation of environmental protection measures proposed in ESMP.

The Sub-Project owner (PPMU) and Contractors are the key entities responsible for implementation of this ESIA. Key responsibilities of PPMU and the contractors are as follows:

(a) PPMU

- PPMU is responsible for ensuring that the ESIA is effectively implemented. The PPMU will assign a qualified staff to be responsible for checking implementation compliance of Contractors, include the following: (a) monitoring the contractors' compliance with the environmental plan, (b) taking remedial actions in the event of non-compliance and/or adverse impacts occur, (c) investigating complaints, evaluating and identifying corrective measures; (d) advising to the Contractor on environment improvement, awareness, proactive pollution prevention measures; (e) monitoring the activities of Contractors on reppling complaints; (f) providing guidance and on-the-job training to field engineers on various aspects to avoid/mitigate potential negative impacts to local environment and communities during construction.
- PPMU has responsibility for preparing monitoring reports to submit to CPO.

(b) Contractor

- Contractor is responsible for carrying out civil works and informs PPMU, local authority and community about construction plan and risks associated with civil works. As such,

contractor is responsible for implementing agreed measures to mitigate environmental risks associated with its civil works.

- Contractor is required to obey other national relevant legal regulations and laws.

9. Capacity Assessment and proposed training program:

- Sageguards policies of environmental and social of the sub-project
- Improving knowledge on environmental protection
- Building capacity on ESMP and ESMoP
- Training on environmental health and safety measures
- Training on improving of gender equity
- Training on IPM

10. Budget allocation: Both ODA fund and Counterpart fund of Vietnam Government are used for sub-project investment. Total budget estimation is: VND: 45,365,800,000. Budget for ESMP implementation including:

- Mitigation measure (VND):	1,464, 000, 000
- Independent monitoring (VND):	1,044,000,000
- Capacity building (VND)	590,000,000

3.3. SUMMARY ESIA OF SONG QUAO RESERVOIR, BINH THUAN PROVINCE

1. **Background:** Song Quao reservoir is located in Ham Tri commune, Ham Thuan Bac district, 41 km far from sea. It was built in 1988 and completed in 1997. This is annual regulating reservoir, in dry season, it is supplied water from Dan Sach river under La Nga river basin, ensures water supply for 8120 ha of paddy field with irrigation level of $P=75\%$ and supply water for domestic use in project. Catchment area of reservoir is 296 km², capacity of reservoir is 73x10⁶ m³. Head works and auxiliary works of Song Quao reservoir include the following components:

Earthfill dam (main dam and sub- dam): homogeneous dam with cut – off trench:

- The length of left dam is 470m, and right dam is 416m; the altitude of dam crest is 92.0m (the maximum height of dam is 40m); width of top is 6,0m.;
- Sub – dam 1, 2 and 3 with total length is 525m, the maximum height is 25m. The sub – dam 4 with elevation equal to natural elevation of 90.80m, so it is emergency spillway instead of dam in case of large flood;
- *Outlet works intake:* is located in sub dam 1 and is reinforced concrete works with rectangular cross – section; dimension BxH is (2x2.5) m;
- *Spillway:* reinforced concrete structure, with 3 curve – gateS (6x 8m), connecting to chute and dissipation of energy in form injecting form;

Dan Sach weir: its task is supply water for Song Quao reservoir from Dan Sach stream as well as this construction has to ensure releasing water into Dan Sach stream in order to avoid increasing flood in Song Quao reservoir

2. **The objectives of** dam rehabilitation and safety improvement of Song Quao reservoir are: (i) increasing capacity of flood protection for reservoir, improvement and modernization of works to ensure safety and stabilize in long – term in context of complex situation of climate change, compatibility with purpose of industrial – modernization of country ; (ii) improve safety of head works of Song Quao reservoir, protect assets of community at downstream area;

3. **Current status of head works:** asphalt concrete penetrated for crest reinforcement has deteriorated, much peeling and subsidence appeared on the dam crest, downstream ledge has been deteriorated or damaged in some segments. Concrete of the dam face has been mostly cracked along the crest. Due to waves, dam upstream slope has slagged down, stone pavement is of disportion, dam slope is waved, rugged and less beautiful looking. The downstream slope has many positions eroded by surface water, ditches and up/down thresholds mostly under damage; the dam slope is rugged and less beautiful looking; Dan Sach weir: Due to the impact of rainfall, the dam up/downstream slopes are annually eroded and degraded with bushy plants growing on the dam body. There is seepage and deep erosion at downstream to the left .

Impact due to releasing water of Song Quao reservoir: downstream area is fertilizer delta of Ham Thuan Bac with high population density and there are main traffic route such as North - South railway, National highway 1A, and it is about 8 -10km far from construction and 20 km far from Phan Thiet city. The communes along Quao river will be impacted directly by flood, of which some households living in flood releasing corridor will be affected directly. According to the survey in 2015, the influence area due to releasing water from Song Quao reservoir includes 7 communes with 4 ethnic groups of Kinh, Gialay, Khor me, Tay. Total estimated households to be affected directly are approximately 4963 households.

4. Description of project's activities: (i) Reinforcing dam crest (main dam and sub – dam) with concrete; improving downstream and upstream slope; installing seepage monitoring equipment in dam ; (ii) New construction of the second spillway with reinforced concrete grade M200; (iii) Dan Sach weir: covering weir and upstream slope by reinforced concrete; constructing regulating culvert at the starting point of diversion canal in order to prevent flood from Dan Sach river going in Quao river; (iv) Repairing and improving construction road and management road no.1, 2, 3, 4, 5 with total length of 5.12 km.

5. Impacts on environment, society and mitigation measures: in short - term the project implemented will recover the situation of deterioration of components of works. In long – term, the project will improve dam safety, stability; the leveling up of construction will decrease risk of damage to downstream area, increase effectiveness of construction and sustainable development of water resources of Song Quao reservoir basin. However, the project implementation will be results of some potential adverse impacts and risks of natural and social environment, relating to: (i) Land acquisition and clearance, (ii) construction activities, and (iii) operation of the reservoir.

6. Plan of prevention or mitigation is performed in detail in Environmental and social management plan (ESMP)

Number of minority households who are affected in subproject area are 8 households of Thuan Hoa commune, Ham Thuan Bac district (Châm, K'ho and Rắc lây).

The implementation of subproject will acquired land permanently with total area of 164.320m², of which, 162,000m² is production land and 2,332m² is residential land (mostly in Thuan Hoa commune). 18 households must be out of protection corridor of works in Thuan Hoa commune. In addition, when subproject is implemented, project owner will also acquire temporarily 3.7ha of land for disposal site, material storage, construction road and construction site. The affected households will be compensated and supported according to Resettlement Policies Framework, the details are shown in Resettlement Action Plan (RAP) of project. There is no grave or temple or any cultural, religious constructions which will be impacted.

Earthworks volume: volume of dam and outlet works is 115,377 m³, volume of Dan Sach repairing is 14,292 m³. Soil is transported from borrow pit (D2 road) across NR 28, along road no. 5 to location of repairing, with 3km length. Rock is transported from Dan Hoa village, Thuan Hoa commune, Ham Thuan Bac district with distance of 3km (from NR 28 along with road no.1 and 5) to repairing location. Waste is transported to disposal site with distance of 500m, along construction road no. 1, 5. Sand is transported from Luong Tay commune, Luong Son town, Bac Binh district with distance of 30 km along NR 1A - road 771 and NR 28. Cement, steel: distance to construction site is 27km, from Phan Thiet. 30 – 50 workers will be mobilized in pre – construction phase in short time (1 month). Number of workers at construction time in rush time is approximately 200 workers. 16 machines will be used for construction including concrete mixing station with capacity of 30m³/h, bulldozer, compactor, mixer with capacity of 250 liters, concrete pumping machine, power generator, pump etc. Construction phase may cause the negative impact on natural environment (increasing air, surface water, ground water pollution, noise and vibration, etc) and social (traffic congestion, social security, etc). However, these impacts are local, temporary, in small scale and they can be mitigated and prevented through:

- Follow Environmental and social management plan of project;
- Consult with local authorities and local people from pre – construction phase and remain during implementation time of project;
- Monitor closely implementation of the project.

7. Environmental and social impact assessment (ESIA) of project is to develop specific action plan, with objective of ensuring natural environment and social environment at project area. The whole implementation process of project will be supervised closely by Province Project Management Unit, Department of Natural Resources and Environment, construction supervision consultant, Environmental management consultant, and local community. Monitoring process will be recorded and reported publicly and periodically

8. Plan to manage and mitigate the impacts during project implementation process: To minimize potential adverse impacts during project implementation period, the following measures need to be done adequately under the close, uninterrupted and open consultancy with local authority and community, especially with affected households:

- Make sure that the environmental protection criteria will be stated in contract's terms of project and make clear with the contractors.
- Implementing mitigation measures adequately with the observation and modification suitably to actual conditions to achieve the highest minimization.
- Supervising and monitoring closely the implementation of safety measures to ensure the mitigation measures should be sufficient and effectively implemented during project's implementation.
- Planning and performing completely the stakeholder consultation during project's preparation and implementation.

9. Responsibility: Central Project Office (CPO) takes responsibility for supervision overall project and progress of the subproject: *"Repairing and safety improvement of Song Quao reservoir subproject"*, including the implementation of environmental protection measures proposed in ESMP.

10. Binh Thuan irrigation exploitation one member Ltd. company takes responsibility for preparing detail bids/tenders information, selecting contractor suitably, preparing contracts and ensuring effective implementation and close supervision of ESMP of project. The contractor takes responsibility implementing project as planned, periodically report to CPO. CPO will associate closely with local authority to ensure the effectiveness of stakeholder consultation and promote minimized measures effectiveness. Department of Natural Resources and Environment of Binh Thuan province will bear responsibility of supervising the implementation of environmental policies as per regulated by Vietnam Government. After project completed, the operation organization will take responsibility of maintenance and periodic inspection project's works.

11. Budget allocation: Both ODA fund and Counterpart fund of Vietnam Government are used for sub-project investment. Total budget estimation is: **271,434,000,000 VND**.

- Mitigation measure (VND):	1,113, 000, 000
- Independent monitoring (VND):	1,803,000,000
- Capacity building (VND)	62,000,000

3.4. SUMMARY ESIA OF KHE SAN RESERVOIR, NGHE AN PROVINCE

1. Background: Khe San reservoir is located in Quynh Thang commune, 80km far from Nghe An city in the south. The reservoir was built in 1980. The catchment area of the reservoir is of 5.2 km², water volume of 1.47x10⁶ m³. The headwork cluster and auxiliary works of the Khe San reservoir consist of following categories:

- **Dam:** It is homogeneous earth dam with the maximum height of 8.0-15m, length of 389 m. Crest elevation is at +44.5m; width of 2.6-3.5m;
- **Spillway:** Spillway width Btr = 23.6m; covered by reinforced concrete; following by a chute and cushioning pool; **Water intake:** reinforced concrete structure, located on the right side of the dam; dimension b×h = 0.8×0.8 m. It is box sewer with regulator tower gate in upstream;
- **Management and operation route:** (i) Route to Khe San from raw pineapple road: current surface of this route is earthen, width is of 1.0-1.5m; It is steep slope and slip in rainy season, difficult to travel.

2. The main purposes of upgrading and improvement safety of dam and reservoir are: (i) Ensure the safety of the reservoir during operation and exploitation process, adapting to climate change and meeting the increasing demands for water of people in the downstream area, mitigating the negative impacts on the environment, landscape of reservoir foundation and downstream; (ii) Ensure original design goals of supplying water for 120 ha of rice and crop plants in current irrigated areas of communes named Quynh Thang of Quynh Luu district and (iii) Ensure the safety of human life and infrastructure of downstream area. The subproject “*Repair and Improvement for Safety of Khe San Reservoir, Nghe An province*” was proposed for investment funded by the World Bank, under Dam Rehabilitation and Safety Project (DRSP)

3. Due to long time use (35 years from 1980-Now), the construction has seriously degraded. The problems of erosion, water leakage recorded in the construction system of Khe San reservoir are included: the upstream face erosion, section from the upper water level is dropped by waves and is seriously eroded; The downstream toe is leaking, water seepage through the dam body caused local erosion on the dam face; The spillway eroded the concrete structures, damaged drainage facilities formed the seepage flow along both inside and outside of the wall. Water intake is still manually operated, the operation bridge and covering house are damaged, operation gate is leaking, ect. Although several facilities had been reinforced, but many items of the work have been degraded, capability to store water is low, and unsafety during operation process may happen.

4. Description of the subproject: The activities under the project include: (i) fix seepage in dam body and foundation, fix local erosion places; (ii) change the valve and gasket of water intake; (iii) expand spillway and build new bridge across the spillway; and (iv) upgrade management and operation route. The project has been designed and implemented in lines with environmental and social management framework (ESMF) and dam safety framework of WB, assuring to comply strictly with administrative regulations as well as criteria of Social Republic of Vietnam. The potential impacts during preparation and implementation periods of project has been assured sufficient determination, strictly supervision and management by detail plans and periodical reports submitted to management organizations.

5. Environmental and social impacts and mitigation measures: The project implemented will bring in considerable benefits to local community, such as: (i) Stabilize water supply, facilitate agriculture production and improve the life of local people; (ii) Dam safety improved will be

secure about the life and production of people in downstream; (iii) Improve the landscape, ecosystem and microclimate conditions of the reservoir. However, the project implementation will be results of some potential adverse impacts and risks of natural and social environment, relating to: (i) Land acquisition and clearance, (ii) construction activities, and (iii) operation of the reservoir.

Detailed plan to prevent or mitigate the adverse impacts are described Environmental and Social Management Plan (ESMP).

There is no ethnic minority household affected by the project.

For Khe San sub-project implementation, total land of 12,200 m² (perennial crop land) will be permanently recovered and 10,000 m² of land managed by Quynh Thang commune will be temporary recovered for construction purpose. There are no grave, temple or any culture, belief, religious structures affected in the project area.

The other building materials were purchased from Quynh Luu district centers (with distance: 7-25km). The preparation phase of ground clearance should mobilize 20-30 workers in the short term (1 month). The number of workers in the field to focus on the peak construction period is about 50 workers. The unit machines will be used to serve the construction work, including: bulldozers 110Cv, excavators, trucks, mixer 250 liters, concrete pavers, generators, water pumps.

The project construction may arise negative impacts to natural environment (such as: increasing pollution of air, water, soil, noise, vibration, etc.) and social environment (traffic jam, social security, etc.). However, these impacts are partial, temporary with small sphere and can be prevented/minimized via:

Ensuring to comply with Environmental and Social management plan of project,

Consulting with local authorities as well as local residents from project preparation period and maintain during project construction period,

Supervising closely project's implementation.

Environmental and Social Impacts Assessment (ESIA) report aims to make detail implementation plan in order to ensure natural environmental and social quality in project area. The entire process of project implementation will be closely monitored by the Provincial management unit (PMU), Department of Natural Resources and Environment (DONRE), construction supervision consultants (CSC), environmental management consultants and local communities. Monitoring process will be recorded and publicly periodically reported.

6. Plan to manage and mitigate impacts during project implementation process: To minimize potential adverse impacts during project implementation period, the following measures need to be done adequately under the close, uninterrupted and open consultancy with local authority and community, especially with affected household (AH):

Make sure that the environmental protection criteria will be stated in contract's terms of project and make clear with the contractors.

Implementing mitigation measures adequately with the observation and modification suitably to actual conditions to achieve the highest minimization.

Supervising and monitoring closely the implementation of safety measures to ensure the mitigation measures should be sufficiently and effectively implemented during project's implementation.

Planning and performing completely the stakeholder consultation during project's preparation and implementation.

7. Responsibility: Central Project Office (CPO) takes responsibility for supervision overall project and progress of the subproject: *"Repair and Improvement for Safety of Khe San*

Reservoir, Nghe An province”, including the implementation of environmental protection measures proposed in ESMP.

8. Nghe An irrigation management and exploitation unit takes responsibility for preparing detail bids/tenders information, selecting contractor suitably, preparing contracts and ensuring effective implementation and close supervision of ESMP of project. The contractor takes responsibility implementing project as planned, periodically report to CPO. CPO will associate closely with local authority to ensure the effectiveness of stakeholder consultation and promote minimized measures effectiveness. Department of Natural Resources and Environment of Nghe An province will bear responsibility of supervising the implementation of environmental policies as per regulated by Vietnam Government. After project completed, the operation organization will take responsibility of maintenance and periodic inspection project’s works.

9. Budget allocation: Both ODA fund and Counterpart fund of Vietnam Government are used for sub-project investment. Total budget estimation is: 43,577,164,000 VNĐ.

Budget for ESMP implementation including:

Implementing ESMP: 626,000,000 VND

Implementing ESMoP: 436,735,000 VND

3.5. SUMMARY ESIA OF KHE GANG RESERVOIR, NGHE AN PROVINCE

1. Background: Ngoc Son is a mountainous commune of Quynh Luu district, along 48B road from Nghia Dan to Cau Giat, 9km far from Cau Giat district center to the south. Khe Gang reservoir located in Ngoc Son commune, Quynh Luu district has been built in 1991. It was built under the aid of Belgium government (WARM fund). The storage capacity of the reservoir is 1,776 thousand cubic metre and 5.25sqkm of the basin area irrigating for 120ha of rice and 55ha of seasonal crops. The headworks of reservoir are included:

- **Dam:** It is a homogeneous earth dam with maximum height of 12.5m, length of 460m, crest elevation of +26m, and crest width of 3-4m;
- **Spillway:** It is the earth and broad-crested free spillway, width of 45m and overflow elevation of +23.6m;
- **Water intake:** It is the unsubmerged and box-shaped water intake, dimension of 0.8×0.8 m, length of 50m, inlet elevation of +18.30m;
- **Management road:** It is the earth road with width of 2-5m.

2. Due to the long-time operation, the earth dam was downgraded seriously with small dam face and rough height. The previous earth dam has low quality and crude trench that result of the filtration in the body and foundation of dam. The protective layer of quarry stone of upstream face has been eboulement. The protective layer of grass graft downstream face has been strongly eroded and there is no drainage facility. On the other hand, the earth spillway lies in the right side of the dam has also been eroded and damaged, especially in the side of the contiguous abutment and downstream spillway. There are 2,500 people settle and produce stably with 1,500 ha of natural area in the downstream of Khe Gang reservoir, especially, around 300m far from the dam at the downstream side has one national road 48B and railway Nghia Dan-Quynh Luu run over. These are life-line traffic lines connect the west of Nghe An with coastal districts. In the recent years due to the downgrading of Khe Giang reservoir that reducing water supply capacity for economic development of Ngoc Son commune as well as threatening safety in the downstream. In case of the dam broken then the loss of life as well as assets immeasurably.

3. The subproject ***“Repair and upgrading of Khe Gang reservoir , Ngoc Son commune, Quynh Luu district, Nghe An province”*** was proposed for investment funded by the World Bank, under Dam Rehabilitation and Safety Project (DRSP).The objectives of the subproject are: (i) Ensuring the longterm stable dam and reservoir; (ii) Ensuring the safety life of 2,500 people and protecting 1,500ha of natural area; (iii) Protecting the safety of national road 48B and the railway Nghia Dan – Quynh Luu; (iv) Supplying stable water sources to irrigate for 120 ha of rice and 55 ha of seasonal crops; (v) Supplying water for domestic use of people, livestock and poultry; Encreasing the ground water level, contributing to local people life improvement, increasing the air humidity to prevent forest fire, making climate and environment equable in the region.

4. Subproject description:The subproject activities are included: repair and upgrading dam, spillway, water intake, new built operation house and management road. The subproject has been designed and implemented in line with environmental and social management framework (ESMF) and dam safety framework of WB, assuring to comply strictly with administrative regulations as well as standards of Social Republic of Vietnam. The potential impacts during preparation and implementation periods of the subproject has been assured sufficient determination, strictly supervision and management by detail plans and periodical reports to management organizations.

5. Environmental and social impacts and mitigation measures: The subproject implemented will ensure the safety of asset and life of local people in downstream, supply water for stable of 175ha of irrigated area, supplement ground water for domestic use of local people in dry season, environment improvement and prevent forest fire. However, the project implementation will be results of some potential adverse impacts and risks of natural and social environment, relating to: (i) Land acquisition and site clearance, and (ii) construction activities.

6. The subproject is implemented in the resident area of Kinh people. A preliminary study indicates the permanent land acquisition area is 0.5ha (mainly is non-use land along the reservoir and perennial trees). The land area belongs to the ownership of people's committee of Ngoc Son commune. There is no affected household in terms of migration and resettlement by the project. There is only one affected household in terms of assets on the land due to land acquisition. The affected household will be compensated and supported sufficiently comply with resettlement policy framework (RPF), detailed in the project's RAP report. In the subproject area, there is no any grave, temple or any culture, belief, religious affected.

7. The subproject construction period may arise negative impacts to natural environment (such as: increasing pollution of air, water, soil, noise, vibration, etc.) and social environment (traffic jam, social security, ect.). However, these impacts are partial, temporary with small sphere and can be prevented/mitigated via:

- (i) Ensuring to comply with Environmental and Social Management Plan (ESMP);
- (ii) To consult with local authorities as well as local people from project preparation period and maintain during project construction period;
- (iii) Supervising closely project's implementation.

8. Environmental and Social Impacts Assessment (ESIA) report aims to make detail implementation plan in order to ensure natural environmental and social quality in project area. The entire process of subproject implementation will be closely monitored by the Provincial management unit (PMU), Department of Natural Resources and Environment (DONRE), construction supervision consultants (CSC), environmental management consultants and local communities. Monitoring process will be recorded and publicly periodically reported.

9. Plan to manage and mitigate impacts during project implementation process: To minimize potential adverse impacts during project implementation period, the following measures need to be done adequately under the close, uninterrupted and open consultancy with local authority and community, especially with affected household (AH):

- (i) Make sure that the environmental protection standards will be stated in contract's terms of project and make clear with the contractors.
- (ii) Implementing mitigation measures adequately with the observation and modification suitably to actual conditions to achieve the highest minimization.
- (iii) Supervising and monitoring closely the implementation of safety measures to ensure the mitigation measures should be sufficiently and effectively implemented during subproject implementation.
- (iv) Planning and performing completely the stakeholder consultation during subproject preparation and implementation.

10. Responsibility: Central Project Office (CPO) takes responsibility for supervision overall project and progress of the subproject: *“Repair and upgrading of Khe Gang reservoir, Ngoc Son commune, Quynh Luu district, Nghe An province”*, including the implementation of

environmental protection measures proposed in the Environment and Social Management Plan (ESMP).

11. Nghe An Agriculture and Rural Development Project Unit takes responsibility for preparing detail bids/tenders information, selecting contractor suitably, preparing contracts and ensuring effective implementation and close supervision of ESMP of project. The contractor takes responsibility implementing project as planned, periodically report to CPO. CPO will associate closely with local authority to ensure the effectiveness of stakeholder consultation and promote minimized measures effectiveness. Department of Natural Resources and Environment of Nghe An province will bear responsibility of supervising the implementation of environmental policies as per regulated by Vietnam Government. After project completed, the operation organization will take responsibility of maintenance and periodic inspection project's works.

12. Budget allocation: Both ODA fund and Counterpart fund of Vietnam Government are used for sub-project investment. Total budget estimation is: **43,008,000,000VND**.

Budget for ESMP implementation including:

- Mitigation measure (VND): 626, 000, 000
- Independent monitoring (VND): 105,087,000

3.6. SUMMARY ESIA OF BAN RESERVOIR, PHU THO PROVINCE

1. Background: Ban reservoir is located in Tien Luong commune, Cam Khe district, Phu Tho province. It was built in 1976. The function of the reservoir is the water supply for about 150ha of agricultural land belonging to the Tien Luong commune, Cam Khe district

Due to the long-time exploitation, the work has seriously degraded. The current status of headworks as follows:

- i) Earth dam is about 354m length, consists of three dams A, B, C, the upstream face of dam hasn't reinforced, some places near the spillway has eroded.
- ii) The spillway is the earth spillway. In the rainy season, the flood discharge capacity is not guaranteed, the spillway serious eroded, especially in the downstream of the spillway. Before each rainy season, local people often have discharged the water through the drain to prevent erosion at the spillway. Therefore, reducing the capacity of the reservoir in the water supply.
- iii) Drain water has a broken valve and the body of drain, they are needed to be repaired or remade.

In the Ban reservoir's downstream, people have settled, lived, and produced stably (194 households, of which 102 poor and near poor households; 150ha of rice and vegetables). The deterioration of Ban irrigation works has limited the water supply capacity, decreased the water resources for the development of social economy, and threatened the safety of the reservoir downstream. If the dam breaks, the damage of lives and property of the people is immeasurable.

2. The main purposes of the renovation and improvement to safety of the dam and reservoirs are: (i) Ensure the safe of the reservoir during operation and exploitation process, adapting to climate change and meeting the increasing demands for water of people in the downstream area, mitigating the negative impacts on the environment, landscape of reservoir foundation and downstream; (ii) Ensure original design goals of supplying water for 150ha of rice and vegetables; and (iii) create the appropriate infrastructure to attract investment in tourism and services. The project "**repair and improvement of Ban reservoir, Tien Luong commune, Cam Khe district**" has been proposed with the funding from the World Bank, the project is belongs to the rehabilitation and dam safety project.

3. Project description: The activities under the project include the repair and upgrade dams, spillway, drain water, construction and management route, and some works along the construction route. The project has been designed and implemented in lines with environmental and social management framework (ESMF) and dam safety framework of WB, assuring to comply strictly with administrative regulations as well as criteria of the Socialist Republic of Vietnam. The potential impacts during preparation and implementation periods of the project has been assured sufficient determination, strictly supervision and management by detail plans and periodical reports submitted to management organizations.

4. Environmental and social impacts and mitigation measures: The project implemented will bring in considerable benefits to the local community, such as: (i) Stabilize water supply, facilitate agriculture production and improve the life of local people; (ii) Dam safety improved will be secure about the life and production of people in downstream; (iii) Improve the landscape, ecosystem and microclimate conditions of the reservoir. However, the project implementation will be results of some potential adverse impacts and risks of natural and social environment, relating to: (i) Land acquisition and clearance, (ii) construction activities, and (iii) operation of the reservoir.

A detailed plan to prevent or mitigate the adverse impacts are described Environmental and Social Management Plan (ESMP).

At the site, 100% of affected people in sub-project area are Kinh people.

A preliminary study shows that the project will permanently affect to the alluvial land area of 15,000m² and the garden of 15 households, and 1100m² of land that managed by commune will be temporary recovered for construction purposes. There is no household has to relocate and resettle. The affected household will be compensated and supported sufficiently complying with the resettlement policy framework (RPF). The details are stated in the project's RAP report. There is no grave, temple or any culture, belief, religious structures affected in the project area. The project construction may arise negative impacts to the natural environment such as increasing pollution of air, water, soil, noise, vibration, etc., and social environment such as traffic jam, social security, etc... However, these impacts are partial, temporary with small sphere and can be prevented/minimized via:

- i) Ensuring to comply with Environmental and Social management plan of the project,
- ii) Consult with local authorities as well as local residents of the project preparation period and maintain during the project construction period,
- iii) Supervising closely the project's implementation.

Environmental and Social Impacts Assessment (ESIA) report aims to make a detailed implementation plan in order to ensure natural environmental and social quality in the project area. The entire process of project implementation will be closely monitored by the Provincial management unit (PMU), Department of Natural Resources and Environment (DONRE), construction supervision consultants (CSC), environmental management consultants and local communities. Monitoring process will be recorded and publicly periodically reported.

5. A plan to manage and mitigate impacts during project implementation process: To minimize potential adverse impacts during project implementation period, the following measures need to be done adequately under the close, uninterrupted and open consultancy with local authority and community, especially with AH:

- i) Make sure that the environmental protection criteria will be stated in contract's terms of the project and make clear with the contractors.
- ii) Implementing mitigation measures adequately with the observation and modification suitable to actual conditions to achieve the highest minimization.
- iii) Supervising and monitoring closely the implementation of safety measures to ensure the mitigation measures should be sufficient and effectively implemented during the project's implementation.
- iv) Planning and performing completely the stakeholder consultation during project's preparation and implementation.

6. Responsibility: Central Project Office (CPO) takes responsibility for supervision overall project and the progress of the subproject: ***“Repair and Improvement of Ban Reservoir, Tien Luong commune, Cam Khe district”***, including the implementation of environmental protection measures proposed in ESMP.

7. Phu Tho irrigation management and exploitation unit takes responsibility for preparing detail bids/tender information, selecting a contractor suitably, preparing contracts and ensuring effective implementation and close supervision of ESMP of the project. The contractor takes responsibility implementing project as plan, periodically report to CPO. CPO will associate closely with local authorities to ensure the effectiveness of stakeholder consultation and promote minimized measure effectiveness. Department of Natural Resources and Environment of Phu Tho province will have the responsibility of supervising the implementation of environmental

policies as per regulated by Vietnam Government. After project completed, the operation organization will take responsibility of maintenance and periodic inspection project's works.

8. Budget allocation: Both ODA fund and Counterpart fund of Vietnam Government are used for sub-project investment. Total budget estimation is: **25.515.398.000 VND**.

Budget for ESMP implementation includes:

Implementing ESMP: 636.000.000 VND,

Implementing ESMoP: 270.458.000 VND

3.7. SUMMARY ESIA OF DAI THANG RESERVOIR, HOA BINH PROVINCE

The ESIA report of the rehabilitation and upgrading Dai Thang reservoir headworks presents positive and negative impacts on environment and society. It includes 8 main parts as follows:

1. **Background:** Dai Thang Reservoir is located in Duc Binh village, An Binh commune, Lac Thuy district, Hoa Binh province. It was built in 1960 from a branch of Cho Dap stream which is flowed to Hoang Long River. With a working area of 1.6km^2 , total capacity of $483,000\text{ m}^3$, Dai Thang Reservoir supplies irrigative water for 100 ha of paddy rice, 30 ha of farm produce as well as depletes groundwater for 200 households surrounding. The work items of Dai Thang headwork system consist of:

- **Dam:** It is a homogeneous earth dam with the size $L \times B \times H = 200\text{m} \times 3\text{m} \times 16\text{m}$. Downstream face of the dam has many termite nests (about 50 – 60 nests when monitoring) and it is covered with wild grass and weeds. Dam body had 5 lateral cracks and 1 longitudinal crack (with a size from 1 to 2 cm).
- **Water intake:** It is located in the body of dam with reinforced concrete structure, discharge of $0.15\text{m}^3/\text{s}$, length of 100m and diameter of 400mm.
- **Spillway:** It is an earth spillway with the size of $L \times B = 40\text{m} \times 20\text{m}$. It is located about 150 from left abutment of the dam and no energy dissipation basin.
- **Channel system:** Channel system was reconsolidated in 2008. The system has total length of 5 km, size of $B \times H = 0.5\text{m} \times 0.5\text{m}$ or $0.3\text{m} \times 0.3\text{m}$ and structure of the mortar stone having the strength of #100.

Due to long time use, the construction has seriously degraded. Currently, the headwork system of Dai Thang Reservoir is highly becoming deteriorated. Reservoir is deposited, resulting in 10 – 15% capacity reduction; dam face is carved by waves with some palates (depth of 30 – 40 cm; downstream face is eroded by rain, creating troughs ($D = 20 - 30\text{ cm}$, $B = 10 - 20\text{ cm}$); water intake is facing with permeable phenomenon and there is no energy dissipation basin after water intake; overflow spillway is a vertical drop with many deep troughs.

2. The main purposes of the sub-project:

(i) Ensure the safety of the reservoir during operation and exploitation process, adapting to climate change and meeting the increasing demands for water of people in the downstream area, mitigating the negative impacts on the environment, landscape of reservoir foundation and downstream; (ii) Ensure original design goals of supplying water for irrigation of 100ha of paddy rice, 30ha of farm produce for 3 villages (Duc Binh, Dai Thang, Thang Loi) in An Binh commune, Lac Thuy district (iii) Ensure the safety of human and human's properties of downstream people in the rainy season (iv) Encourage small scale aquaculture in Dai Thang Reservoir.

The subproject "Rehabilitation and Improvement for Safety of Dai Thang Reservoir, Hoa Binh Province" had been proposed for investing and funding by the World Bank, under Dam Rehabilitation and Safety Project (DSRIP)

3. **Sub-project description:** Implementation of sub-project consists of: rehabilitation of headwork dam, strengthening of weir, rebuild management house, termite treatment and installation of monitoring system. Sub-project is designed and implemented based on framework of environment-social management plan (ESMP) and framework of dam safety program from World Bank to follow strictly administrative regulations as well as standard of Vietnamese

government. Impacts during the preparation and construction process are fully assessed, managed and monitored by submitting detail plans and periodically report to management board

4. Affected zone/area of sub-project

If the dam is broken, administrative zones of An Binh commune, schools, medical centers, post offices, etc... will be influenced. In more details, about 6km of concrete and asphalt road; electrical wire system, 5 km of channel system, 130ha of farmland and 400 households with a population of 1600 habitants will be influenced, in which:

The affected household will be compensated and supported sufficiently complying with resettlement policy framework (RPF). The details are stated in project's RAP report. In total there are 12 households will be affected in terms of land loss as follow:

- As calculated, approximately 15,935 m² and 4,438 m² will be lost permanently and temporarily respectively.
- In which 7 households will loss permanently in agricultural land with the area of 12,413 m²; 2 households will loss permanently in agricultural land with the area of 1,718 m² và in forestry land having the area of 500 m²; 1 household will loss permanently in the residential land with the area of 500 m² and in agricultural land with the area of 803.2 m²; 3 households will be lost temporarily in agricultural land with the area of with the area of 3.604 m²; Especially 1 household will lost a house with a area of 60 m².
- Annual crops will be lost: 12,578 m² of paddy rice 3,840 m² of maize; 920 m² of groundnut and 822 m² of sugar cane. Forestry trees lost: 130 Acacia trees at the ages from 3-5 years old.
- 244 households will be influenced when the water cut off during the period of the water intake repairation in which the minority people (Muong) takes 223 households; The area of 571,297 m² of the paddy rice will be encountered the water shortage within 2 to 6 months in which the area belongs to the Muong people takes 535,711 m²

5. Environmental-social impacts during implementation of sub-project:

- **Preparation stage:** preparation of plant, tents and material collection impacts to environment and society. In this stage, land appropriate from forestry (about 25,000 m² for quarry, dumping site, borrow) and agriculture (about 5,000 m² for tents, material collection site) affects forestry cover level and income of influenced households. 15,935 m² of the residential, agricultural and forestry land of 12 households in Duc Binh village are considered to be impacted. Other impacts such as waste generation (2.5kg solid waste/day), wastewater (0.48m³/day) dust and exhaust fume are temporary impacts and only affect in the short time (01 months of preparation stage).
- **Construction stage:** Influenced sources are spillway, water intake strengthening and rebuild of management house. Positive impacts can be predicted as increase of the capacity of the spillway, improvement of infrastructure for headwork system and enhancement of irrigation for agriculture activities for the An Binh commune; create job opportunities for local people and encouragement of goods consumption. On the other hand, with a maximum number of 52 workers/day (dividing by 2 shifts), about 2.5 m³/day of wastewater and 13kg solid waste/day will be generated. The influences of waste generation in this stage are insignificant. Transportation of construction materials requires 157 turns/day with a volume of 230,441 tons. Due to dust generating, the influenced radius is 700m during 20km of transportation distance.
- **Operational stage:** The effectiveness for irrigation in agriculture of Dai Thang reservoir depends on operation process. Since management house is rebuilt therefore

infrastructure, appurtenant works (i.e. toilet, drainage system, water supply system) will not be affected at the first years of operation. There are insignificant waste generating from operational stage. However, the problematics of white ants inside the dam body can influence to environment, for instance, reduce the strengthening of the dam, cause flood to downstream people when having heavy rain, discharge in reservoir will be higher designed value and finally, water can permeate through the body of dam.....

6. Environmental and social impacts and mitigation measures

- Disminish the impacts to water and soil environment: water supply in safety, collect and treat wastewater effectively. Daily waste collection should be applied to manage solid waste.
- Disminish the impacts to air environment: Cover trucks/vehicles with canvas on the way from material shop to headwork system. By using good quality of fuel, the impacts to air environment could be reduced. Working during the preparation of plant, materials for implementation of sub-project.
- Diminish the impacts to human health and life: implement the construction works in day time to reduce the influence of noise to local people. Educate workers' attitude to excavate natural resource in plan and to live in local community. Using local labor on implementation of sub-project to increase income for poor people and reduce cultural confliction.

7. Plan to manage and mitigate impacts during project implementation process: To minimize potential adverse impacts during project implementation period, the following measures need to be done adequately under the close, uninterrupted and open consultancy with local authority and community:

- i) Make sure that the environmental protection criteria will be stated in contract's terms of project and make clear with the contractors.
- ii) Implementing mitigation measures adequately with the observation and modification suitably to actual conditions to achieve the highest minimization.
- iii) Supervising and monitoring closely the implementation of safety measures to ensure the mitigation measures should be sufficient and effectively implemented during project's implementation.
- iv) Planning and performing completely the stakeholder consultation during project's preparation and implementation.

8. Budget allocation: Both ODA fund and Counterpart fund of Vietnam Government are used for sub-project investment. Total budget estimation is: VND **35,537,760,462**

In which Budget for ESMP implementation : VND **458,700,000**

Budget for ESMoP implementation: VND **237,603,000**

9. Public consultation and disclosure

In this report, the activities relevant to public consultation will be also mentioned to assess acceptable level and feedback from local people during implementation. Public consultation activities are mainly focused on affected area (Duc Binh, Thang Loi, Dai Thang, Dai Dong). Consulted people are the leaders of community, affected people (selected from 4 villages). The results, all of them positively support for sub-project "Rehabilitation and safety improvement of Dai Thang Reservoir"

3.8. SUMMARY ESIA OF KHE CHE RESERVOIR, QUANG NINH PROVINCE

1. Background: The work of Khe Che reservoir is located at An Sinh Commune, Dong Trieu District, Quang Ninh Province, 78 km from Ha Long City and Hanoi Capital from 90 km, the reservoir was calculated and designed in 1986, until 1995-1998, the work was repaired and upgraded a number of items under head works system. So far this work has been operating for nearly 30 years. The lake has basin area: 22.4 km². Total capacity is 12 million m³. The head works and auxiliary works complex of Khe Che reservoir consist of the following items:

- **Dam:** Dam is built by homogeneous soil with 20m in height, 658m in length. The crown level is at 26.9m, 4.2m in width
- **Flood spillway:** Type of spillway is long based weir; spillway structure is cement rock wall, the overflow weir width of 4 m, the overflow weir length of 5m, and the overflow weir level of 23.48m.
- **Off take regulator:** The off take regulator at the right abutment of dam is arranged a valve house at the upstream of dam, the regulator has reinforcement concrete structure with dimension of b×h = 1.0×1.3m.
- **Management and operation road:** Management and operation road along the inter-commune road to bridge is built by concrete; the section from bridge to dam surface with 110 m in length is currently soil road. After running through the dam surface, this section is linked with the local road next to the lake. The road surface is rough with many pot-holes, which is not convenient for management and especially for flood prevention and fighting.

2. Purpose: The main purpose of improving and upgrading dam and lake safety is: (i) to ensure flood fighting safety for head works of Khe Che reservoir; (ii) to create stable irrigation water source for about 1,000 hectares of cultivated land, including 534 ha of rice; (iii) to create environmental landscapes, ecology of project zone for tourism; (iv) to contribute to the economic growth of the project zone, development of aquaculture. Project of “Repairing, upgrading headworks complex of Khe Che reservoir” proposed for implementation funded by the World Bank belongs to the project of improving and upgrading dam safety

3. Necessity: Up to now, the works of Khe Che reservoir has been operating for nearly 30 years, during the process of operation; it has been repaired, upgraded locally, but only temporarily. The project is rated as the level III project, the calculations, designs for work criteria are severed for the level III works. However, in recent time, the climate change, weather complexity show that the actual flood situation has exceeded the designed calculation criteria. The issues related to the degradation of Khe Che reservoir include: The overflow channel to the surface has not been reinforced; the left abutment has a 30m long section of wall by masonry. The wing wall at right abutment of the input section has been cracked, the dam surface has been raised by masonry, in the course of long-term use, the travel has caused landslide on surface and sweating potholes, underbrush has grown sparsely along the crest, the upstream wall with masonry structure plastered at the coping has had some cracks, the head of coping dam has been broken with a length of 1.5 m. Current management road is soil road, after running through the dam surface; this section is linked with the local road next to the lake. The road surface is rough with many pot-holes, which is not convenient for management and especially for flood prevention and fighting. Off take regulator with downstream valves used from the 1990s has been rusted and no longer used. 02 underground lines through stream, namely Tam Viet and Ngam Ba currently have not enough capacity for flood drainage.

Besides, the downstream of Khe Che reservoir is the residential area of over 3000 persons of three communes, namely An Sinh, Tan Viet, Viet Dan, but Khe Che reservoir is not designed for emergency spillway, intake sill and narrowed bed level; therefore some floods in past years have shown the severity of ensuring the safety of reservoirs.

Thus, the implementation of sub-project for repairing and upgrading Khe Che reservoir works is extremely essential.

4. *Description of project:* The project activities include:

- *Items for repairing and upgrading:*
 - Expanding flood spillway
 - Executing concrete for dam surface
 - Hardening concrete for management road.
 - Improving and installing of equipment for offtake regulator
- *Items for newly building:*
 - Building house for flood prevention and work management
 - Executing salvage and rescue road in combination with spillway line construction
 - Rebuilding 02 undergrounds through stream with reinforced concrete structure M250:
 - + Tan Viet underground with 4 gates: 4 x (6x3.5)m.
 - + Ba Xa underground with 2 gates: 4 x (6x3.5)m.
 - Providing equipment for salvage and rescue
 - Installing survey system

The project is designed and carried out in accordance with the Environmental and Social Management Framework (ESMF) of the project and Dam safety framework of the World Bank, in order to ensure strict compliance with administrative regulations as well as standards of the Socialist Republic of Vietnam. The arisen impacts during the preparation and implementation of the project is fully defined, strictly managed and monitored by the detailed plans and periodic reports to the management levels. Khe Che reservoir is proposed to be 01 of the 12 sub-projects carried out in the first year of the project of improving and enhancing safety for dams and lakes (WB8) funded by the World Bank with development goals for supporting the implementation of the Government's dam safety program. There are 5 safety policies of the World Bank to be enabled in this sub-project.

5. *The environmental and social impacts and mitigation measures*

The implementation of project will bring huge benefits to the local community such as: (i) providing a stable water supply, facilitating production conditions, improving the lives of people; (ii) enhancing dam safety to help people comfortably live and produce in the downstream area; (iii) improving the landscape, lake ecosystems and microclimate conditions. However, the project will cause some negative effects and potential risks of the natural environment and society related to: (i) land acquisition and land clearance, (ii) construction and (iii) reservoir operation.

6. The plan on prevention or mitigation is specifically presented in the Environmental and Social Management Plan (ESMP).

7. Project zone, An Sinh commune, with mainly inhabited community is Kinh ethnics. There are no ethnic minorities household affected so EMDP shall not be implemented in this sub-project.

8. According to the calculations, the total volume of excavation soil for construction works of the project is about 55,459 m³, volume of backfill soil is 3,412 m³. In particular, the required volume of backfill soil is 996 m³; the remaining amount will be made use of excavated volume. Thus, about 51,051 m³ needs to be moved to the disposal area. The disposal area is located along the foot of the dam, with dimension of 35 * 500m. The total capacity of disposal area is about 52,500 m³. The building raw materials are purchased from Dong Trieu far from the work around 8-10km. The number of workers in the peak period is about 50 workers. The number of trucks is 3600 turns over a period of 10 months.

9. The process of construction of the project can cause negative impacts to the natural environment (air, water, soil pollution, noise, vibration...) and social environment (traffic jams, social security...). However, these effects are only partial, temporary, in a small scale and can be prevented/ minimized by:

- Comply with environmental and social management plan prepared for project;
- Consult with local authorities and local people from the phase of project preparation and during project construction process;
- Closely monitor the implementation of the project.

10. **Report on Environmental and Social Impact Assessment (ESIA)** of the project aims to prepare a specific plan with purpose of ensuring the quality of natural environment and social environment in project regions. The entire process of project implementation will be closely monitored by the provincial PMU, Department of Natural Resources and Environment (DNRE), construction supervision consultant, environment management consultant and local communities. Monitoring process shall be documented and publicly reported periodically.

11. **The plan on impacts management and mitigation during project implementation:** In order to mitigate potential negative impacts during the project, the following measures should be fully performed, under closed, continuous and open-hearted consultation with local government and communities, especially affected households:

- Ensuring environmental standards to be covered in the terms of the contract and interpreted to the contractor.
- Performing fully the mitigation measures, monitoring and adjusting under the actual conditions, so as to achieve the highest mitigation efficiency.
- Supervising and monitoring closely the implementation of safety measures to ensure the full and effective execution of mitigation measures for the entire project.
- Planning and implementing the program of public consultation during the project.

12. **Responsibilities:** Central Project Office (CPO) shall assume responsibility for overall supervision and progress supervision for the project: ***“Repairing and upgrading headworks complex of Khe Che reservoir”***, including the implementation of environmental protection measures as proposed by the ESMP.

13. Water resources Investment and Development Management Unit No. 2 shall be responsible for preparing the detailed bidding information, selecting reasonable contractors, drafting contract to ensure effective implementation and strict supervision for ESMP of the project. The Contractor is responsible for implementing projects under the proposed plan, periodically reporting to the CPO. CPO takes responsibilities for closed cooperation with local authorities to ensure consultation efficiency and promote the effectiveness of mitigation measures. Quang Ninh Province Department of Natural Resources and Environment shall be responsible for monitoring the implementation of policies relating to the environment as stipulated by

Vietnamese Government. After the work is put into use, operators shall be responsible for periodic maintenance and inspection of work items.

14. *Allocation of funding:*

Total budget estimation is:	52.914.333.000 VND
- Mitigation measure (VND):	300,564,000
- Independent monitoring (VND):	993,491,281
- Capacity building (VND)	52,000,000

3.9. SUMMARY ESIA OF DONG BE RESERVOIR, THANH HOA PROVINCE

1. Background: Dong Be reservoir is located at Xuan Du commune, Nhu Thanh district that is 40 km away from Thanh Hoa city to the southwest. It was built in 1989 and the last rehabilitation of the reservoir was done in 2003 by the fund of Song Chu Irrigation Company. Its basin area is 9.4 km², reservoir capacity is 1.97 million m³. The headworks and its auxiliary structures includes the following items:

- **Dam:** The dam was built of homogeneous soil with height of 10.95 m, length of 714.18 m. The dam crest elevation is 42.3 m with width of 5.0 m;
- **Spillway:** has width of Btr = 50 m; made of reinforced concrete; its downstream part is a slope connected to a dissipation basin;
- **Intake:** is located at the right side of the dam, made of reinforced concrete with steel thickness of Fi = 0.8 m. It is a circle culvert with control valve at its upstream;
- **Management road:** (i) From road 506 to Dong Be reservoir is an asphalt road with width of B = 3 m and length of L = 200m, another road on the right side is made of earth with length of 100 m; (ii) From Trieu Thanh junction to the dyke and spillway on the left side of main dam is an earth road with length of L = 700 m. It is difficult to go on this road in the rainy season.

2. Sub-project objectives: The main purposes of dam rehabilitation and safety improvement are: (i) Ensure safety of the reservoir for operation to adapt to climate change, meet the growing needs of the users in the downstream, mitigate the negative impact on the environment, landscape at downstream of the reservoir; (ii) Ensure the designed irrigation capacity for 255 hectares of rice production and aquaculture in irrigation areas of Trieu Thanh commune, Trieu Son district and Xuan Du commune, Nhu Thanh district. The sub-project "**Dong Be dam rehabilitation and safety improvement, Xuan Du commune, Nhu Thanh district, Thanh Hoa province**" has been proposed to be funded by the World Bank under the projects Dam Rehabilitation and Safety Improvement.

3. Status of headworks facilities: Dong Be Reservoir serves for irrigation and water supply for the poor mountainous communes of Nhu Thanh and Trieu Son districts. Since its operation, it has contributed significantly to improve the lives of local people, create a reliable water source for rice irrigation in the areas of mountainous communes that settle lives of people in the area. Because this 25 year-old reservoir had some impairs when it was constructed and it has been affected by the weather through a long time, the dam safety is not secured. Along the length of the dam, there are many seepages, rock in the upstream side is broken and fragmented. At the middle of the dam foot, 80 m from the intake to the left, dam surface is sag down that making unsafe condition of the dam. The intake has an impair of valve gate in the construction process so that water leaks through the gate and it is difficult to move the gate. The concrete pipe culvert itself was badly damaged, the concrete strength decreases due to erosion, reinforced steel exposes in some points. There is no management house for the intake operation. Concrete surface of the spillway is damaged partially, many dissipation ridges are broken. Although some structures were recovered, but they are too old to be able to regulate water and keep safety of the reservoir during operation.

4. Sub-project description: The activities of the project are as follows: treatment of seepage through body and foundation of dam, recovery of partial erosion; replacement of the intake; widening of the spillway; building of bridge over spillway; construction of management road. The project was designed and carried out in accordance with the Environment and Social Management Framework of the project (ESMF) and Dam Safety Framework of the World Bank,

while complied strictly with regulation and standards of the Socialist Republic of Vietnam. The impacts arisen during the preparation and implementation of the project are fully identified, managed and monitored closely by the detailed plan and periodic reports to the managers.

5. Scope of sub-project's impacts:

Two communes affected by sub-project are Trieu Thanh commune, Trieu Son district and Xuan Du commune, Nhu Thanh district. 13 households (78 persons) will be affected trees and crops in the dam's protected area managed by the State. No household (HH) will be relocated or severely affected; no household's structure, business work will be affected; no heritage, landscape, temple, grave will be affected; no ethnic minority household will be affected. Affected people will be compensated and assisted in compliance with Resettlement Policy Framework (RPF); those will be presented in detail in Resettlement Action Plan (RAP) of sub-project.

Impacts on land: The sub-project will acquire permanently 5,721 m² of dam's protected area where people are using, including 3,039 m² agriculture land, 1,872 m² of upland crops land, 310 m² of aquaculture land and 500 m² of hilly land. The temporary land acquired for dumpsite is 10,815 m² of aquaculture land that the Communal People's Committee (CPC) owns and contracts seasonally with HHs.

Losses of crops and trees with total quantity of 2,140 include 10 banana trees, 500 bamboos, 20 eucalyptus, 1,610 acacias; and 1,872 m² of rice and upland crops.

In the area of sub-project, ratio of ethnic minority people is 5% but none of them is affected.

6. Waste generation:

It is estimated that the volume of excavated soil for the expansion of spillway and digging is 8064.5 m³ and 465 m³ for building management house. Earth fill volume needed for the project is 63754.5 m³ which is purchased from earth mine in Minh Son commune, Trieu Son district, 18 km far from the construction site through the favorable provincial road No. 506. Disposed soil, organic soil layer and disposed materials will be moved to dumpsite with capacity of 29,000 m³, where are two lakes in village 4 and 5 of Xuan Du commune, 4 km from the dam. The other building materials were purchased from Trieu Son town center with transport distances about 10 – 20 km. The construction site preparation will require around 20-30 workers in the short term (1 month). The highest number of workers at the site is about 50 people. 55 machinery units will be used to serve for construction, including 110 Cv bulldozers, excavators, 5-ton trucks, 250-liter mixer, concrete vibrators, 110 KVA generator, water pump...

7. The environmental and social impact and mitigation measures: The project will provide considerable benefits to the local community such as: (i) stable water supply to facilitate production and improve the lives of people; (ii) improve dam safety to help people comfortable in living and production at the downstream; (iii) improve the landscape, ecosystems and microclimate conditions of the reservoir. However, the project will have some negative impacts and potential risks of the natural environment and society related to: (i) land acquisition, (ii) construction and (iii) reservoir operation. However, these impacts will be partial and temporary in narrow scope and they can be prevented/ mitigated by following actions:

- Compliance with the Environment and Social Management Plan of the sub-project;
- Consultation with the local authorities and people in project preparation period and during construction progress;
- Supervise strictly project implementation.

8. Prevention and mitigation plan is described in Environment and Social Management Plan (ESMP).

9. The management plan to minimize impacts during project implementation: To minimize the potential negative impacts during the project, the following measures should be implemented in full, under the close and continuous consultations with local governments and communities, especially affected households:

- i) Ensure that environmental standards must be included in the terms of the contract and explained to the contractors.
- ii) Fully comply with the mitigation measures, with monitoring and edit to suit the actual conditions, aims to achieve the highest efficiency of mitigation.
- iii) Supervise and monitor closely the implementation of safety measures to ensure the full implementation and effectiveness of mitigation measures in the entire project.
- iv) Planning and implementation of a full program of public consultation throughout the project.

The report on Environmental and Social Impact Assessment (ESIA) of the project aims to prepare a specific plan, with the objective of ensuring the quality of the natural environment and social environment in the project are. The entire process of project implementation will be closely monitored by the PMU, Department of Natural Resources and Environment (DONRE), construction supervision consultants, environment management consultants and local communities. Monitoring process will be documented and publicly report periodically.

10. Responsibilities of stakeholders:

Central Project Office (CPO) is responsible for monitoring the whole project and progress of the sub-project **“Dong Be dam rehabilitation and safety improvement, Xuan Du commune, Nhu Thanh district, Thanh Hoa province”**, including implementation of environmental protection measures proposed in ESMP.

The Irrigation Management Board and Operation of Thanh Hoa is responsible for preparing the bidding detailed information, choosing the right contractor, drafting contract to ensure effective implementation and strict supervision of the ESMP. The contractor is responsible for implementing project in accordance with the proposed plan, preparing detailed report periodically to the CPO. CPO is responsible for close communicating with local authorities to ensure effective consultation and promote the effectiveness of mitigation measures. Department of Natural Resources and Environment of Thanh Hoa province will be responsible for monitoring the implementation of policies relating to the environment as stipulated by the Government of Vietnam. After the work put into operation, operators will be responsible for maintenance, periodic inspection of work items.

10. Budget: Project uses ODA and counterpart fund of the Government of Vietnam with the total investment capital of **79,768,000,000VND**.

Cost of ESMP implementation:

- Implementation of ESMP: 1,396,000,000 VND
- Monitoring of ESMP: 821,116,000 VND

3.10. SUMMARY ESIA OF DAP LANG RESERVOIR, QUANG NGAI PROVINCE

1. Background: Dap Lang Reservoir Rehabilitation and Upgrade is to repair and improve the safety of the dam, as well as the safety of irrigation system downstream, which includes 100 ha of agricultural land, and the life safety of more than 300 households living in downstream.

The status of the site: Dap Lang reservoir is of Nghia Hanh district, Quang Ngai province, has been build since 1978. This is being used of over 37 years, Dap Lang reservoir has been seriously degraded; the safety of the dam has been not guaranteed and it did not provide enough water for downstream according to the original design. Thus, it is necessary to be repaired and upgraded.

Scale and level of structure

+ Investment level: Upgrading

+ Investment scale:

- Total volume of the reservoir: $V=463.567 \text{ m}^3$
- Soil dam: Length: 148.5 m, Max of dam height: $H_{\max}=14,70 \text{ m}$
- Flood spillway is made by concrete, operated by free overflow mechanism.

$$\sum B = 19m$$

- Water intake culvert combined with flow-controlled equipment made of steel pipe inside concrete pipe D500. This has open-close valves downstream open-close valves.

+ Structure level: Determined according to QCVN 04–05:2011/BNNPTNT:

- Irrigational area: 100 ha (< 200 ha): level IV
 - Soil dam, max height 14.7m on land: level III
- Therefore, the focal complex: level III; canal system: level IV

2. Current status of structure: It has been seriously damaged in the focal complex. To meet the requirement, the reservoir have to provide water for 60ha agriculture land downstream. However, this capacity is hard to meet, especially in dry season when soil dam is penetrated and unable to store water inside. The width of flood spillway is enough but it is limited in height. This current condition is not safe to discharge water. The water intake culvert is made by concrete of 80cm and free flow. But it is not closed causing water loss and erosion both sides.

3. The activities of the project: Include upgrading soil dam, flood spillway, water intake culvert, and construction and management roads. The project has been designed and carried out in accordance with the Environmental and Social Management Framework (ESMF) and dam safety framework of the World Bank ensuring compliance with strict regulations as well as administrative standards of Vietnam. The impacts generated during the preparation and construction phase of the project will be fully identified, strictly managed and monitored by detail plans and reported periodically to the management level.

4. Environmental Impacts and Mitigation Measures: The project will provide great benefits for local communities, such as: (i) stabilizing water supply, facilitating agricultural production and improving the local people living; (ii) improving dam safety to help people live comfortably and produce stably downstream; (iii) improving the landscape, ecosystems and microclimate conditions. However, the implementation of the project will also has some potentially negative impacts and risks on natural environment and society related to: (i) land acquisition and land clearance, (ii) construction and (iii) operation of the reservoir.

- Impacts prevention and minimization plan will be described in the Environmental and Social Management Plan (ESMP).

- The project area has mainly Kinh community, accounting for 89.3%. Not any ethnic household is affected by the project.
- The project permanently acquired a total land area of 13,778 m² of agricultural land and forestry, temporarily affected 39,875 m² of 23 households in the Tan Phu 2 village. There are none household has to be relocated. The affected households will be compensated and fully supported under the Resettlement Policy Framework (RPF). The detail is given in the Resettlement Action Plan (RAP) of the project. In the project area, there is not any tombs and shrines or any cultural, or religious structures affected.
- Volume of backfilling soil is 40,241m³. The project is expected to exploit soil in three stations, which were planned with a total volume of 37,125 m³ (Exploitation sites given in the annex 4). Volume of digging soil is 34,415 m³, surplus excavated soil, waste and organic waste will be dumped in planned landfill with area of 13,558 m³. Construction stone will be purchased from An Hoi stone mine, 27km from the construction site; sand and gravel will be taken from the Cong Hoa Bridge, at Ve River, 7km from the work place. Other materials will be purchased from Quang Ngai city, 26km from work site.
- Human resources required for the preparation and construction phases are about 80 people, and can be up to 200 people. Approximately 27 kinds of machine will be used, including: 7ton-truck, 110CV bulldozers, cranes, concrete mixers and pavers, generators, cranes, stone cutting machine, etc.
- The construction activities can cause several potentially negative impacts on natural environment (increased air pollution, water, soil, noise, vibration, etc.) and social environment (traffic jams, social security, etc.). However, these impacts are temporary and on a partly scale and can be prevented/minimized by ensuring compliance with environmental and social management plan prepared for this project, consultation with local authorities and local people from the preparation to construction phase of the project, monitoring closely the implementation of the project.
- Report of Environmental and Social Impact Assessment (ESIA) of the project aims to implement a specific plan, with the target of ensuring the quality of natural environment and social environment in the project location. The entire implementation of the project will be closely monitored by PPMU, DARD, constructing supervision consultants, environmental management consultants, and local communities. Monitoring process will be documented and reported periodically and publically.
- The impacts minimization and management plan during project implementation: In order to minimize potentially negative impacts during the project, the following measures should be fully implemented with close, continuous and open consultation to local authorities and communities, especially affected households as below:
 - Ensuring environmental standards must be included in the contract and has to be explained to the contractor.
 - Implementing fully the mitigation measures, monitoring and regulating in order to be matched with actual conditions, to achieve the highest efficiency.
 - Supervising and monitoring closely the implementation of safety measures to ensure full and effective implementation of mitigation measures in the project.
 - Planning and implementing the community consultation program throughout the project.

5. Responsibilities: Project Management Unit (PMU) under MARD is responsible in monitoring progress of the project "Dap Lang Reservoir Rehabilitation and Upgrade, Nghia Hanh District, Quang Ngai Province", including the implementation of environmental protection measures proposed in ESMP.

Hydraulic Construction & Investment Projects Management Unit in Quang Ngai has

responsibility for preparing the detailed bidding document, selecting reasonably contractors, documenting contract to ensure effective implementation and strictly supervising ESMP of the project. The contractor is responsible for implementing projects according to proposed plan and reporting periodically to the CPO. CPO is responsible collaborate closely with local authorities to ensure effective consultation and promote the effectiveness of mitigation measures. Quang Ngai DARD will be responsible for monitoring implementation of environmental policies according to regulation of the Government of Vietnam. After being use, operation unit will be responsible for periodical maintenance and inspection of work items.

6. Allocation of funding: The projects use ODA funding and in-kind fund of the Government of Vietnam. The total investment costs **VND 31,418,955,000**.

- Mitigation measure (VND):	265.250.000
- Independent monitoring (VND):	287,710, 000
- Capacity building (VND)	28,000,000

3.11. SUMMARY ESIA OF DA THE RESERVOIR, LAM DONG PROVINCE

1. Background: Being situated in My Duc commune, Da Teh district, Lam Dong province towards the South of Lam Dong province, Da Teh Reservoir is about 180km and 150km far from Da Lat city and Ho Chi Minh City, respectively. The reservoir is characterized by basin area of 198km² and capacity of 29.35x10⁶ m³. Its head works complex and auxiliary works include following items:

- Earth dam;
- Flood spillway;
- Water intake;
- Operation house and communication system for management purpose;
- Managed electric wire line;
- Managed road

2. Rehabilitating and improving safety of the dam and reservoir aim to: (i) assure reservoir safety during operation in adaptation with climate change and in accordance with the increasingly high demand of lowlands area, minimizing the adverse impacts on environment and landscape of reservoir bed and lowlands; (ii) ensure the initial design objective for stably irrigating 2,300 hectares of rice paddy field and crops in the whole year covered by the available irrigation area of My Duc commune and Quang Tri commune, Da Teh district, Lam Dong province; (iii) ensuring domestic water supply with flow rate of 10.000m³ per day and night, etc. The Project on “***Rehabilitating and improving safety for Da Teh Reservoir, Lam Dong province***” has been proposed to be launched with finance from WB within the Dam Safety and Improvement Project.

3. Due to long time operation period, the works has been degraded such as slide, water leakage and penetration through embankment foundation. Although some damaged sections have been reinforced, the water regulation capacity and reservoir safety are no longer available during operation because the works are too old.

4. Project description: The Project’s activities include:

Earth dam:

- Rehabilitate and expand the dam section towards downstream to ensure that the designed section is equal to embankment with compact coefficient of $K \geq 0.97$;
- Reinforce the dam top by 20cm thick M200 concrete;
- Upstream roof: From the elevation of + 146.0m or less, disordered ashlar are dropped (by removing from upstream roof). From the elevation of + 146.0m to the elevation of + 150.0m, 25cm thick hand facing stones are arranged in the filtering macadam layer within M200 reinforced concrete with dimensions of (5x5)m. From elevation of + 150.0m or more, the dam top is reinforced by pre-cast in-situ M200 reinforced concrete with 15cm thickness;
- Repair and complete the dam’s downstream roof (constructing irrigation ditch by M150 concrete, sodding for protection purpose, extending and building the downstream attic-type irrigation and drainage rock pile, etc);
- Apply the high pressure drilling to avoid water penetration for dam body and foundation, the total length is 318m (the right shoulder is 110m long whereas the center section is 208m long).

Flood spillway:

- Expand and upgrade the overflow weir in the form of door-based weir:
- Elevation of overflow weir: + 150.2m, 24m width, arranged with 3 plain gates (8x1.5)m; steel valve gate operated by electric hoist;
- Recover the water slope and flank and rehabilitate the flanks to the design elevation by M300 reinforced concrete;
- Expand weir's upstream channel;
- Re-repair couplings by PVC combined with asphalt concrete;
- Re-build weir bridge with M200 reinforced concrete with 4m width and load of H18;
- Erect the protection handrails along two sides of flanks and water slope .

Water intake:

- Roughly chisel all internal culvert surfaces, clean the surface and plaster 7cm thick steel grid cement mortar;
- Reinforce external valve tower body from the elevation of +157m or less + 150m by roughly chiseling, cleaning and applying 7cm thick steel grid cement mortar;
- Repair the tower building and service bridge;
- Replace new stainless stain valve gate and gate operation machine;
- Reinforce the 250m long channel section behind the gate; rectangular section channel with M200 reinforced concrete structure.

Operation house and communication system for management purpose:

- Construct head works operation house with 4th grade house standard and gross area of 150m²;
- Construct the automatic reservoir water level observation system to facilitate the works management and operation

Managed electric wire line:

Construct the 1.8km long LV wire lines from weir shoulder to flood spillway for management and operation purpose.

Managed road:

Reinforce the managing road from the section behind the water intake to flood spillway with specifications of 1.7km length, M200 concrete, 20cm thickness and 3m width.

The Project is design and launched in accordance with the Project's Environmental and Social Management Framework (ESMF) and dam safety framework of WB, ensuring strict adherence to administrative regulations and standards of the Socialist Republic of Vietnam. The impacts incurred during the Project's preparedness and implementation are also ensured to be determined fully and closely managed and supervised by detail plans and periodic reports to the management at all levels.

5. Social environmental impacts and mitigation measures: The project launch shall offer the great benefits to the local community such as: (i) stabilizing water supply, improving the production conditions and living standards of the local people; (ii) improving dam safety to help the local people in lowlands to feel secured to live and produce; (iii) improving landscape, climate system of the reservoir and micro-climate conditions. However, the project performance shall raise some potential adverse impacts and risks on natural and social environment pertaining: (i) construction and (ii) reservoir operation.

6. The preventative or mitigation measures are detailed in the ESMP.

7. The sub-project site is characterized by residential community, mainly King ethnic (92.7%). No ethnic minority households are affected.
8. When the Sub-project is launched, 1 hectare of public land at the dam shoulder (under the commune's management) shall be temporarily recovered to use as backfilling soil material mine. Within the project site, no graves or temples or any cultural or religious works are affected.
9. The calculation of design consultant unveiled that total excavated soil volume (earth dam, operation house, flood spillway, dam paths and spillway paths) is about 80,000m³; backfilling soil volume required for the entire works is about 93,000 m³. All excavated soils shall be reused to embank the dam and paths to the dam and spillway. An estimated 5,000 m³ of soft soil which is not used and organic removing soil shall be dumped right at the dam bottom to protect the soil dam. The insufficient quantity of backfilling soil shall be taken from soil material mine to use. The Consultant has launched the backfilling soil material mine located at the dam's right shoulder covering an area of 1ha with exploitation reserve of 100,000m³, at transportation distance of 200m – 1,000m, in which the manual or mechanical exploitation and transportation are favorable. This low hilly side area is managed by the local authority. The compensation for site clearance has been successfully completed since 2009. Other building materials such as stone, sand, rubble stone, gravel, etc., unavailable at the site must be bought from other places:
 Stone: At the construction site, stone from Bao Loc stone pit is not used. It is about 70km far from the works;
 Sand, rubble stone and gravel: It is exploited at Da Quay River which is about 10km far from the works;
 Others: Other materials are taken from center of Da Teh district about 10km far from the works or transported from Ho Chi Minh City (about 150km).
10. Site preparation phase requires to mobilize about 15-20 workers in short term (01 month). Number of workers concentrated at site in peak hours is about 150 persons (construction of soil dam, spillway, paths to dam, access road and operation house, etc.) Total 40 machines shall be used to serve for construction such as 110CV bulldozer, excavator, truck, 500l mixer, concrete compactor, electric generator, pumps, etc.
11. Works construction may generate adverse impacts on natural environment (increase in air pollution, water pollution, soil pollution, noise and vibration pollution, etc) and the social environment (traffic jam, affecting social security, etc.) However, such impacts are only local, temporary, small and preventative/minimized by:
 Ensuring adherence to the ESMP prepared for the Project;
 Consulting the local authority and the local people from project preparation and maintaining during the Project performance;
 Closely supervising the Project performance.
12. The Project's ESIA Report aims to prepare the specific action plan to ensure the quality of natural environment and social environment at the Project site. Entire project performance process shall be closely supervised by Project Management Unit (PMU) under Department of Natural Resources and Environment (DONRE), construction supervision consultant, environmental management consultant and local community. The supervision process shall be recorded and reported in public and periodic manner.

- 13. Impact management and minimization plan during project performance:** In order to minimize the potential adverse impacts during the Project performance, the following measures should be taken under the close, continuous and open consultation with the local authority and community:
Assurance of environmental standards must be covered in the terms of the Contract and interpreted with the Contractor.
Full performance of mitigation measures with proper observation and modification in accordance with the practical conditions to obtain the highest mitigation performance.
Close supervision and monitoring of implementation of safety measures to ensure the full and effective performance of mitigation measures in the entire project.
Planning and full performance of Community Consultation Program during the Project life.
- 14. Responsibilities:** Central Project Office (CPO) is responsible for supervising the overall project and implementation progress of the project on: ***“Improving safety of Da Teh Reservoir, Lam Dong Province”***, including implementation of environmental protection measures as recommended in ESMP.
- 15.** Lam Dong Irrigation Investment & Management Center is responsible for preparing the detail bidding invitation information, selecting proper contractor, drafting contracts to ensure successfully perform and closely supervise the Project’s ESMP. The Contractor is responsible for launching the Project as scheduled and submitting the periodic detail report to CPO. CPO is responsible for working closely with the local authority to ensure the consultation efficiency and improve the performance of mitigation measures. Lam Dong Province’s DONRE is responsible for supervising the implementation of environmental policies as stipulated by Vietnamese Government. After the works is put into operation, operator shall be responsible for periodically maintaining, servicing and testing the works items.
- 16. Expenditure allocation:** ODA and counter-part capital of Vietnamese Government are used with total investment of: **82,695,623,000 VND.**
Cost for ESMP implementation:
ESMP implementation: 551,000,000 VND;
Environmental and Social Surveillance Plan: 342,144,000 VND.

3.12. SUMMARY ESIA OF PHU VINH RESERVOIR, QUANG BINH PROVINCE

1. Background: PhuVinh reservoir is located in ThuanDuc commune and Dong Son ward, 7km far from Dong Hoi city in the West. The reservoir was built in 1992 and has not been repaired or upgraded. The catchment area of the reservoir is of 38 km², water volume of 22.364x10⁶ m³. The headwork cluster and auxiliary works of the PhuVinhreservoir are consist of following categories:

- **Main Dam:** It is homogeneous earth dam with the maximum height of 27.6m, length of 1776 m. Crest elevation is at + 24.2m; width of 5.0m;
- **Left auxiliary dam:** It is homogeneous earth dam with the maximum height of 28.8m, length of 1259 m. Crest elevation is at + 25.4m; width of 6.0m;
- **Right auxiliary dam:** It is homogeneous earth dam with the maximum height of 28.9m, length of 400 m. Crest elevation is at + 25.5m; width of 5.0m;
- **Spillway:** Spillway width Btr = 18.0m; covered by reinforced concrete; following by a chute and energy-relief tank; $Q_{x1\%} = 380\text{m}^3/\text{s}$
- **Water intake:**reinforced concrete structure,located on the lesft side of the main dam; dimension b×h = 1.2×1.6 m. It is box sewer with regulator tower gate in upstream;

2. The main purposes of upgrading and improvement safety of dam and reservoir are: (i) Ensure safety and stability of construction during operation process; (ii) Enhance flood-prevention ability for Dong Hoi city; and (iii) Supply water for 1672 ha of Agricultural land and local people in Dong Hoi city with capacity of 18,000 m³/day economic and social development of Dong Hoi city. The subproject **“Repair and upgrade PhuVinh reservoir – QuangBinh province”** was proposed for investment funded by the World Bank, under Dam Rehabilitation and Safety Project (DRSP).

3. Due to long time use, the construction has seriously degraded. The problems of erosion, water leakage recorded in the construction system of PhuVinh reservoir are included: (i)Upstream face of main dam has been downgraded and sunken at many sections, create many concavo-convex areas and even some parts have been peeled; (ii) Downstream face is protected by grass; downstream water drain ditches are degraded and damaged at many sections; (iii) Inlets are leaked, pressured open/close motor is degraded, poses danger in operation. That is a main reason why inlets don't gain the original design water volume and don't supply enough water for irrigation areas. Concrete layers of inlet body are peeled and calcified. Therefore, it is necessary to build a new inlet; and (iv) Spill way: stream directing wall has cracked and broken, some points on concrete ramp have stripped, flip lips to emergency valve have been damaged severely. Although several facilities had been reinforced, but many items of the work have been degraded, capability to store water is low, and unsafely during operation process may happen.

4. Description of the project: The activities under the project include: (i) repair and upgrade main dam; (ii) Build a new inlet, 50 m far from the existing inlet with it's size ensuring current water supply ability; (iii) repair, upgrade and consolidate main channel by steel-enforced concrete; (iv) rehabilitate lifting system and bulk heads of spillwayand (v) build a new light system on main dam top. The project has been designed and implemented in lines with environmental and social management framework (ESMF) and dam safety framework of WB, assuring to comply strictly with administrative regulations as well as criteria of Social Republic of Vietnam. The potential impacts during preparation and implementation periods of project has been assured sufficient determination, strictly supervision and management by detail plans and periodical reports submitted to management organizations.

5. Environmental and social impacts and mitigation measures: The project implemented will bring in considerable benefits to local community, such as: (i) Stabilize water supply, facilitate agriculture production and improve the life of local people; (ii) Dam safety improved will be secure about the life and production of people in downstream; (iii) Improve the landscape, ecosystem and microclimate conditions of the reservoir. However, the project implementation will be results of some potential adverse impacts and risks of natural and social environment, relating to: (i) Land acquisition and clearance, (ii) construction activities, and (iii) operation of the reservoir.

6. Detailed plan to prevent or mitigate the adverse impacts are described in Environmental and Social Management Plan (ESMP).

7. 100% of local communities in sub-project area are Kinh people. There is no ethnic minority HH affected by the project.

8. The sub-project implementation will require acquiring permanently 6.78 ha, of which 1.21 ha land owned by 07 households in Dong Son ward and 5.57 ha land of operational unit which belongs to the extent of dam safety. There is no replaced household. The affected households will be compensated and supported sufficiently complying with resettlement policy framework (RPF), see details in RAP of the subproject. There are no grave, temple or any culture, belief, religious structures affected in the project area.

9. As calculated, quantity of filling and digging soil for the construction are 18,500 m³ and 176,000 m³ respectively. Of which, amount of inlet digging soil will be reused so weathered soil and digging stone, soil for discharge is 21,881 m³. Supplement filling soil is 166,361 m³. Land mine is 2km

As calculated, quantity of filling and digging soil for the construction are 18,500 m³ and 176,000 m³ respectively. Of which, amount of inlet digging soil will be reused so weathered soil and digging stone, soil for discharge is 21,881 m³. Supplement filling soil is 166,361 m³. Land mine is 2km far from spillway with exploitation quantity of 199,600 tons. Surplus excavated soil, covering plant and waste materials are dumped in disposal site area reserved of about 50,000 m³, belonging to ThuanPhong hamlet with transportation distance of 1.5 km. Construction materials are purchased from material stores in Dong Hoi city. Around 20-30 workers will be mobilized in the short time (1 month) for preparation and land clearance period. The maximum of workers will be mobilized for the intensive construction. The number of workers is 40 people for this stage. 24 set of machines and vehicles will be used for the construction including: Digging machine, Grader with the capacity of 108 CV, Concrete mixer, Concrete vibrator, Mortising slot machine, Self vibration, Tilting car, Water car, Generator.

44.314 m³ of excavated soil and 9,501 m³ of filled soil will be used for all the construction activities. Because all filled soil can be utilized from excavated soil, there is no need to exploit other soil bank for the construction. Surplus excavated soil, covering plant and waste materials are dumped in disposal site area reserved of about 50,000 m³. It is low-lying area which has been exploited soil in village No. 1, Trung Mon commune, about 2.5km far from the construction site. Other construction materials are purchased in center of TuyenQuang city, transport distance is of about 7-15km. Around 20-30 workers will be mobilized in the short time (1 month) for preparation and land clearance period. The maximum of workers will be mobilized for the intensive construction. The number of workers is 50 people for this stage. 27

set of machines and vehicles will be used for the construction including: bulldozers (110 Cv), excavators, trucks, mixers (250litre), concrete pavers, generators, water pumps.

10. The project construction may arise negative impacts to natural environment (such as: increasing pollution of air, water, soil, noise, vibration, etc.) and social environment (traffic jam, social security, etc.). However, these impacts are partial, temporary with small sphere and can be prevented/minimized via:

- Ensuring to comply with Environmental and Social management plan of project,
- Consulting with local authorities as well as local residents from project preparation period and maintain during project construction period,
- Supervising closely project's implementation.

11. Environmental and Social Impacts Assessment (ESIA) report aims to make detail implementation plan in order to ensure natural environmental and social quality in project area. The entire process of project implementation will be closely monitored by the Provincial management unit (PMU), Department of Natural Resources and Environment (DONRE), construction supervision consultants (CSC), environmental management consultants and local communities. Monitoring process will be recorded and publicly periodically reported.

12. Plan to manage and mitigate impacts during project implementation process: To minimize potential adverse impacts during project implementation period, the following measures need to be done adequately under the close, uninterrupted and open consultancy with local authority and community, especially with AH:

- Make sure that the environmental protection criteria will be stated in contract's terms of project and make clear with the contractors.
- Implementing mitigation measures adequately with the observation and modification suitably to actual conditions to achieve the highest minimization.
- Supervising and monitoring closely the implementation of safety measures to ensure the mitigation measures should be sufficient and effectively implemented during project's implementation.
- Planning and performing completely the stakeholder consultation during project's preparation and implementation.

13. Responsibility: Central Project Office (CPO) takes responsibility for supervision overall project and progress of the subproject: ***“Repair and upgrade PhuVinh reservoir - QuangBinh province”***, including the implementation of environmental protection measures proposed in ESMP.

14. QuangBinh irrigation management and exploitation unit takes responsibility for preparing detail bids/tenders information, selecting contractor suitably, preparing contracts and ensuring effective implementation and close supervision of ESMP of project. The contractor takes responsibility implementing project as planned, periodically report to CPO. CPO will associate closely with local authority to ensure the effectiveness of stakeholder consultation and promote minimized measures effectiveness. Department of Natural Resources and Environment of QuangBinh province will bear responsibility of supervising the implementation of environmental policies as per regulated by Vietnam Government. After project completed, the operation organization will take responsibility of maintenance and periodic inspection project's works.

15. Budget allocation: Both ODA fund and Counterpart fund of Vietnam Government are used for sub-project investment. Total budget estimation is: **110,052,924,000VND**.

Budget for ESMP implementation including:

- Implementing ESMP: 120,283,000 VND;
- Implementing ESMoP: 191,933,000 VND