QUANG NGAI PROVINCIAL PEOPLE'S COMMITTEE

DEPARTMENT OF AGRICULTURE AND RURAL DEVELOPMENT

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DAM REHABILITATION AND SAFETY IMPROVEMENT PROJECT (WB8)

REPORT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

SUBPROJECT: REPAIR AND UPGRADE OF DAP LANG RESERVIOR-HANH TIN TAY COMMUNE- NGHIA HANH DISTRICT- QUANG NGAI PROVINCE

Quang Ngai, 5/2015

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Prepared by:

EMPLOYER **CONSULTANT**

Quang Ngai, 5/2015

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ABBREVIATIONS

AH	:	Affected Household
CPO	:	Central Project Office
DARD	:	Department of Agriculture and Rural Development
DRSIP	:	Dam Rehabilitation and Safety Improvement Project
EM	:	Ethnic Minority
ESIA	:	Environmental and Social Impact Assessment
ESMoP	:	Environmental and Social Monitoring Plan
ESMP	:	Environmental and Social Management Plan
MARD	:	Ministry of Agriculture and Rural Development
MONRE	:	Ministry of Natural Resources and Environment
MoIT	:	Ministry of Industry and Trade
MWL	:	Medium Water Level
ODA	:	Official Development Assistance
PMU	:	Project Management Unit
PPC	:	Provicial People's Committee
PPCH	:	Plant Protection Chemicals
RAP	:	Resettlement Action Plans
WB	:	World Bank
TSP	:	Total Suspended Particles

SUMMARY

Sub-project "Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province" 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 m^3
  - Earth dam: Length: 148.5 m, Max of dam height: H_{max}=14,70 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
  - Earth dam, max height 14.7m on land: level III

Therefore, the focal complex: level III; canal system: level IV

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 earth 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.

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

Environmental impacts and mitigation measures: Thesub-project will provide great benefits for local communities, such as: (i) stabilizing water supply, facilitatingagricultural 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 thesub-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 sub-project area has mainly Kinh community, accounting for 89.3%. Not any ethnic household is affected by the sub-project.
- The sub-project permanently acquired a total land area of 13,778 m^2 of agricultural land and forestry, temporarily affected 39,875 $m^2$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 sub-project. In the sub-project area, there is not any tombs and shrines or any cultural, or religious structures affected.
- Volume of backfilling soil is 40,241m^3. The sub-project is expected to exploit soil in three stations, which were planned with a total volume of 37,125 m^3 (Exploitation sites given in the appendix 4). Volume of digging soil is 34,415 m^3, surplus excavated soil, waste and organic waste will be dumped in planned landfill with area of 13,558 m^3. 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 sub-project, consultation with local authorities and local people from the preparation to construction phase of the sub-project, monitoring closely the implementation of the sub-project.
- Report of Environmental and Social Impact Assessment (ESIA) of the sub-project aims to implement a specific plan, with the target of ensuring the quality of natural environment and social environment in the sub-project location. The entire implementation of the sub-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 sub-project implementation: In order to minimize potentially negative impacts during the sub-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 sub-project.

- Planning and implementing the community consultation program throughout the sub-project.

Responsibilities: Project Management Unit (PMU) under MARD is responsible inmonitoring progress of the sub-project "Repair and Upgrade of Dap Lang Reservoir-Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province", including the implementation of environmental protection measures proposed in ESMP.

Hydraulic Construction & Investment Projects Management Unitin 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 sub-project. The contractor is responsible for implementing sub-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.

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

The cost for the environmental and social monitoring and management plan is about **VND 580,960,000.**

ESIA report includes 8 major parts as below:

Part 1: Introduction

Part 2: Sub-project description

Part 3: Policy, legal and administrative framework

Part 4: Environmental and social-economic chracteristics of the sub-project area

Part 5: Environmental and social impact assessment

Part 6: Alternative analysis

Part 7: Environmental and social management plan

Part 8: Stakeholder consultation and information disclosure

PART 1: INTRODUCTION

1.1. General information of the project

Name of project

In English: Dam Rehabilitation and Safety Improvement Project (DRSIP)

Project objective

The project development objective is to support the implementation of the Government dam safety program by improving the safety of prioritized dams and reservoirs as well as to protect people and assets of the downstream communities.

Project Management Organizations

The Ministry of Agriculture and Rural Development (MARD) will be responsible for overall implementation and management of the project. The MARD will work closely with MoIT and MoNRE in implementation of the project through beneficiary agreements to execute specific activities. A Project Steering Committee (PSC) would be established at the central level to coordinate the policy and strategic issues, provide overall guidance and assist in coordination. The PSC will include the three Ministries and will be chaired by the Prime Minister's Office (PM Office) or by the National Steering Committee for Flood and Storm Control.

A Project Management Unit (PMU) would be established under MARD and would provide support to all the three Ministries. Implementation of the rehabilitation works and preparation of dam safety plans would rest with the provincial level authorities. The DARDs will be procincial responsibilities.

A National Dam Safety Review Panel would be established under the project to provide support during implementation. The independent Panel of Experts (PoE) would comprise several individual consultants, each with considerable experience in dam rehabilitation programs. The independent PoE would be expected to visit at least twice a year for a period of two weeks, at minimum, to review, assess and advise the Government on the program.

Project description

The proposed project 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. This adopts the international convention in defining dams based on height and volume. Specifically, the Decree defines the following: (i) large dams from 15m high or with reservoir capacity of three million cubic meters or more; (ii) medium dams from 10m to 15m high or dams with reservoir capacity from one to three million

cubic meters; and (iii) small dams from 5m to 10m high or dams with reservoir capacity between 50,000 and one million cubic meters.

The project would be an optimized mix of both structural and non-structural measures. Structural measures include rehabilitation and upgrading safety work of existing dams, including instrumentation, such as safety monitoring equipment. Such physical works represent the large part of the project budget (>80%). Non-structural dam safety activities, which are a critical and key component of the Bank-supported activities under the project, would include support to strengthen the legal and institutional framework; safety monitoring; operational procedures, operations and maintenance (O&M); and emergency preparedness plans. These measures also include an assessment of the resources to ensure sustained O&M and monitoring.

It is proposed that the projectconsistof four principle components:

- Component 1: Dam Safety Rehabilitation (US$400 million)
- Component 2: Dam Safety Management and Planning (US$90 million)
- Component 3: Project Management Support (US$10 million)
- Component 4: Disaster Contingency (US$ 0 million - no fixed allocation, but not to exceed 20% of the total project cost)

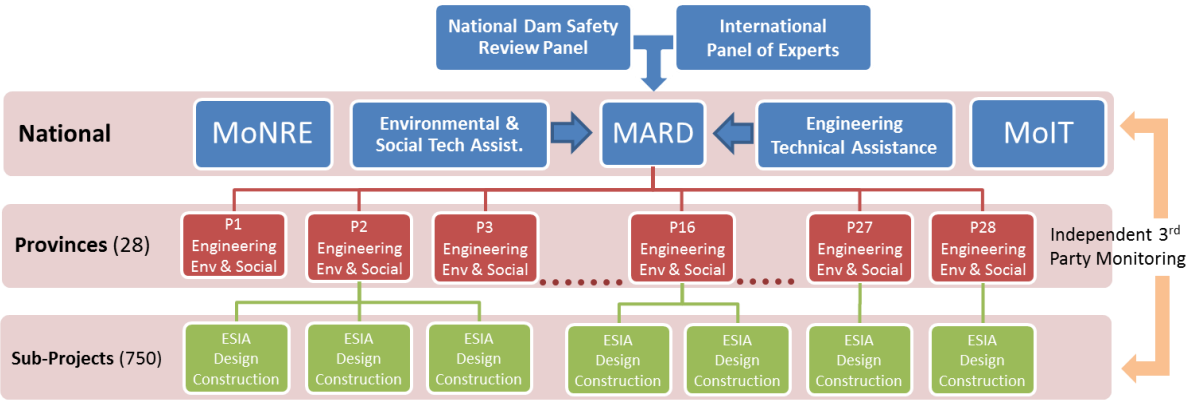


Figure 1-1: Implementing arrangement of the project

Project location

The proposed project will be implemented in 28 provinces in the North, the Central and Tay Nguyen (Highlands). Over 750 dams will be expected to choose from 28 provinces for investment recommendations based on the most priority selection. To prioritize measures that solves the risk of poverty and inequality. To prioritize dams that little impact on land acquisition and affect many people, infrastructure, socio-economy, including the risk of dam structure, hydrologic flow, economic damage. These will be further categorized according to the readiness level; the regions that have prepared materials about technical design will be prioritized.

Project duration

The proposed project will be implemented over a period of six years – from 1st December 2015 to 1st December 2021. The drafts of Environmental Impact Assessment (EIA), Resetlement Action Plans (RAP)and Ethnic Minority Development Plans (EMDP)of the first year sub-project will be ready by 21st April 2015and the ESMF will be ready by 15th June 2015 for disclosure. These safeguard documents need to be cleared by the Bank before the disclosure. The EIA of the subsequent years' sub-projects will be prepared once the EMF has been agreed by the Government of Vietnam and the WB.

Sub-projects

The projects support structural rehabilitation of existing irrigation dams were built mostly in the 1980 and 1990s. Approximately 90% of the dam was repaired as earth dams and small dams with a height less than 15m and design capacity of less than 3 million cubic meters. The proposed project will not change the structure or upgrade to ensure safety. The repairations will be limited to the structural restoration of the main and auxiliary dams, slope stability with concrete or stone tile, strengthening and expanding the existing flood spillway to increase the discharge and existing capacity, replacing equipment and electrical systems of outlet/discharge culverts and flood spillway, grouting to control leakage and improve management road and current operations.

For each sub-projects, the first year will be selected to develop individual ESIA report.

1.2. Approaches and methodology for ESIA implementation

1.2.1. Approaches and methodology for social assessment

To ensure all potential impact could be identified during sub-project preparation, the SA was conducted through series of consultations with various sub-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 . A total of 103 respondents participated in the SA exercise for this sub-project, of which 103 people participated in the household survey (quantitative), and 32 people participate in focus groups discussions, community meetings, key informantion interview (qualitative). In-depth interviews and group discussions involve those from the survey sample and key personnel at provincial, district, commune levels. Each group has 6-8 people. (For the social sampling methods, see Appendix B1)

Positive and negative impacts, including the results of gender analysis, results and Related Recommendations (Community Health Management Plans; Community Consultation and Communication Strategies; and Gender Action Plan and Plan Monitoring are detailed in Appendix B5).

Ethnic minority screening

As part of the social assessment, where ethnic minority (EM) peoples are present in the sub-project area–as confirmed by the EM screening (as per Bank's OP 4.10), consultation with them were carried out in a free, prior, and informed manner, to confirm if there is broad community support from affected EM peoples for the sub-project implementation. EM screening was conducted as per Bank's OP 4.10, and was done the scope and coverage of the social and environmental impact assessment as follows:

Beneficial areas of the sub-project: Tan Phu 1, Tan Phu 2 and Tan Hoa villages

Affected areas of the sub-project:

- Due to land acquisition and construction: Tan Phu 2 village
- Due to water cut-off for dam rehabilitation: TanPhu 2 and TanPhu 1 villages

No ethnic minority groups are identified in these beneficial and affected areas.

Given the results of social assessment and consultation =>No Ethnic Minority Development Plan for the sub-project.

1.2.2. Approaches and methodology for environmental assessment

1.2.2.1. Approaches

- ESIA is executed in accordance with policies and legislation of the Government and the WB.
- ESIA assessment must combine with the analysis of economics, finance, institutions, society and technique of sub-project to ensure environmental and social issues is sufficiently interested in the sub-project and location selection, the decisions relating to technology solutions.
- Forecasts and quantitative assessment of the impact can be happened by sub-project. The impact need to be described by specific data. The operations of the sub-project should be considered in different phases: the preparation phase; construction phase; the phase of operation and maintenance.
- Distinguish between pairs of positive- negative effect, indirect and direct impact, cumulative impact, medium- long term impact. Identifying potential impacts that

may occur during the construction process; the unavoidable and irreversible impacts.

- Describe quantitatively impacts about cost and environmental benefits. Assigning economic value if possible.

1.2.2.2. Methodology

a. Field survey methods:

- Conducting surveys on the current status of environmental resources, soil and water sampling, and rapid assessment of water quality standards in the field to update the latest documents related to sub-project area.
- Conducting environmental field surveys by sampling and analyzing indicators in the laboratory to determine the status of surface water quality, groundwater quality and soil quality in the sub-project area and its surroundings.
- Sampling samples as proposed in sampling figure.
- Collecting air quality information from the environmental report of Quang Ngai province or of similar sub-projects that have been also implemented in the sub-project area in 2014.
- Surface and ground water is collected by water sampling devices based on TCVN 6663-6:2008 (ISO 5667-6:2005). Water sample is treated and preserved according to TCVN 6663-14:2000 (ISO 5667-14:1998).
- Soil and water samples were preserved and taken to the Laboratory of the Institute for Water and Environment to be analyzed to see if they meet the quality standards.

b. Statistical methods: collecting, processing and analyzing related meteorological, hydrological, environmental and socio-economic data.

c. Method of expert advice: through the meetings, consulting expert review about proposing solutions to minimize negative impacts of the sub-project.

d. Rapid assessment method: Use the pollution factor of the World Health organization (WHO) to estimate the amount of waste and to forecast the pollution.

+ Assess the pollution load of air waste and water waste

+ Develop measures to minimize the pollution.

+ Estimate the load and concentration of polluted chemicals generated from construction activites and sub-project operation, then evaluating quantitatively and qualitatively the impact on the environment

e. Comparative methods: Evaluating the impact by comparing with the norms and

standards for the quality of soil, water, noise, air and other related environmental factors

g. *Matrix method:* To compare each activity of the sub-project with each parameter or environmental and social component (air, water, health, economic, etc.) to assess the relationship of cause-consequences of the sub-project implementation

PART 2: SUB-PROJECT DESCRIPTION

2.1. Overview of the sub-project

- **Name of sub-project: Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province**
- **Objectives:**
  - To ensure dam safety in the fact that the construction is being degraded seriously.
  - To enhance the protection to downstream local people and eco-social infrastructure that are facing with risks.
  - Ensure safety in the supply of irrigation water for agricultural production, combine with aquaculture. Thereby, ensure safety for life and production, income for residents in the beneficiary region.
  - To contribute improving environment in the sub-project area.
- **Owner:**

  Department of Agriculture and Rural Development, Quang Ngai province

  No. 41- Pham Van Dong - Quang Ngai city - Quang Ngai province

  Representative: Hydraulic Construction & Investment Projects Management Unit

  Tel.: +84 55 3825003
- **Location of the sub-project:**

Sub-project is located on Rau River, a small tributary on the left bank of Ve River. The basin starts from a high mountain in the West, major streams flow Eastwest; topographic is higher at the West and lower at the East. Center of the basin is about 13km far from south of Nghia Hanh district center and about 2.4km North–Northwest of Hanh Tin Tay Commune People's Committee.

The basin is located between the coordinates:$14^o56'19" \div 14^0\ 57'11"$ N and $108^044'36" \div 108^0\ 45'55"$ E

The coordinates of focal works are $14^0\ 56'42"$ N and $108^0\ 45'55"$ E.

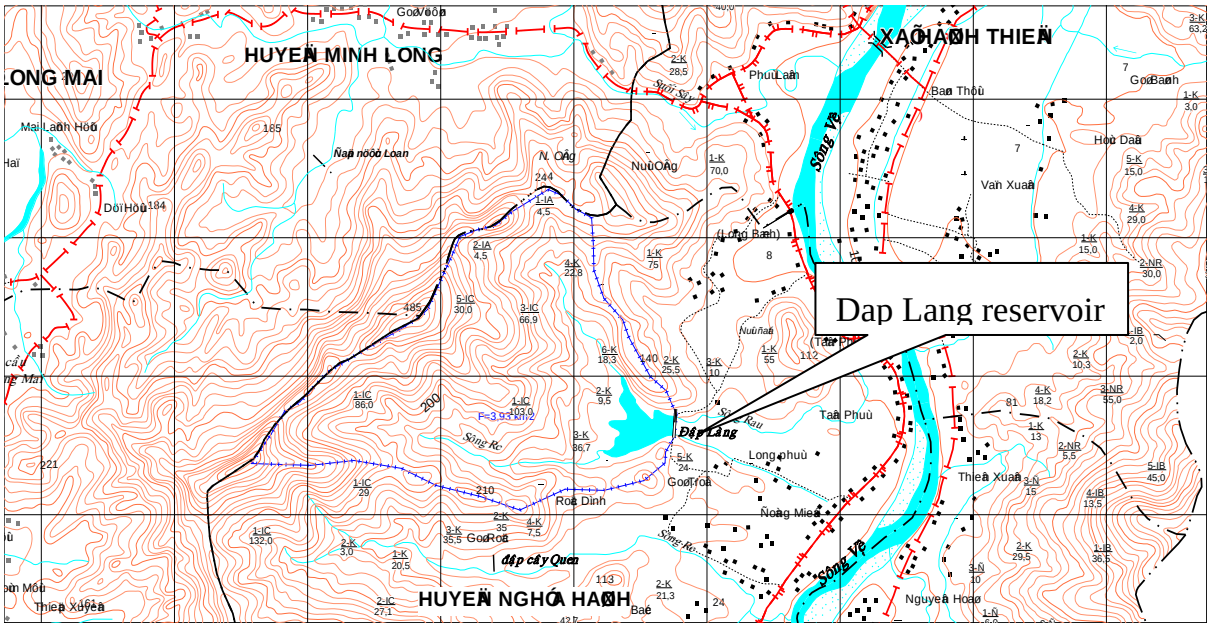


Figure 2-1: The site plan of Dap Lang reservoir, Hanh Tin Tay commune, Nghia Hanh district, Quang Ngai province

- **Total investment:**

The total investment of the sub-project is 31,418,955,000 VND (Thirty-one billion four hundred and eighteen million, nine hundred and fifty-five thousand Vietnam Dong only).

2.2. The proposed scope of work

Current status

Soil dam and focal works have been constructed and used since 1978. Dap Lang is a homogenous soil dam, with dam crest elevation of 31.1m; length of dam crest of 135m, dam crest breadth of 3m, maximum height of 13.1m. Currently, the structure of dam crest is made of earth, convex and concave in many locations. Local residents' travel forms trails and hollows.

The dam crest has no wave-retaining wall, lighting system, deformation monitoring mark. The dam has no seepage monitoring system for dam body.

Upstream dam slope: the upstream dam slope with a coefficient of 3 is reinforced by rip-rap masonry. Currently, rip-rap masonry is peeled and damaged; trees and weeds overgrow; there are settlement and hollow in many places on the slope. The upstream slope has no hydrometrical post to measure water level in the reservoir.

Water intake culver: water intake culver with diameter of 80cm that is degraded seriously leading water leakage in the walls of the culvert. In addition, this can be elements that cause ground erosion effecting the works.

Flood spillway: the flood spillway was built in 1978 and repaired in 2003 by adding a concrete mantle layer from the bottom of the water slope to 1 absorption floor and field floor. However, the compensated layer was sloughed from the old platform by the flow. This broke some positions on concrete layer and stickout the steels. Overflow does not guarantee the ability to safely remove the current flood conditions. This flood spillway is not able to ensure safety availabilities for spilling the water in the condition of large flood.

*Canals:*Canal system was mostly concreted in 2003. Currently, this system is still good for related activities. Soild canals had been filled.

Mangement house: not yet observed.

*Transport system:*Transport system is quite good. The main route is a provincial route, 624B, that connect to Quang Ngai city and neibouring districts. In addition, transport system is mostly concreted and prepared within the context of the New Rural Programme.

*Construction options:*appropriate and selected construction option is to repair and upgrade focal terminal system that includes: soil dam repairation;reconstruction of flood spillway, water intake culver and management house. Canal system will be reconstructed during the next period of the subproject because of limited fund.

Quantity and scale of subjects:

Table 2-1: Technical parameters of the project

No.	SUBJECTS	UNIT	CURRENT STATUS	STATUS AFTER REPAIRATION AND UPGRAGE
A	**RESERVOIR**			
1	Supply of irrigation water	ha	Design:100ha/ Actual:52ha	83
2	Work's grade		III	III
3	Irrigation assurance level		75%	85%
4	Design flood frequency			1.5%
5	Checking flood frequency			0.5%
6	Diversion frequency			10%
7	Design flood level	m		31.24
8	NRWL	m	28.80	28.80

9	Dead water level (DWL)	m	24.00	24.00
10	Checking flood level	m		31.67
11	Normal volume V_{normal}	10^3m^3	413.430	413.357
12	Useful volume V_{useful}	10^3m^3	362.634	362.561
13	Dead volume V_{dead}	10^3m^3	50.796	50.796
B	SOIL DAM			
1	Elevation of soil dam crest	m	30.8-31.1	32.50
2	Breadth of dam crest	m	3	6
3	Dam length	m	135	151.5
4	Maximum dam height H_{max}	m	13.1	14.7
5	Upstream slope/ Downstream slope		US: 2.6-3.0; DS : 2.5-2.7	US: 3.00/2.75 DS: 2.55/2.75
6	Cao trình đỉnh vật thoát nước lăng trụ	m		+21.00
8	Bề rộng đỉnh vật thoát nước	m		2.50
10	Mái thượng / mái hạ vật thoát nước			1.50 / 2.00
C	FLOOD SPILLWAY			
1	Design discharge	m^3/s		118.35
2	Sill breadth	m	20	20
3	Sill elevation	m	28.80	28.80
4	Sill length	m	88	177
5	Silling type		Free	Free
6	Sill structure		Ashlar stone +concrete	Reinforced concrete
D	WATER INTAKE CULVERT			
1	Design discharge	l/s		112
2	Elevation of upstream/downstream culvert bottom	m		23.00/21.70
3	Type		Box culvert D800, Upstream flat valve tower	Steel pipe D400 covers reinforced concrete
4	Culvert length	m	40	65
5	Culvert slope	%		2%
E	MANAGEMENT HOUSE			
1	Construction level			IV
2	Construction area	m^2		42

- Transporting soil, stone and constructing materials

Table 2-2: Transporting soil, stone and construction materials

Subjects	**Location**	**Mining volume**	**Mining quality**	**Transporting distance and route**
Station No.2	An area of 10720 m^2, low hills , elevation changes from +37.34m đến +72m, the slope of 25^0-30^0, the trees currently exploited .	- Calculated by the arithmetic mean method , based on the results of exploration pits, assessing C1 volume. - The total volume of 18,760 m3	Sand and clay containing some weathered pieces, low plasticity (SLCM - G) yellow-brown – red-brown, major compositions of sand, clay, dust and quartz gravel, little piece weathering.	Distance from the transport station to the dam is about 350m south of the dam terminaloutside the reservoir area
Station No.3	An area of 723m^2low hills , elevation changes from+26.36m to +45.42m, located South-East downstream, slope 15^0-20^0, *Acacia* is currently planted in the downstream area outside the reservoir.	- Calculated by the arithmetic mean method , based on the results of exploration pits, assessing C1 volume. - The total volume of 1012 m^3	Sand and clay containing some weathered pieces, low plasticity (SLCM-G) red-brown, major compositions of sand, clay, dust and quartz gravel, little piece weathering.	Distance from the transport station to the dam is about 350m along exploited route of *Acacia*
Station provides construction materials	+ Sand and gravel is taken at Cong Hoa bridge–Ve riverHanh Thien commune, Nghia Hanh district.			+ The transporting distance to the bottom of the works is about 7km.

	+ Rocks is taken at An Hoi quarry			+ The transporting distance is about 27km

- Quantities of main works

Table 2-3: Quantities of main works

No.	Description	Unit	Soil dam	Flood spillway	Culvert
1	Excavated soil	m^3	24.472	4.023	5.920
2	Soil for packing	m^3	37.230	1.902	1.109
3	All type of concretes	m^3	520	1571	156
4	Stone, brick	m^3	213		26.45
5	Dry stone	m^3	2.011	239	
6	Shed stone	m^3	1.700		
7	Filter gravel	m^3	382	114	
8	Filter sand	m^3	382		
9	Grass plantation	m^3	2.808		
10	Work's form	m^3	847	2157	777
11	Geotextile	m^3	4.380		
12	All types of steel pipe	Ton	0.12	86	10

- List of used machines

Table 2-4: List of used machines

No.	Types	Quantities	**Quality requirement**
		Total	
1	Wheels crane 6Tons	1	All means and vehicles must be provided with: 'Certificate of Conformity to Quality Standard, Technical Safety and Environmental
2	Crane10Tons	1	
3	Crane25Tons	1	
4	Flat rammer 1kW	2	
5	Pointed rammer 1,5kW	2	
6	Wacker	1	

7	Stone and brick cutting machine 1,7kW	1	Protection" in accordance with Decision no 35/2005/QD-BGTVT to prevent excessive noise from machines which are not maintained properly. - Certificate of Conformity to standard of technical safety and environmental protection applied to motorbike participating in road traffic (22 TCN 278 - 01) - Certificate of Conformity to the technical safety and environmental protection standard applied to motorized vehicles (22 TCN 224 - 01)
8	Steel cutting machine 15kW	1	
9	Steel bending and cutting machine 5kW	1	
10	Steel bending and cutting machine 5kW	1	
11	Drilling machine 2,5kW	1	
12	Drilling machine 4,5kW	1	
13	Steel bending roll machine 5kW	1	
14	Grilling machine 2,7kW	1	
15	Digging machine 1,25 m^3	3	
16	Air rammer 16Tons	2	
17	Air rammer 9Tons	2	
18	Welder 23kW	2	
19	Concrete mixing machine 250l	2	
20	Concrete mixing machine 500l	1	
21	Motar mixing machine 80l	1	
22	Bulldozer 108CV	2	
23	Bulldozer 180CV	1	
24	Truck 7Tons	8	
25	Máy vận thăng 0.8Tons	1	
26	Pulley block 5Tons	1	
27	Electric winch 5Tons	1	

2.3. The construction schedule

2.3.1. Implementation progress and constructing diversion

Period 1: from 01/02/2016 to 01/05/2016 (before small flood)

Activities:

- Digging the dam foundation on the left bank, elevations up to 26.50m, meanwhile digging the foundation of flood spillway and water intake culvert. The culvert body will be reconstructed.
- Transporting unused digging soil to the waste yard (note to avoid the water canals).
- Constructing the management house.

- Constructing flood spillway.
- Finalizing water intake culvert.

Flow diversion:

- Reusing digged soils to put on the dike.
- Putting pipe of D80cm over the dike, diversion based on a small canal digged behind the basement of old water intake culvert.

Period 2: from 20/5/2016 to 15/9/2016 (after small flood)

Activities:

- Digging the rest part of the basement.
- Digging for water outtake and opening the slope.
- Constructing drainages.
- Reinforcing upstream slope and fill up tha dam to elevation of 32.26m.
- Constructing the wall againsts waves.
- Planting grass on downstream slope and drainages.
- Constructing the road for long-term use.
- Finalizing and handing the works.
- After constructing the diversing canals as desinged, it is covered by plastic canvas.

Flow diversion:

- Diversing the flow through new constructed culvert.
- The layer that has direct contact with the flow, has to be taken after completing flow diversing activity. Soil to cover diversion canal and dam is used the same type. This is implemented according to regulated procedure for soild dam. Because the diversion canal is small, therefore wacker is used traditionally.

2.3.2. Organization and implementation progress

Implementation time: the works have not much activities and farovable infrastructure. This will be implemented and completed in one year.

Implementation progress: January – September.

In order to ensure the implementation progress, the Design Consultant recommended to divide the work into small technical sub-contracts. In addition, the

employer has to select contractors that have enough availability to implement the work as planned.

Table 2-5: Construction time

No.	**Subjects**	**Construction time *(months)***	**Starting time**	**Ending time**
1	Earth dam and water intake culvert	6.5	15/2	30/8
2	Flood spillway	6.5	15/2	30/8

PART 3: POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

Sub-project of "Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province" does not affect to the ethnic minorities groups, the sub-project areas does not have natural forests, biodiversity conservation areas, wetlands or the threatened species (includes fauna and flora species). The major impacts of the sub-project to the natural environment relate to the activities of land excavation, reparation of headwork of dam, material and waste transportations, borrow pit exploitation, and some impacts on the local committees due to temporary land acquisition (6 affected households) and permanent land acquisition (18 affected households), in which there are three households permanently affected on temporary land and permanent land. The applicable policies, institutional frameworks for environmental and social impacts assessment of the sub-project can be explained below:

3.1. Applicable national law and regulations

3.1.1. Legal framework on environmental impact assessment

Law on environmental protection no.55/2014/QH13, on Regulating Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitment. Environmental report should be carried out simultaneously with the establishment of investment projects (Feasibility study report). Requesting time for EA report making, delivery and appraisal are specified in section no.2 of Article no.13 of Decree no.21/2011/ND-CP. Environmental screening steps (typical environmental assessment to the project) should be done in accordance with the list of projects typeDecree no.18/2015/ND-CP

Environmental impact assessment (EIA). In chapter 4 of Decree no.18/2015/ND-CP on date 14/02/2015, from the article 12 to article 17 were specified in the formulation, evaluation and approval of environmental impact assessment reports, the implementation of projects and the designed mitigation measures to protect environment before and after a project officially operation. In the article 12 of this Decree also regards on environmental impact assessment process to the project implementation, the project owner have to organise meetings to public consultants, such as Provincial People's Committees, local authority (Commune People's Committees level- CPC), affected (direct or indirect) people or committees in the local by the project implementation, mandatory; analysis the feedbacks, comments obtained from the affected groups, and consider advantage or disadvantage the impacts of the

project to community and to design the mitigation measures to reduce the negative impacts on natural environment, biodiversity, community. According to theo.2 of the Decree, the project has to make EIA if the reservoir capacity is of 100,000m^3 or more.

Environmental protection plan. Chapter 5 of Decree no.18/2015/ND-CP on date 02/14/2015, from Articles no. 18 and no.19 and the Annex II of this Decree defined that a new project implementation, or scale extension, increasing capacity have to identify the affecting objects and have to make a plan of environmental protection

According to the regulations of Vietnam Government, the sub-project "Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province" have to perform the report of Environmental Impact Assessment.

3.1.2. Dam safety regulations

Decree no. 72 /NĐ-CP on date 07/05/2007 of the government of Vietnam on dam safety management. According to the decree, a big dam is the dam with the height calculating from the floor face to the top of the dam equal to or greater than 15 meters or dam of water reservoirs with the scale of capacity equal to or greater than 3,000,000 m^3 (three million cubic meters). Small dam is the dam with the height calculating from the floor face to the top of the dam smaller than 15 meters. Dam owners are organizations and individuals owning dams to harness the benefits of water reservoirs or assigned to manage, operate and harness water reservoirs by the competent state agencies. Ministry of Agriculture and Rural Development takes responsibility before the Government for the implementation of state management of dam safety. The Ministry of Industry presides over and coordinates with ministries, branches and relative localities to appraise, approve or submit to the Prime Minister for approval of the process of operating hydropower reservoirs. The provincial-level People's Committees implement its state management on dam safety in the areas.

3.1.3. Land acquisition by the State and resettlement policies

Land Law no. 45/2013/QH13, effected on 07.01.2014, this law prescribes the regime of land ownership, powers and responsibilities of the State in representing the entire-people owner of land and uniformly managing land, the regime of land management and use, the rights and obligations of land users involving land in the territory of the Socialist Republic of Vietnam. The law also gives the guidance on Land acquisition, recovery and compensation, resettlement and the requirement to ensure safety of dam corridor and reservoir, irrigation works, etc.

3.2. WB safeguards policies triggered

The safeguards policies of WB given in the form of operational policies (OPs), which includes 10 triggered policies, included the important policy OP 4:01 environmental assessment. Here are a summary of WB's policies that is related to the sub-project:

Table 3. 1. Selected environmental and legal safeguard policies of WB related to the sub-project

Policies	Objectives
OP 4.01 Environmental Assessment	- To ensure the environmental and social soundness and sustainability of investment projects. - To provide decision makers with information on potential environmental and social impacts related to the project. - To enhance the transparency and participation of affected communities into the decision making process.
OP 4.37 Safety of Dams	To ensure that dam safety issues are adequately addressed, especially for high and/or risky dams: - The policy involve to new dams construction - The issues occurs by the existing dams and dams under Construction he - The other important issue: dam height, reservoir capacity, suitability of safety standards
OP 4.12 Involuntary Resettlement	- To ensure that the following policies will be applied: - Avoid or minimize involuntary resettlement and impacts on economic activities, including loss of livelihoods - Provide transparent compensation procedures during involuntary taking of land and other assets - Provide sufficient investment resources to enable the persons displaced by the project to share in project benefits (implemented through the Resettlement Action Plan) - Restore and improve the standards of living of persons affected by the project - Provide prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project. Development of Resettlement Plan and mitigation measures must be carried out based on consultation with affected populations and participatory approaches.

PART 4: ENVIRONMENTAL AND SOCIAL CURRENT STATUS

4.1. Physical condition

4.1.1. Natural conditions

a. Meteorology and hydrology

The area of sub-project in Hanh Tin Tay commune, Nghia Hanh district, Quang Ngai province that is located in the Central Vietnam with a tropical monsoon climate.

The documents on climate, meteorology, hydrology of sub-project area are taken for An Chi and Quang Ngai stations that are the nearest stations to the sub-project area. Characters of climate in the sub-project area as follows:

- **Characteristics of climate:**

Table 4-1: Characteristics of Rau river basin (up to the work) extracted from map scaled 1/50.000

Flv *(km^2)*	L_{sc} *(km)*	L_{sn} *(km)*	J_{sc} *(‰)*	J_d *(‰)*
3.93	2.64	2.63	22.90	178.01

- Temperature: The average annual temperature is of 25.7^0C. Highest temperature is usually in May, June and July with the value of 41.4^0C. Lowest temperature, 12^0C often occurs on December, January.
- Humidity: Humidity is relatively high in winter and low in summer. The maximum humidity occurs in November and December, the lowest humidity occurs in July and August. The average annual humidity and lowest humidityis 85.3% and 34% respectively.
- Number of sunshine hours: The number of sunshine hours in the sub-project area classified at high average value as compared regionally. Annual total number of sunshine hours averaged 2300 hours. Mountainous and midland regions reached an average of 2000 hours.
- Wind: Two main seasons are summer and winter. Wind direction changes seasonally. In Quang Ngai, from September to March next year, wind direction mainly is from north to northwest, from April to August is from east to

southeast. Wind speeds vary by region, the plainland are usually reached 1÷1.5m/s, while mountainous reaches 1÷1.2m/s, coastal areas reaches 4.5m/s.

- Evaporation: Annual evaporation average is about 1256mm, basin annual evaporation averages at 1000 mm, evaporation increases 256 mm.
- Annual precipitation: Rainy season concentrates in the last four months of the year, while dry seasonoccurs from September to December, the dry season from January to August. The dry seasonis long and nearly identical to agricultural production and activity. Rainy season in the last four months of the year occupies about 70-80% of the total annual rainfall. The rainy season coincides with the storm season, tropical cyclones and the northeast monsoon. When there is a combination of the different types of rainy weather often with great intensity, causing wide spread flooding, destroying crops and property, seriously affecting the lives and activities of the regional people.

Analysis result and statistics of annual precipitation (to 2013) at An Chi station are shown in the following table:

Table 4-2: Frequency-based annual precipitation

Xo*(mm)*	Cvx	Cs	P%			
			25%	50%	75%	85%
2,566.7	0.27	0.81	2,968	2,475	2,065	1,876

Maximum daily precipitation at An Chi station:

Table 4-3: Frequency-based maximum daily precipitation

Xomax *(mm)*	Cv	Cs	P%			
			0.5%	1.00%	1.50%	2%
226.3	0.54	2.16	771.3	677.6	623.7	585.9

- **Characteristics of river network:**

Density of river network in the basin is relatively small (1.34km/km^2). The streams usually have large flows in the rainy season and very little water in the dry season. Especially, the small streams sometimes are in the absence of surface runoff. The streams are shallow and slope. In the flooding season, high rate floweasily cause landslide and swept away all obstacles on its way.

b. Topography

The topography of the sub-project area is highland mountainous terrain of Nghia Hanh district with elevation from 100m to 1000m.

The Rau river basin is surrounded by mountain range with the elevation of 500÷100m. Vegetation covering the basin is mainly regenerated forest such as acacia, eucalyptus and a part of primary forest. Reservoir expansion upstream and contraction at the Earth dam terminal. The reservoir formed by the surrounding mountains to the west basin. Bottom elevation of the reservoir ranges from 18.5m to 28.5m. Width of the reservoir ranges from 200 to 400m, the average length is about 500m.

Irrigation area is located downstream, along the Rau banks and a part of the left bank extends northward Say.The irrigation area is about hundreds ha that stretches from the bottom of mountain to the banks of Ve river.

Overally, irrigation area islarge and flat. Terrain is high at the west and lower eastward. This is suitable for arranging irrigation canal system in the sub-project. However, the irrigation area stronglydissected by the system of roads, rivers, culverts. Therefore, we have to arrange many works such as road culverts, trough bridges, siphon in the irrigation system. Especially, the irrigation area on the left bank is distributed extensively and unconcentrated. This makes arrangement of irrigation system is difficult.

c. Geology

Based on the results of exploration and soil samples for physical parameters, stratigraphy of the ground layer as followed:

Layer 1: Old dam backfill: Sand, dust, clay mixed with the weathered aggregates and fragments; averagely plastic (SICMC-G), reddish-brown, chicken liver purple. Main composition is sand, dust, clay and some friable, soft, weathered aggregates and fragments. In natural conditions, soil is wet and saturated; humidity and state change based on the half-hard – plastic hard depth; averagely - weakly permeable $K=4.6x10^{5}$cm/s.This layer distributed along the old dam, thick about 12.0m.

Layer 2: Sand, dust, clay mixed with gravels; low plastic (SIMC-G), yellowish-brown. Main composition is sand, dust, clay and few quartz gravels. In natural conditions, soil is saturated, in rigid, plastic state; weakly permeable $k=3.7x10^{-5}$. Origin: alluvium-accumulation in stream bed aQ_2^3. The layer distributes in the scope of stream bed and earth dam foundation, with average thickness of 1.0m.

Layer 3: Pebble and gravel mixture containing organic, soaked sand (CoGS-O); bluish-gray – dark gray. Main composition is pebbles, gravels, coarse-grained sand and few round boulders with small edge dimension of 0.1m – 0.15m which distribute

unevenly in the layer. In natural conditions, soil is saturated, of medium tight structure, permeable strongly k=8,3x10^{-2}cm/s. Origin: alluvium-accumulation in stream bed aQ_2^3. The layer distributes along stream bed and terrace, dam foundation; its thickness varies from 3.0m in the dam to 3.9m in the spillway end.

Layer 4: Sand, dust, clay mixed with the weathered aggregates and fragments; low plastic (SLMC-G); reddish-brown, yellowish-brown spots. Main composition is sand, dust, clay and friable, soft, weathered aggregates and fragments. In natural conditions, soil is saturated, in rigid, plastic state, averagely permeable K=5.6x10^{-5}. Origin: eluvial slope aQ_2^3. The layer distributes mainly on the surface of hillside (dam shoulder, sill), with the thickness of 4.2m.

Layer 5: The zone is completely weathered (C.W); most rocks tranform into soil in the form of sand, dust, clay mixed with aggregates, gravels; low plastic (SLMC-G); brown, reddish-brown, chicken liver purple; soft, plastic state, averagely permeable K=7.2 x10^{-5}cm/s. The layer distributes mainly in the area (dam foundation and right dam shoulder), with the thickness of 3.8m.

Layer 6: The zone is strongly weathered (H.W); rock's color is changed; rocks transform into soil in the form of sand, dust, clay mixed with aggregates, gravels; low plastic (SLMC-G); the level of weathering is not even, in some places, a number of friable, soft or relatively hard aggregates and clots remain. However, the structure and composition of bedrock is unchanged; averagely permeable K=2.6x10^{-4} cm/s. The layer distributes mainly in the area, with the undeterminedly large thickness due to the limited investigation depth.

Layer 7: Averagely weatheredbiotite- quartz schist (M,W); rock's color is changed; rocks are hard, strongly cracked; bluish-gray – dark blue. The structure of primary rock is complete, cracks develop toward many directions, at the gradient of 10^0- 20^0 and 40^0. Rocks are brittle; cracks are often easily separated; several mm-3mm open cracks are filled by iron oxides and sand, clay.

Potential risks in the sub-project area are mainly landslides and soil erosion.

4.1.2. Water environment

- ***Surface water***

In the Hanh Tin Tay commune, there is no water source to serve the living. Most people use water for irrigation is taken from Dap Lang reservoir.

Dap Lang reservoir has a capacity of about 362 561 m^3 water initially planned to

irrigate 10ha of arable land but only enough to irrigate 60ha of rice in the Winter-Spring season, Summer-Autumn season is often not enough water. In the sub-project area, status of irrigation has three irrigation works are part of the irrigation. Because of less water, irrigation canals are soil, therefore dry conditions often occur. Especially, in the dry season, all the dams is without water. Status of dams, canals and irrigated area is presented in the following Table.

Table 4-4: Status of irrigation system in the sub-project area

No.	Dams	Irrigated area (ha)	Dam types	Irrigation status
1	Lang	60	Soil	Water scare in two seasons
2	Dong Cau	Belong to Dap Lang	Concrete	
3	Yen Hoa pump station	5	Pump station: 1 machine	Irrigation canal is too slow
		65		

Table 4-5: Actual irrigated area of the whole commune and beneficial area

Plant structure	Spring crop		Autumn crop		Farm produce	
	Area (ha)	Productivity (ton/ha)	Area (ha)	Productivity (ton/ha)	Area (ha)	Productivity (ton/ha)
Whole commune	185	62	160	62	220	7
Beneficial area	52	62	40	62	30	7

In order to assess status in the sub-project area, the consultant collected four water samples for biological, physical and chemical parameters.

a. Sampling sites:

Table 4-6: Sampling sites for surface water

No.	**Samples**	**Coordinates**		**Time**		**Positions**
		X	**Y**	**1st**	**2nd**	
1	NM1	14°56'11.62"N	108°45'25.67"E	05/02/2015	18/03/2015	On the left of the reservoir
2	NM2	14°56'6.66"N	108°45'26.49"E	05/02/2015	18/03/2015	On the right of the reservoir
3	NM3	14°56'12.55"N	108°45'31.32"E	05/02/2015	18/03/2015	Dam slope near to flood spillway
4	NM4	14°56'9.78"N	108°45'27.83"E	05/02/2015	18/03/2015	Middle of the reservoir

Source:Field data

b. Analyzed parameters (12 parameters):

The following parameters were analyzed: pH, DO, Total Suspended Particles (TSP), BOD_5, COD, NO_2^-, NO_3^-, Crom III, Crom VI, Amoni NH_4^+, Coliform, E. Coli.

c. Regulations for comparison:

The results of surface water analysis is compared to the National Technical Regulations for surface water QCVN 08:2008/BTNMT.

Level A2 for living purpose but have to be treated.

Level B1 for irrigated purpose.

Table 4-7: Analysis results on surface water in the sub-project area

No.	**Parameters**	**Unit**	**QCVN 08:2008/ BTNMT Cột B1**	**NM1**		**NM2**		**NM3**		**NM4**	
				1st	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**
1	pH	-	5,5-9	7,1	7.0	6,8	6,9	6,8	7,0	6,9	7,0
2	DO	mg/l	≥ 4	4,8	4.9	5,0	5,1	6,2	6,1	4,9	5,1
3	TSS	mg/l	50	36	37	36	37	37	38	31	32
4	BOD_5	mg/l	15	4.1	3.8	3.7	3.8	3.6	3.5	3.7	3.9
5	COD	mg/l	30	27.3	27.1	27.1	29	28.1	27.8	28.2	28.4
6	NO_2-	mg/l	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
7	NO_3-	mg/l	10	4.3	4.5	4.3	4.4	4.2	4.3	3.7	3.8
8	Crom III (Cr^{3+})	mg/l	0.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
9	Crom VI (Cr^{6+})	mg/l	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
10	NH^{4+}	mg/l	0.5	0.25	0.21	0.31	0.30	0.34	0.33	0.29	0.31
11	Coliform	MPN/ 100ml	7500	460	500	1500	1470	1490	1510	1460	1450
12	E,coli	MPN/ 100ml	100	28	25	35	37	39	42	35	34

Source: Field data

d. Remarks:

The results of water samples at four locations in the reservoir is compared to QCVN 08:2008/BTNMT column B1 (applied for irrigation purposes irrigation). It shows:

The analysis parameters are reached surface water quality standards for irrigation.

Water in the reservoir is neutral and pH value ranging from 6.8 to 7.1. DO values are over 4.0. Particularly, at the 3rd sampling location that near the overflow outlet, water flow moves faster than the rest part of the reservoir. This facilitates the oxygen dissolved in the water, here so DO is higher.

Because the water in the reservoir moves with small speeds (<0.01m/s). Therefore, the reservoir becomes a sedimentation tank that settling most of the large size suspended particles to the bottom. Concentration of suspended particles at 4 sampling locations meets the standard QCVN 08:2008/BTNMT.

The remaining parameters such as COD, BOD, NO2, NO3 ... Coliform, E. coli meet the standards of MONRE for irrigation.

Through two observations, it is found that water quality in the reservoir is relatively stable, and has not much change in quality and components of pollutants in water. Water in the reservoir can be assessed that is fresh, ensuring the safety for the lives and development of aquatic flora and fauna.

- ***Ground water***

a. Sampling sites:

Table 4-8: Sampling sites for ground water (water from wells)

No.	**Samples**	**Coordinates**		**Time**		**Position**
		X	**Y**	**1st**	**2nd**	
1	NN1	14°55'34.32"N	108°45'56.76"E	06/02/2015	19/03/2015	Well in householdin Tan Phu 1 village
2	NN2	14°55'55.34"N	108°46'16.98"E	06/02/2015	19/03/2015	Well in householdin Tan Phu 2 village
3	NN3	14°56'33.02"N	108°46'13.30"E	06/02/2015	19/03/2015	Well in householdin Tan Hoa village

Source:Field data

b. Analyzed parameters:

The following parameters were analyzed: pH, hardness, solids, COD, NO_2^-, NO_3^-, Cl^-, Crom VI (Cr^{6+}), Amoni (NH_4^+), and Sunfat (SO_4^{2-}).

c. Regulations for comparison:

The results of surface water analysis is compared to the National Technical Regulations for ground waterQCVN 09:2008/BTNMT.

Table 4-9: Analysis results on ground water in the sub-project area

No.	**Parameters**	**Unit**	**QCVN 09:2008/**	**NN1**		**NN2**		**NN3**	
				1st	**2nd**	**1st**	**2nd**	**1st**	**2nd**
1	pH	-	5.5-8.5	6.9	7.0	7.1	7.2	7.2	7.1
2	Hardness($CaCO_3$)	mg/l	500	103	105	114	110	111	115
3	Total solids	mg/l	1500	95	94	94	95	97	98
4	COD	mg/l	4	3.1	3.0	3.2	3.1	3.4	3.3
5	NO_2-	mg/l	1.0	0.08	0.07	0.12	0.12	0.13	0.12
6	NO_3-	mg/l	15	3.9	4.1	3.5	3.4	3.7	3.5
7	Clorua (Cl^-)	mg/l	250	34.7	34.9	36.9	37	32.9	32.5
8	Crom VI (Cr^{6+})	mg/l	0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
9	Amoni (NH_4^+)	mg/l	0.1	0.03	0.03	0.03	0.03	0.03	0.03
10	SO_4^{2-}	mg/l	400	34.1	35.0	33.2	34	29	29.4

Source:Field data

d. Remarks:

There were six groundwater samples that were analyzed at 3 different positions and two different times. The results is compared to QCVN 09:2008/BTNMT on ground water quality standards. All parameters are below the permitted level showing the quality of ground water in this area is good and not affected by the economic activities. The quality of ground water is still clean by low-density population and high density of the vegetation that contains thick layers of root filtering and keeping waste.

The analysis results at three different locations in the Tan Phu 1, Tan Phu and Tan Hoa villages show that the parameters reached at very low value as compared tothe standard. This water can be used for domestic purposes.

4.1.3. Air environment

a. Sampling sites:

Table 4-10: Sampling sites for air environment

No.	Samples	Coordinates		Time		Position
		X	Y	1st	2nd	
1	KK1	14°56'11.09"N	108°45'31.87"E	05/02/2015	18/03/2015	Dam slope
2	KK2	14°56'7.59"N	108°45'37.89"E	05/02/2015	18/03/2015	Household along the roads, Tan Phu 2 village
3	KK3	14°56'1.11"N	108°45'57.17"E	05/02/2015	18/03/2015	Household along the roads, Tan Phu 2 village
4	KK4	14°55'54.54"N	108°46'16.38"E	05/02/2015	18/03/2015	Household along the roads, Tan Phu 2 village

Source:Field data

b. Analyzed parameters: Noise (Leq), TSP, CO, SO_2, NO_2, Pb

c. Regulations for comparison

The results of air analysis is compared to the National Technical Regulations:

Noise: the National Technical RegulationsQCVN 26:2010/BTNMT

For surrounding air: QCVN 05: 2013/BTNMT: the National Technical Regulations for surrounding air quality averaged for 1 hour.

Table4-11: Analysis results on the air in the sub-project area

No.	Parameters	Unit	QCVN 05: 2013/ BTNMT	KK1		KK2		KK3		KK4	
				1st	2nd	1st	2nd	1st	2nd	1st	2nd
1	Noise (Leq)	dBA	60	38.1	38.2	41.2	40	44.3	44.2	42,2	42.2
2	Total suspended particles (TSP)	µg/m^3	300	90	89	140	135	140	145	150	145
3	CO	µg/m^3	30000	KPH	KPH	600	620	700	730	800	780
4	SO_2	µg/m^3	350	KPH	KPH	KPH	KPH	KPH	KPH	KPH	KPH
5	NO_2	µg/m^3	200	KPH	KPH	KPH	KPH	KPH	KPH	KPH	KPH

Source:Field data

Note: KHP: not yet observed

d. Remarks:

The analysis results in above table shows thatair quality in the sub-project area is frech. All the parameters analyzed at 4 sites is lower than the limit of Vietnam standard. Monitoring results also indicates that the air quality is stable over time and most of the parameters have not changed much between two observations.

At site 1, air quality in the area of the current dam slope is the best because of the absence of population, roads and much of trees. In this area, CO, NO2, SO2 is not detected, while TPS concentration is the lowest as compared to others.

At the sites 2, 3 and 4, there are households along the road. This is the reason makes concentration of dust in the air higher. CO is detected at the low concentration. NO2 and SO2 is not observed because of less transportation activities.

For the area at the existing dam and the one is expected to upgrade, air quality is good. The concentration of parametersis many times lower than QCVN 05:2013/BTNMT.

4.1.4. Soil environment

Table 4-12: Land user structure in the whole commune and beneficial area

Land user structure	**Natural land (ha)**	**Forest area (ha)**	**Residential land (ha)**	**Waste land, rivers, ponds (ha)**	**Agricultural land (ha)**
Whole commune	3,925.29	2,928.22	35.24	84.52	573.02
Beneficial area	1,177.59	796.85	11.41	16.50	216.73

Sub-project area is located in the Highland of Ve River. The focal works is about 2km far from the left bank of Ve river. Previous studies showed that there are about six soil types in this area. The mountainous area has all kinds of red and yellow soils on metamorphic rocks and clay, occupying most of the area. The plain land area has soil types such as sand, silt, gray soil and yellow-red soil. Gray soil is popular in the highland. Black and yellow-red soils are widely distributed in the mountainous area. There are seven levels in the sub-project area:

+ **Layer** 1: Sand, dust, clay mixed with the weathered aggregates and fragments; averagely plastic (SICMC-G), reddish-brown, chicken liver purple. Main

composition is sand, dust, clay and some friable, soft, weathered aggregates and fragments.

+ **Layer**2: Sand, dust, clay mixed with gravels; low plastic (SIMC-G), yellowish-brown.

+ **Layer 3:** Pebble and gravel mixture containing organic, soaked sand (CoGS-O); bluish-gray – dark gray.

+ **Layer 4:** Sand, dust, clay mixed with the weathered aggregates and fragments; low plastic (SLMC-G); reddish-brown, yellowish-brown spots. Main composition is sand, dust, clay and friable, soft, weathered aggregates and fragments.

+ **Layer 5:** The zone is completely weathered (C.W); most rocks tranform into soil in the form of sand, dust, clay mixed with aggregates, gravels; low plastic (SLMC-G); brown, reddish-brown, chicken liver purple.

+ **Layer 6:** The zone is strongly weathered (H.W); rock's color is changed; rocks transform into soil in the form of sand, dust, clay mixed with aggregates, gravels; low plastic (SLMC-G).

+ **Layer 7:** Averagely weatheredbiotite- quartz schist (M,W); rock's color is changed; rocks are hard, strongly cracked; bluish-gray – dark blue.

- Soil in material stations:

+ Station 1 (inside reservoir): clay sand and small weathered pieces of stone, plant roots, organic materials that is thick from 0.2 to 0.4m.

+ Station 2 (mountain): clay sand and small pieces of stone, organic materials that is thick from 0.2 to 0.3m.

+ Station 3 (low mountain): clay sand and small pieces of stone, organic materials that is thick from 0.2 to 0.3m.

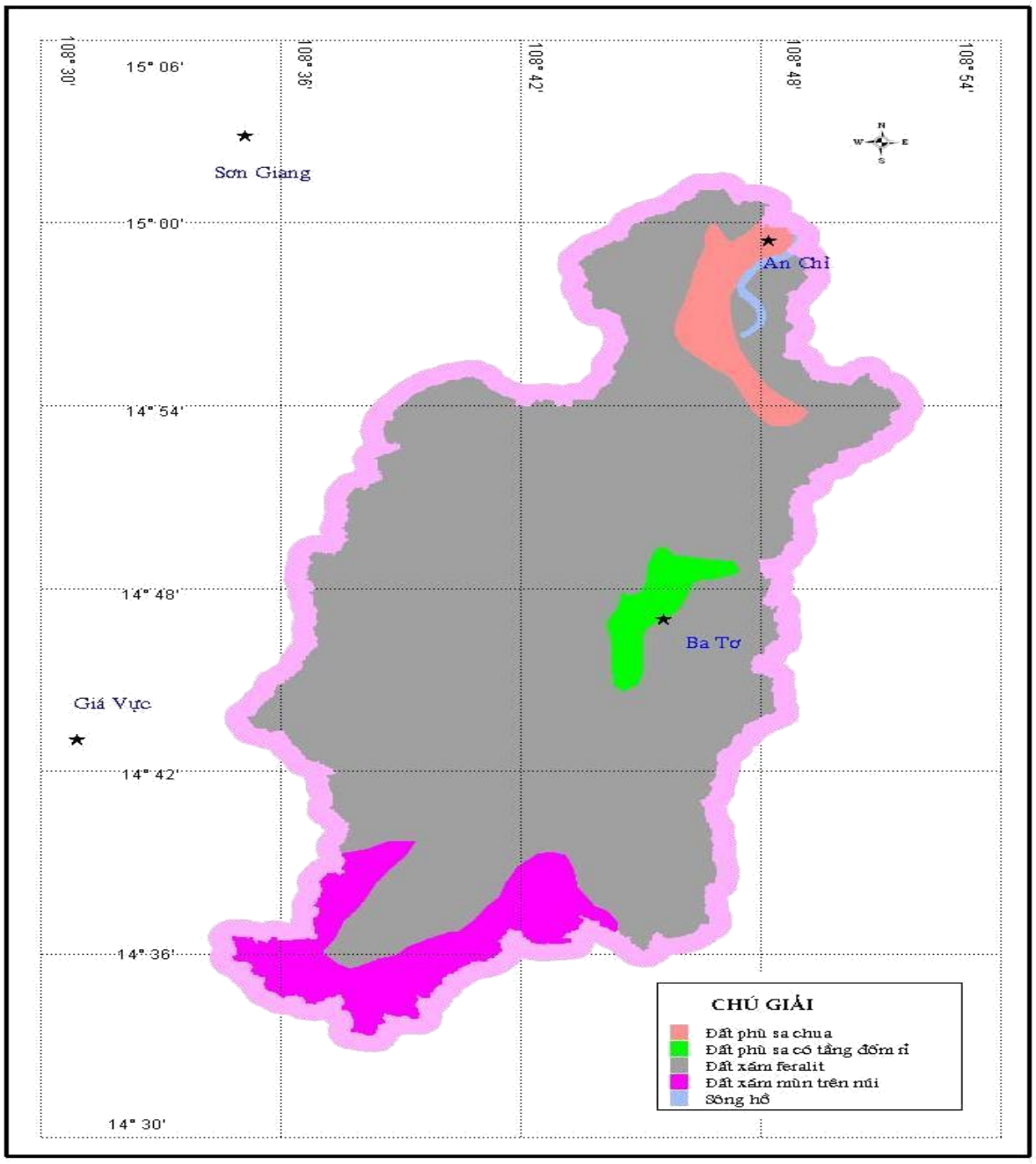


Figure 4-1: Soil map in Ve river basin, An Chi station.

Table 4-13: Characteristics of soil

Name of stations	**Particle percentage (%)**			
	Clay	**Dust**	**Sand**	**Gravel, grit**
Station 1	20.67	19.44	41.72	18.17
Station 2	17.39	15.11	32.93	34.57
Station 3	16.15	12.78	32.96	38.11

Sampling and analysis:

a. Sampling sites:

Table 4-14: Soil sampling sites

No.	Samples	Coordinates		Time		Positions
		X	Y	1st	2nd	
1	D1	14°56'13.13"N	108°45'25.39"E	06/02/2015	19/03/2015	On the left of the reservoir
2	D2	14°56'7.58"N	108°45'29.22"E	06/02/2015	19/03/2015	On the right of the reservoir
3	D3	14°56'10.34"N	108°45'33.22"E	06/02/2015	19/03/2015	Existing earth dam

Source:Field analysis

b. Parameters:

Analyzed parameters: Asen (As), Cadimi (Cd), Copper (Cu), Lead (Pb), Zinc (Zn).

c. Regulations for comparison:

Results of soil analysis is compared to the National Technical Regulations for the permissible limits of heavy metals in soil QCVN 03:2008/ BTNMT.

Table 4-15: Results of soil analysis in the sub-project area

No.	Parameters	Unit	QCVN 03:2008/ BTNMT	D1		D2		D3	
				1st	2nd	1st	2nd	1st	2nd
1	Asen (As)	mg/kg dried soil	12	1.02	1.07	1.07	1.07	1.03	1.03
2	Cadimi (Cd)	mg/kg dried soil	2	0.48	0.47	1.02	1.07	0.46	1.06
3	Copper (Cu)	mg/kg dried soil	70	40.34	40.33	45.33	45.32	40.35	42.33
4	Lead (Pb)	mg/kg dried soil	100	24.55	24.27	27.27	27.28	25.29	25.28
5	Zinc (Zn)	mg/kg dried soil	200	32.00	32.02	33.02	33.00	32.00	33.00

Source:Field data

d. Remarks:

Through the analysis of 03 soil samples in different locations in the sub-project area and compare with QCVN 03:2008/BTNMT National technical regulation on permissible limits of heavy metals in the soil, the analysis criteria are well below the allowed level, indicating the quality of the soil in this area is still good, not much affected by the economic activities. Soil in the sub-project area is suitable for agricultural cultivation, forestry and in fact is forestland, partly agricultural land.

Arsenic is relatively homogeneous at all threesites, approximately 1mg/kg dry soil and much lower than the standard.

Area of the right reservoir has concentration of copper, lead, zinc, cadmium that are higher than that at remaining sites, but inconsiderably different and still in the range of allowance according to QCVN 03:2008/BTNMT.

4.2. Biological environment

4.2.1. The flora

The covering vegetation in the basin is mainly reforested such as acacia, eucalyptus and a part of primary forest. The vegetation in upstream reservoir is mainly reforested with a part of primary forest and a small portion of cultivated area. On the roof of upstream and downstream reservoir, grass is overgrown followed by eucalyptus and perennial timber planted on the two abutments of the hillsides. Underwater flora includes freshwater plants like algae, seaweed.

The economic importance of the plants:

- Plants: Acacia, eucalyptus is grown mainly because of their economic significance for the local people

- Annual crops: Rice and maize are the main crops in the sub-project area.

4.2.2. The fauna

The results of the survey show that the fauna in the sub-project area did not show up its abundance. The terrestrial fauna is mainly cattle, pigs and buffalos in addition to raised ducks, chickens… The underwater fauna includes traditional freshwater fish like tench, grass carp, unisex perch and crustaceans such as shrimp, crab…

In the sub-project area, there is no kind of flora and fauna listed in the Red book.

Protected area: The sub-project area is of Nghia Hanh district with no area that needs to be protected on environment and ecology.

4.3. Socio-economic and cultural characteristics

4.3.1. Population

Hanh Tin Tay is a mountainous commune in Nghia Hanh district, population in the whole commune is 5,403 people with 1,309 households, including 4,825 Kinh people and 611 people from other nationalities.

- Number of people living by agriculture : 4,811 people.

- Number of main workers: 3,570 people.

Total poor households: 239 households with 722 people accounts for 18.26%. This rate is quite high as compared to average of the whole country.

Beneficial area: is in the territory of 3 villages in Hanh Tin Tay commune including Tan Phu 1, Tan Phu 2, Tan Hoa; a small part of Phu lam village is in Hanh Thien commune. The estimated population in the beneficiary area is 1,370 people with 346 households; the population living by agriculture is 1,315 people. Number of main workers is 959 people, female workers account for 450 people. Total poor households are 47 households with 185 people.

- Beneficial area is mainly in Hanh Tin Tay commune which is one of the poor communes in Nghia Hanh district, Quang Ngai province. Income of local residents in the beneficiary area primarily depends on agriculture without any other revenue. Besides, agriculture production is underdeveloped, focues on water rice production, with low productivity due to the unproactive irrigation water source.

4.3.2. Socio-economic status

4.3.2.1. Overview of socio-economic in the sub-project area

The production value of the sectors in Hanh Tin Tay has increased since 2012-2014, the details as follows:

The total value of production in 2012: 57,877 billion VND, accounted for 98% of the target in the resolution, increased by 5.9% over the same period; in which: the value of agriculture-forestry-fishery sector was 54,130 billion VND, accounted for 97.6% of the target in the resolution, increased by 4.8% over the same period; the value of construction industry was 1.69 billion VND, accounted for 112.8% of the target in the resolution, increased by 0,7% over the same period; the value of trade-service sector was 2,057 billion VND, accounted for 98.8% of the targeted, increased by 28.6% over the same period. Income per capital reached 7.5 million VND/person/year.

In 2013: 63.2 billion VND, accounted for 102% of the target, increased by 6.7% over the same period; in which: the value of agriculture-forestry-fishery sector was 59.3 billion VND, accounted for 102% of the target, increased by 6.4% over the same period; the value of construction industry was 1,8 billion VND, accounted for 103% of the target, increased by 12.5% over the same period; the value of trade-service was 2.1 billion VND, accounted for 100.5 % of the target, increased by 10,5% over the same period. Income per capital reached 9.5 million VND/person/year.

In 2014, the production value was 67 billion VND. In which: the value of agriculture-forestry-fishery was 62.71 billion VND; the value of construction industry was 1.99 billion VND; of trade-service was 2.31 billion VND. Income per capital reached 13 million VND/person/year.

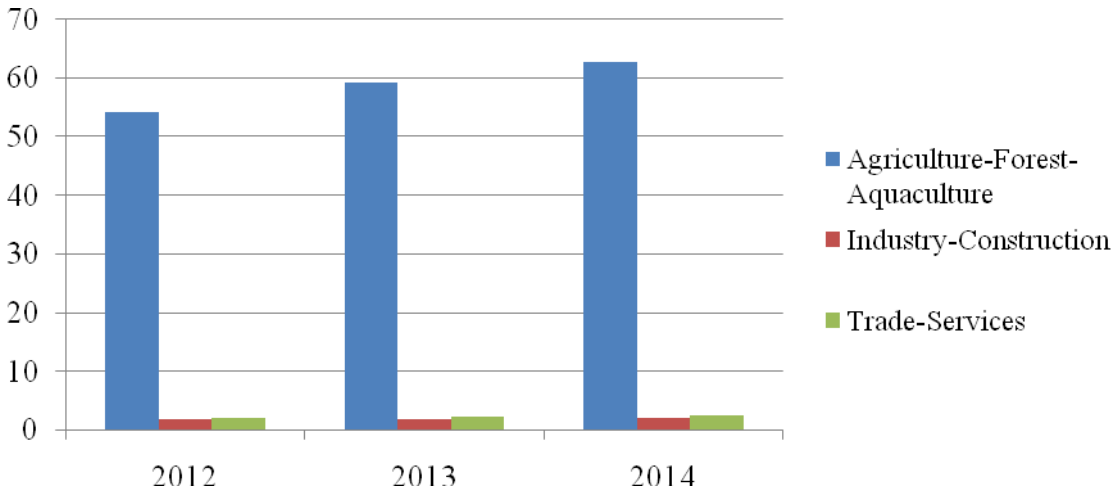


Figure 4-2: The structure of the economy in the 3 year of 2012 – 2014 (Unit: billion VND)

The sector taken the key role in the area is agriculture-forestry-fishery (about 93% of the economy), followed by trade-service sector and ultimately the construction industry.

The economic status in 2014 is shown as follows:

Economic sector

a. Agriculture, forestry and fishery sector

+ Agricultural production: The value of agricultural production was 55 billion VND.

+ Cultivation: The production value was 23 billion VND. The total cereal output was 2,816 tons, in which rice production was 1,720 tons and corn production was 1.096 tons.

- *Rice:*

+ Winter- Spring season: Sowing area was 172.5 ha with the yield of 6583 kg/ha, the output of 1,135.5 tons.

+ Summer-Autumn season: Sowing area was 98 ha, with the yield of 5970 kg/ha, the output of 585 tons.

The total area of sowing rice was 270.5 ha, with the yield of 6360 kg/ha and the output of 1.720 tons.

- *Corn:* the area of 176/150 ha with the yield of 6200 kg/ha, the output of 1.099 tons, accounted for 115% of the target.

- *Peanuts*: the area of 36/30 ha, with the yield of 2230 kg/ha and the output of 80.4 tons.

- *Wheat:* the area of 40.1/140 ha, the yield of 19300 kg/ha, the output of 775 tons.

- *Sugarcane* in crop year of 2013-2014: The area of 12.8 ha, the yield: 62 tons/ha, the output: 793.6 tons. Crop year of 2014 -2015: the planted area of 11.6 ha.

- *Vegetables*: The area of 21.5 ha, the yield of 11600 kg/ha, the output: 249 tons.

- *Beans:* The area: 38 ha, the yield: 2270 kg/ha, the output: 86.2 tons.

+ Livestock- Veterinary: The total number of livestock was 5.980/5.920; including 2,250 cows, 1,800 bred cows, 430/420 buffalos; 3,200/3,300 pigs, estimated 25,000 poultry.

+ Agricultural extension: Implementing the conversion planting model from the rice cropping area that experienced of water shortage to planting peanuts (3ha) or planting maize (3ha) (Tan Phu 1, Phu Khuong).

+ Maintenance, exploitation and forest protection: The value of forestry production was 7.5 billion VND. The total area of concentrated forestation was 245 ha, scattered plantation was 20,000/15,000 with 71% forest cover.

+ Aquaculture: The area for aquaculture was 10,2ha, with the yield of 14/14 tons and the output of 2/4.5 tons, mainly cropping of trench, tilapia in small-scale farming households and 2 irrigation reservoirs.

b. Industry, trade services, basic construction and rural transport

- Industry – Trade services: The value of industrial production and basic construction in 2014 was 1.99 billion VND.

Thank to the encouragement of businesses and trade development, the additional survey of business planning in the commune and the coordination of all levels and sectors to strengthen the inspection of cargo handling of the poor quality products or fakes, the fraud and food poisoning was curbed in the province.

- Basic construction: Completed and made use of Lung Ke water work in Trung Ke 1 with the funding of 250 million VND; upgrading culvert road over Na Ve Phu Tho bridge with the funding of 100 million VND, 20 million of which was social contribution; 12/12 drilled wells of the Red Cross with the funding of 198,912 million VND, 94,912 million VND of which was social contribution.

- Rural transport: Organizing cleaning activities along transport corridor route DH 57 with the funding of 9 million VND, rural concrete roads with the length of 12 km with the funding of 14 million VND; upgrading inter-village roads with sand pouring against marsh subsidence with the volume of 150m3 and the funding of 15 million VND.

c. Finance

Total revenue was 309,550,000 VND, in which the charging fees: 15,000,000 VND, public land fee: 10,700,000 VND, contribution fee for transport maintenance, fire prevention and protection for the forest: 143,640,000 VND, contribution fee for security and defense: 5,810,000 VND, others: 10,000,000 VND. The subsidy received from district budget: 3,948,014,000 VND, in which balanced subsidy: 1,928,817,000 VND, targeted subsidy: 2,009,197,000 VND; targeted new rural development subsidy: 10,000,000 VND. Total expenditure: 4,242,012,000 VND; in which expenditure for development: 99,699,000 VND and recurrent expenditure: 4,142,313,000 VND.

Total social contribution: 25,880,000 VND; road charging fee in 2014: 55,250,000 VND.

d. Land administration and environment

- Land administration: Completed VLAP sub-project in the commune area; worked in collaboration with the district centre for land development for route clearance along Tan Hoa – Trung Ke 1- Trung Ke 2 road; granted 67 certificates of forestry land use; organized to assign protective forest for local communities with a total area of 588 ha.

- Environment: Regular propaganda for environmental protection and garbage collection held at the central market of the commune, village sites and residential areas to create green and clean landscape. Providing banners and coordinating with the Youth organization in cleaning activities in response to the World Environmental Day (5/6); completed waste collection scheme that was implemented at the begining of 2015.

4.3.2.2. Socio-economic conditions of local people in the sub-project area

a) Socio-economic status from field survey

A socio-economic survey of 103 households in Tan Hoa (26 households), Tan Phu 1 (33 households), Tan Phu 2 (44 households) was conducted in order to gather information and assess socio-economic status of the local people in sub-project area. At the same time, the data collected through the survey was a basis to:

- Design the program on income restoration and general living condition improvement.

- Be the baseline data to compare the lives of those whose land was acquired before and after being compensated and resettled, (the data will be used later for monitoring and evaluation in the period of implementing Resettlement plan).

Demographics

The average number of members of each household in the sub-project area was 4.77 people, which was higher than that of the country: 3.89 people (Statistical Yearbook, 2013). There were differences in the average number of people per household between income groups and groups of male and female-headed households.

Table 4-16: Households in the villages affected by the sub-project

	Tan Hoa	**Tan Phu 1**	**Tan Phu 2**
The rate of population growth (%)	0,3	0,5	0,4
Monthly average income (VNĐ/month)	1.083.000	1.083.000	1.083.000
Ethnics	Kinh	Kinh	Kinh

Source: Field data

Of the total number of surveyed households, rate of male was 52.11% and female was 47.89%. All the people in the s affected by the sub-project are Kinh, no ethnic minorities. Average income was over 1,000,000 VND/month.

Table 4-17: Average family number and labor per household

	Average number of family member per household	**Household structure by size of household member (%)**			
		1-2 ppl	**3-4 ppl**	**5-8 ppl**	**<9 ppl**
Total sample	**4.77**	**11.7**	**32**	**52.4**	**3.9**
Tan Hoa	4.56	3.8	38.5	57.7	0
Tan Phu 1	5.12	18.2	15.2	66.7	0
Tan Phu 2	4.6	11.4	40.9	38.6	9.1
To gender of the head of household					
+ Male-headed	73.8	11.1	32.2	53.3	3.3
+Female - headed	26.2	15.4	30.8	46.2	2.9
To income groups					
Group 1 (poorest)		30.4	13	56.5	0
Group 2		11.2	44.4	44.4	0
Group 3		7.1	28.6	60.7	3.6
Group 4		5.9	41.2	52.9	0
Group 5 (richest)		0	44.5	22.2	33.3

Source: SIA Report, 3/2015

An analysis of the household structure based on demographic scale in the surveyed sub-project area showed that a majority of households had 3-4 people (32%) and more than 5 people (52.4%); a few households had 1-2 people (11.7%) and more than 9 people (3.9%). Tan Phu 1 had the most households having more than five people. Compared to that of Tan Hoa and Tan Phu 1. Thus, survey data showed that the model of family structure with a large number of family members and muti-generational demographics remains high in the sub-project area, indicating a lower level of development in this area compared to others.

Occupation

In the occupational structure of the family members who involved in working activities and earning income in the sampled survey of the sub-project area, those worked in agriculture- forestry- fishery sector accounted for the highest percentage of 42.5%; seconded by pupils and students with 19%. The rest was for other jobs with a small percentage like handicraft (0.6%) and trading services with (1.2%).

Table 4-18: Main kinds of occupation of local people in sub-project area

	Loss of labor	**Agriculture-forestry-fishery**	**Trade, services**	**Officials**	**Pupils, Students**	**Handicraft**	**Hired**	**No jobs**	**Inappropriate**	**Others**
Total sample	**6.3**	**42.5**	**1.2**	**3.3**	**19**	**0.6**	**2.9**	**1.8**	**8.3**	**14.1**
Tan Hoa	0.8	51.7	0.0	3.3	18.3	0.0	0.0	4.2	2.5	19.2
Tan Phu 1	11	37	1.37	4.1	25.3	0.0	3.4	1.37	11	5.46
Tan Phu 2	6.6	43.2	1.8	2.8	16	1.4	4.2	0.9	10.3	13.7

Source: Field data

Thus, agriculture-forestry-fishery was the dominant sector in the economy of the sub-project area with the majority of local workforce. The implementation of the sub-project will increase the area of the irrigated land, leading to more production seasons in a year and diversifying other jobs rather than horticulture (such as husbandry, trades and other jobs that require water); thereby increasing jobs and eliminating unemployment in the sub-project area. On the other hand, there might be significant negative impacts on the livelihoods of the households who are currently relatively stable and have land acquired once reasonable measures in design, construction and compensation is not effectively implemented.

Information of the affected households (AH)

The sub-project of upgrading and construction of Dap Lang reservoir is conducted in the Hanh Tin Tay commune, Nghia Hanh district, Quang Ngai province. The implementation of the sub-project will induce long-term impacts to 13,778m^2 of agricultural land and forestland of 22 households in Tan Phu 2; one household will be affected on their area for aquaculture and 226 households will be affected on their agricultural land once the reservoir is repaired due to the lack of water for agricultural production. No household are ethnic minorities.

Table 4-19: General information of the affected households

No	Information	Unit	Amount	Percentage *(%)*
1	**Total number of affected households when constructing the reservoir**	**Household**	**23**	
2	**Total number of affected households when water is cut for reservoir construction**	**Household**	**266**	
3	**Number of affected people when constructing the reservoir**	**ppl**	**118**	
	Male	ppl	65	55.1
	Female	ppl	53	44.9
3	**Age of affected people**			
	Under 18 years old	ppl	24	20.3
	From 18 to 60	ppl	78	66.1
	Over 60 years old	ppl	16	13.6
4	**Ethnics**			
	Kinh	ppl	115	100.0
5	**Marital status**			
	Single	ppl	50	42.4
	Married	ppl	63	53.4
	Divorced	ppl	0	0.0
	Separated	ppl	0	0.0
	Widowed	ppl	5	4.2

Source: SIA Report, 3/2015

Of the total 23 affected households, there are 118 people with 55.1% male and 44.9% female. All of the affected people in the 23 household are Kinh with no ethnic minorities.

The majority of affected people have families, with the proportion of affected people got wife/husbands is 63 people accounted for 53.4%, followed by singles with 50 people accounted for 42.4% and 5 widows for 4.2% due to old age; no case of separation or divorce in the total 118 affected people.

Besides of 23 households being directly affected due to the loss of land for production or agriculture, there will be about 266 households being indirectly affected due to water cut during the construction process.

Education

Approximately 90% of the population in the sub-project area having educational level from elementary school to college/university or higher, in which the number of people graduating secondary and high school accounted for more than 50%. The percentage of people with educational level from college/university or higher accounted for 13.7%. The illiteracy rate is 0.4% and preschool for 1.6%. In general, educational level of the households in the sub-project area is relatively high, compared to the average in Quang Ngai province, creating favorable conditions for economic development of the households, especially for the application of scientific and technological advances in production and job change.

Table 4-20: Educational level of three villages in the sub-project area

	The highest level of education								
	Illiteracy	Primary	Secondary	High School	Intermediate	College/ University or higher	Preschool	Donot know	Total (%)
Total sample	0.4	22.6	29,3	21.1	3.3	13.7	1.6	8.0	100
Communes									
Tan Hoa	0.0	20.7	41.4	14.7	7.7	11.2	4.3	0.0	100
Tan Phu 1	0.0	21.8	21.8	24.3	0.0	21.2	10.9	0.0	100
Tan Phu 2	1.0	24.1	28.2	22.2	3.2	9.7	3.7	7.9	100
Income groups									
Group 1 (poorest)	1.0	21.5	24.7	23.7	1.1	16.2	11.8	0.0	100
Group 2	0.8	25.0	24.2	15.0	2.5	17.5	15	0.0	100
Group 3	0.0	30.6	36.8	16.6	2.8	5.6	0.0	7.6	100
Group 4	0.6	19.9	27.6	23.0	5.7	12.2	6.4`	4.6	100
Group 5 (richest)	0.0	9.1	34.6	21.8	3.6	18.2	12.7	0.0	100

Source: Field data

Living standard of the surveyed households

Table 4-21: Self-assessment on living standard of the surveyed households (%)

	Wealthy	Average	Straitened	Poor
Total	1.0	82.5	10.7	5.8
Tan Hoa	0.0	76.9	19.2	3.8
Tan Phu 1	0.0	84.8	6.1	9.1
Tan Phu 2	2.3	84.1	9.1	4.5
+Female-headed households	0.0	53.8	15.4	30.8
+Male-headed households	1.1	86.7	10.0	2.2

Source: Field data

When local people conducted a self-assessment on living standard based on 04 social groups of: wealthy, average, straitened and poor, the percentage of wealthy household in all 3 s was very low; the majority of the households was self claimed to be average; the percentage of straitened in Tan Hoa was higher than that in Tan Phu 1 and Tan Phu 2. The group with average income accounted for more than 80%, which was suitable for actual status of the 3 surveyed sites, with an average income of 13.000.000 VND/person/year based on the size and structure of current local production.

b) Water use and reservoir management

Water use

The reservoir is designed based on annual regulatory regime. Every year, during the rainy season, it stores water up to the normal water level to reach the required volume. During the dry season, it supplies water as requirements, until the end of dry season when the water level reached the dead level.

Water for agriculture is taken through water gates into the main channels. From this, water is distributed to households through the lower-level branch canal system. The valve gates regulating the allocation of water for agriculture will be adjusted to be suitable for water volume and level in the reservoir for water savings.

Reservoir management

The management and operation of Dap Lang reservoir were assigned for the Agricultural Cooperatives by the People's Committee of Hanh Tin Tay district. The organization structure involved 04 people with annual contracts. The main person in

charge is the chairman of Agricultural Cooperatives with the assigned responsibilities include:

- To control and check the operation and management

- To regulate the water level

- To clean and dredge main canals

Among the staffs, there was no officer having expertise in irrigation; the only main person in charge participated in the training program on disaster management funded by WB 5; 01 staff participated in the training for survey.

The work had no operation procedures, thus the opening/closing of water gates and monitoring of water volume were mainly based on visual observation and experience.

Monitoring, inspecting and repairing of the work were not regularly conducted in accordance with regulations.

Remarks:

With the scale of the sub-project like Dap Lang reservoir, there needs a management unit, which has sufficient number of staffs with suitable expertise on dams. The management and operation procedures need to be established and complied. There requires annual inspection, review, report and propose plans for the repair of the damages and regular maintenances of equipments. There also needs a plan for flood prevention and rescue in the rainy season and in case of emergencies.

c) Dam safety

With the current structure, the roof of the dam will continue to erode and might induce the dam endangered under the impact of waves.

Plants growing too much on the roof of the dam, especially large trees, will facilitate animals to burrow and reside; the decaying tree roots create voids, affecting the safety of the dam's seepage and limiting the visibility while checking.

The residence of local people in the work area as well as the plantation of large trees and the presence of termites may increase the risks of destabilizing the dam, thus the relocation solutions is needed.

The overflow wall of the dam was built of stone over a long time; the drainage facilities might be damaged, forming seepage along the wall feet at both internal and external side. Some sites were peeled. The height of the wall was basically low,

resulting to the overflow of land and rocks outside of the wall into water flow; trees were grown into the wall structure. Many eroded holes were created on the two sides of wall due to the surface runoff and seepages. Downstream channel was narrowed and trees were overgrown, limiting water drainage.

4.3.3. Community facilities and infrastructure

a) Health

It has been ensured that the initial medical examination and treatment for people at the station 24 hours per day. General medical visits were 5574 turns, reaching 110.8 % of the plan; the number of fully immunized children was 77, accounted for 100 % of the plan. Specifically, there were 313 children who were immunized measles vaccination- Rubella, reaching 99.1 %; 77 women or 100% of pregnant women got tetanus vaccination; tetanus vaccinations for postpartum women was implemented for 40 women, reaching 129 %. There are 169 children taking vitamin A, reaching 99 %. The prevention of malnutrition of children less than 2 year-olds was applied for 12 children or 12% and for 42 children under 5 years of age, reaching 14 %. The Ho Chi Minh Communist Youth Union of Health Department implemented medical examination and giving drugs for 500 policy- objects and donated gifts to 5 policy- objects.

Medicinal herbal plants garden was developed. Traditional medical doctors with means of traditional medicine were arranged in caring and treating patients. Households were advocated to build three toilets, 970 households have sanitary latrines, reaching 84.8 %. In which, 524 households have septic tanks, reaching 46 % ; the number of households using clean water wells was 810 households, reaching 70.8 % .

Household health survey: There have been nearly 64 % of households with sick people a month ago. This is a high index causing worrying about the health status and condition of health care today. Mostly these diseases at the colds/ flu and diseases of the elderly patients as osteoarthritis pain, etc.. The percentage of patients with health insurance in the household survey is relatively high, accounting for 58.2%. The s with high percentage ratio of health insurance are Tan Hoa and Tan Phu 2. In some places, families often diagnosed and treated at commune health centers, district hospitals, provincial hospitals, hospitals central or self-medication at the pharmacy.

According to the surveyors, there are four main reasons causing negative impacts on the health situation today as followed:

- The unsafe foods, fruits and vegetables

- Pollution of drinking and living water

- Lack of fresh water

- Stagnant water flooding

The implementation of the sub-project of repairing and upgrading the Dap Lang water reservoir will improve the unoptimistic situation about the current health of the local people.

b) Education

Summarizing the academic year 2013 – 2014 shows those secondary school students with excellent results achieved 10.7%, good results reach 27%, and average results reach 40.8%, accounts for 21.5%. In primary school: excellent results achieved 18.4% good results reached 30.2 % and average results was 46%, accounted for 5.4%; Preschool child reached 76 % good. In academic year 2014 – 2015, the number of students going to school were 684 students, including 229 secondary students; 339 primary school students and 116 preschool children in which 72 students were boarding - classes; reducing the dropout rate of less than 1%; continuing the work of education dissemination for Kindgarden, Primary and Secondary schools.

c) Infrastructure

- Electricity supply system: the national grid was pulled to almost the concentration of population points. Number of households used electricity from the national grid was 1309 households with the percentage of households in accessing to electricity from the national grid / total number of households was 100 %.

- Water used in daily life: 3632 people have accessed to clean water at the rate of 71% who used; 29% of the total population has used sanitary water. The used water is drilled water wells.

- Traffic network: Regional transport system relatively completed, facilitating travelling and sub-project implementation.

- The number of houses which are under the standards of the Ministry of Construction was high, mainly as a semi-permanent and easily affected by natural disasters.

d) Tangible and intangible cultural assets

The sub-project area has no historical site, archaeological site and cultural relic.

e) The social and religion organizations

- The Cultural and Sport Information, Red Cross and Radio

+ Culture and Sports: Holding many cultural, information and sport activities to serve the locally political and entertainment tasks. Cutting the tape roll, slogans, refreshing 15 pano boards to serve Tet and other holidays. Organsating the Volleyball tournament to celebrate Giap Ngo Spring and the Party. Organisating an entertainment night in the spring time to fund raising for learning encouragement, with funding support 11.6 million; Joining the movement of cultural arts of the district such as the traditional boat race; 3/2 volleyball tournament; art fairs, sport for minority to won the first prize; Festival Nghia Hanh District vocals; Volleyball tournament festival BVANTQ entire population; Lion dance contest , ...

Organizing culture approval the 9/9 rural family for 839 households, reaching 101.6 %, of which 475 households reached 3 years of cultural households, cultural villages 7/9, 100 %; repairing the cultural building of the village of Tan Phu 1, port of cultural village of Phu Tho, Phu Khuong and procurement of radio and communication equipment; mobilizing people to make good cultural village etiquette in 2014.

+ Red Cross: Implementing the drilling of 12 wells for rural living in Phu Khuong , Phu Tho , Dong Mieu villages , funding 16,576,000VND / well, including provincial Red Cross supports 8,667,000 VND, social contribution: 7,910,000 VND, reaching 100 % of the plan .

+ Radio of the commune: Quote funding to repair social radio system, loudspeaker clusters of villages; frequent receiving radio program from the central, provincial and district to promptly report information to serve the people and radio communication policies of the Party and the laws of the State

- Labor, Invalids and Social Affairs: the living conditions for those policy people were performed well; visits and gifts to motivate children in especially difficult circumstances during Tet were organized; payment of the central, provincial and district policies for funded families were provided. In addition, those with particularly difficult circumstances and ethnic minorities were supplied of rice with the total number of 9.000kg during the Tet holiday.

In addition, the Commune's People Committee has visited and allocated gifts for policy and typically difficult people during the Tet holiday. 1,544 health insurance cards were allocated of for those policy people, the poor, children under 6 year olds and the elders in accordance with Decision 290/TTg– CP. Documents of posthumously hero Vietnamese Mother, profile of peopled needed social protection ; profile of mode

of worship Martyrs were proposed. Youth eloyments were encouraged to participate to labor export exchanges. There were 4 youth registered to exported labor. There were six children with congenital heart who needed screening at hospital Nghia Hanh. Visiting and gifting to children in difficult circumstances on 1st June was implemented.

4.3.4. Gender analysis

Gender work was presented well done at local level. Overall, there was no major gender inequality in the community. The main housework in the family was often done by men and women who together discussed and made decisions. At the local level, women often did the farm work and housework, cleaning the house.

Women and girls have equal opportunities to access social services such as health, education and entertainment. In these families, boys and girls have been treated equally. However, there were still families with thought of gender prejudice, but that does not significantly affect the access to social services locally.

Table 4-22: The population of the there villages in the beneficial area

	Tan Hoa	Tan Phu 1	Tan Phu 2
Number of households	26	33	44
The ratio of population increase (%)	0.3	0.5	0.4
The ratio of female-headed household (%)	4.35	10.87	10.87

The scale of families headed by men was larger than the female-headed household. In Tan Hoa, the percentage of female-headed family accounted for 4.35 %. In Tan Phu 1 and Tan Phu 2, the ratio of female- headed households of each was also accounted for the same percentage of 10.87 %.

Regarding the economic perspective, income level and gender income of women was lower than men's due to specific tasks and the ability of health. The rate of poor households headed by women is higher than men headed households.

- **Property and land use based on gender**

The right decision at the homeowner, residential land often belongs to men. Compared with the previous time, the role of women in decision problems of production, the livelihood of families has an increased movement.

Health: The policy interventions to improve the health of women must not only ensure that women have access to health services, health care appropriate, high

quality, but also to focus on men's behavior and the impact of that behavior on the lives of women. Therefore, raising the awareness and responsibility of men for special health care for pregnant women will create advantages for women to play their role in caring education of children, taking care of family life and to actively participate in social activities. Raising the position of women in society is not to lower, to reduce, or to damage to the social status of men. In contrast, the improved status and lives of women will increase the status and lives of men. That requires us to have specific goals and programs so that each of the achieved progress will be the result of both women and men. Only then can we build a "prosperous, equitable, progressive and happy" family towards a fair, democratic and civilized society.

Education: Women tend to learn less than men do because women have to take the time to look after their children so they have little time to learn. The absence of women's education directly affects the quality of education children. According to statistics, the levels of education of women in the benefited education region are mainly primary school, a few are secondary and high school. Educated men are still mostly secondary and high school.

- **Child labor classified by gender**

Hard and physical work are implemented by men, while women are in charge of the easier but take more time work. Both men and women in the family share other activities in the agriculture, forestry and fisheries, such as the development of vegetation, seeding, mowing and harvesting, but the amount of time spent various chores between the sexes. The amount of time that a woman spent for production, and harvest lasts from 9 to 11 hours/ day, while men contributed from 7-8 hours/day.

In the structure of the family, women have a major role in raising children. Due to ethnic customs, men rarely do household chores. The burden of household work strongly influences to the ability of a woman to go to school or to participate in social activities. Lack of education and training has limited basic knowledge of women, directly affect the quality of care for children.

Regarding the status of women: Obtained the care from the Party and the State along with the outstanding efforts of women themselves, the team of intellectual women of Vietnam is growing strongly in both quantity and quality. The intellectual women have devoted many valuable scientific works to the theory and practical applications in many fields of social life. However, besides the success, many obstacles, barriers, contradictions and challenges remain to limit the position and role of intellectual women. They are the psychological barriers in society to recognize, assess capacity and position of women, etc.; the contradiction between the

performance of the role, functions as a wife, mother, and the role and responsibilities of the scientific and management staff; the contradiction between the increasing and intensive requirements of the market mechanism with the limitations of knowledge, skills, technical expertise, high-tech capture parts of several intellectual women.

Currently, despite the shared decision-making and implementation of the housework, these things mainly are of the wife responsibility. That means the housework - the frequent work and taking much of rest time, is still a burden of women.

With the target is to eliminate gender discrimination and to create equal opportunities for men and women in economic development - social and human resource development, towards substantive gender equality between men and women and strengthening the cooperation and support between men and women in all spheres of social life and family, the XI Congress, law No. 73/2006/QH11 issued gender Equality Act.

Results of the survey of the division of labor in the family are in the following

Table 4-23: Work allocation

Production Activities	**Both male and Female (%)**	**Male (%)**	**Female (%)**
Horticulture (rice, vegetables)	85.07	8.96	5.97
Breed	87.10	4.84	8.06
Afforestation / care / protection of forests	78.72	14.89	6.39
Exploitation of forest products	64.00	12.00	24.00
Fishing and aquaculture	50.00	25.00	25.00
Worker / Employee	68.75	31.25	0.00
Business / trade	0.00	50.00	50.00
Working away (not often at home)	30.00	70.00	0.00
Family Activity	**Both male and female (%)**	**Male (%)**	**Female (%)**
Childcare	66.07	3.57	30.36
Sweeping homes	12.31	4.62	83.07

Cooking / Housewife	8.96	4.48	86.56
Join the community work	**Both male and female (%)**	**Male (%)**	**Female (%)**
Join a community meeting	61.29	16.13	22.58
Join in training production	50.00	25.81	24.19
Activities of political-social organizations	56.45	20.97	22.58
Join in decision-making	**Both male and female (%)**	**Male (%)**	**Female (%)**
Decision-making in spending large amount of money in the family (shopping valuable asset, weddings)	89.55	7.46	2.99
Decision-making in choosing learning and career of children	72.58	14.52	12.90
Decision-making in Investment and production	82.54	11.11	6.35

Source: Field data

The above statistics show that the women remained a key role in activities of the family as caregivers (30.36%), cleaning of houses (83.07%) and cooking/ homemaker (86.56%). The role of women in participating in community work and decision-making is being raised.

4.3.5. Other services

- Houses

Among the surveyed households, there are 92.75 % of households with a semi-solid house, 2.9 % of households with a leaf roof wooden house and 1.45 % of households with a permanent house.

Table 4-24: Types of houses of the surveyed households

No.	Type of houses	Percentage *(%)*
1	Permanent housing	1.45
2	Semi –permanent	92.75
3	Wooden houses with leaf roofing	2.90
4	Simple and temporary house	0.0

5	No home	2.90

Source: Field data

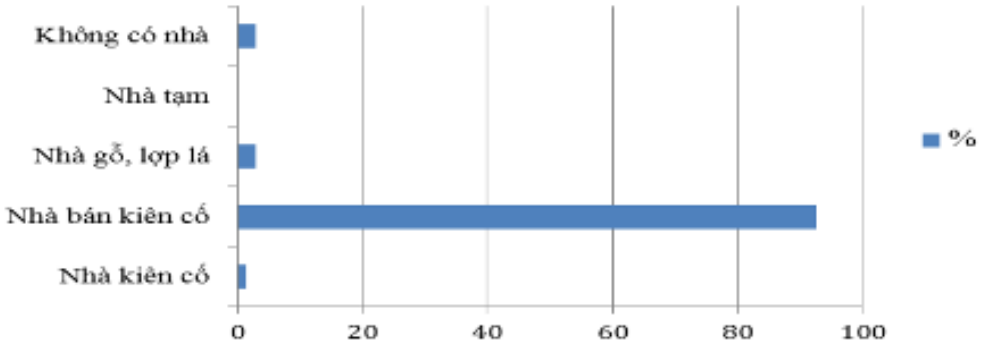


Figure 4-3: Types of houses of the surveyed households

- Water resources

For water used in eating, bathing and production as follows:

- 99 % of surveyed households had drinking water from boreholes and wells

- 99 % of surveyed households use water wells and wells for washing and other daily activities

- 91.13 % of the households surveyed said that source of water for production was from irrigation water from Dap Lang reservoir and 8.70 % came from rivers and canals.

Table 4-25: Water resources for drinking and domestic use of surveyed households

	Rivers/ Canals	**Reservoir**	**Drilled wells**	**Tank water**	**Irrigation**	**Rainfall**
Total sample	0.0	0.0	99	0.0	0.0	1.0
To villages						
Tan Hoa	0.0	0.0	100	0.0	0.0	0.0
Tan Phu 1	0.0	0.0	100	0.0	0.0	0.0
Tan Phu 2	0.0	0.0	97.7	0.0	0.0	2.3
To income groups						
Group 1(poorest)	0.0	0.0	100	0.0	0.0	0.0
Group 2	0.0	0.0	100	0.0	0.0	0.0
Group 3	0.0	0.0	100	0.0	0.0	0.0

Group 4	0.0	0.0	100	0.0	0.0	0.0
Group 5(richest)	0.0	0.0	98.9	0.0	0.0	1.1

Source: Field data

- Toilets

According to economic society survey results, 74.8 % of households have flush / semi- flush toilets. Households with simple toilet (digging in the garden, bridge on lakes, rivers and streams) accounted for 13.6 %; households had two compartments toilets accounted for 10.6%, 1% of households had no toilet. According to survey data from three villages, Tan Phu 2 had the ratio of standard toilet (toilet flush/semi- flush toilets and two compartments) higher rates compared with two other hamplets.

Table 4-26: Households has flush / semi- flush toilets

	No toilet	**Types of toilets**					
		Hygienic standard			**Unhygienic standards**		
		Fush / semi-flush toilets	**Two compartments toilets**	**Total**	**Simple toilet**	**Toilets on lakes, rivers and streams**	**Others**
The total sample	1.0	74.8	10.6	86.4	13.6	0	0
Tan Hoa	1.0	11.7	5.8	18.5	6.8	0	0
Tan phu 1	0	27.2	1.9	29.1	2.9	0	0
Tan Phu 2	0	35.9	2.9	38.8	3.9	0	0
To income groups							
Group 1 (the poorest)	0	78.3	0	78.3	21.7	0	0
Group 2	0	66.7	11.1	77.8	22.2	0	0
Group 3	3.6	57.1	25	85.7	14.3	0	0
Group 4	0	85.3	5.9	91.2	8.8	0	0
Group 5 (the richest)	0	88.9	11.1	100	0	0	0

Source: Field data

- Energy sources

Regarding energy for lighting, 97.10% of households used electricity and 2 households used natural gas, accounting for 2.90%.

Being a mountainous commune, the majority of surveyed households owns forest area so the main source of cooking fuel mainly is wood. 85.51% regularly cooked by wood burning. 13.04 % of the surveyed households used gas. The proportion of regular cooking by electricity accounted for 1,45%.

Table 4-27: Energy sources for lighting of surveyed households

No.	Source of lighting	Percentage *(%)*
1	National grid	97.10
2	Oil	0
3	Gas	2.90
4	Electric batteries, generators, small hydro	0
5	Others	0

Source: Survey data

Table 4-28: The main fuel for cooking of surveyed households

No.	Source of fuel	Percentage *(%)*
1	Firewood	85.51
2	Charcoal	0.0
3	Oil	0.0
4	Gas	13.04
5	Straw , leaves	0.0
6	Biogas	0.0
7	Electricity	1.45
8	Other	0.0

Source: Field data

- Asset and necessities of households

About the assets and necessities of households, the results of a survey of economic - social as follows:

The main asset in the household is radio television, mobile phone, motorcycle/ electric bikes. Other less use assets: cars, washing machines, expensive cabinets, etc..

Table 4-29: The necessities of affected households (%)

	Tan Hoa	**Tan Phu 1**	**Tan Phu 2**

Television	88.5	78.8	99.7
Internet	0.0	3.0	9.1
Motorcycle / electric bikes	80.8	100	84.1
Landline	26.9	3.0	20.5
Mobi phone	92.3	93.9	84.1
Cars (excluding agriculture truck)	0.0	0.0	4.5
Refrigerator	50	42.4	47.7
Air Conditioning	0.0	0.0	0.0
The computer	0.0	3.0	0.0
Washing machine	0.0	0.0	0.0
Gas cook	38.5	30.3	54.5
Water heater	0.0	3.0	0.0

Source: Field data

4.4. Ethnic minorities

The sub-project area does not have ethnic minorities.

PART 5: ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

5.1. Sub-project environmental and social impacts screening

5.1.1. Environmental and social impacts screening

According to the result obtained from environmental and social screening of the sub-project (Appendix A4) and the result from potential impacts screening for environmental and social, outcome s are:

Most potential impacts of the proposed sub-project assessed at medium to low level and reverse able. Following the screening results, required documents to complete Dap Lang sub-project must be done with:

- **ESIA report and its Appendix**
- **Resettlement action plan (RAP) report**
- **Dam safety report**

More information of environmental and social impacts screening in Appendix A4.

5.1.2. Ethnic minority screening

The results of ethnic minority screening showed that there are not any ethnic minority (EM) people living in the sub-project area (including affected communities and beneficiaries). Therefore, it is not necessary to prepare an EM development plan for the sub-project.

A gender analysis was also done as part of the SA to understand underlying gender dimensions to enable gender mainstreaming to promote gender equality, and enhance further the development effectiveness of the sub-project, and the project as a whole. A gender action plan was prepared in the Appendix B6.

5.2. Positive impacts on environment and society of the sub-project

Dap Lang sub-project implementation provides several potential positive impacts to environment and social aspects, they are:

To physical environmental: The repair of the headwork will contribute to regulate the flow of water in rainy and dry season, provide water to agricultural production and domestic use in dry season, increase humid soils, ground water level and storage, support to the local aquatic systems and amphibian's development, improve water balance and ecosystems development. The sub-project also gets the target of risk reduction of Dam, reservoir, flood control, climate change adaptation and micro-climate condition improvement. It will protect forest areas in upper stream of the reservoir and contribute to improve ecosystem and natural biological resources

To Socio-economic development: Stabilizing water irrigation to more than 83ha of arable land of Tan Phu 2, Tan Hoa and Tan Phu 1(presently, there is only 60ha can be irrigated by the reservoir).

Adequate water supply not only increases arable land area but also changes crop structure in high effective production trend. At the same time it creates a favourable condition to develop production activities at downstream area. The local residents may regulate actively water in their paddy field, so they can increase crops in order to improve their income

Impact on society improvement: Rice production is the most common agricultural practice, accounting for 96% of activities. The damaged headwork of Dap Lang reservoir is the main reason affects to economic – social development of the areas. Surveys illustrate that average income within sub-project area communes is very low and often below poverty standards. Most of poverty households think that their situation came from the water deficit to agricultural production. Water supply in winter – spring season is sufficient to crops but countable in summer – autumn season. In the local, 20% of total households are living below poverty level. Hardly, the poverty households in sub-project area can access the local infrastructures and public utility services as well as educational. Approximately 10% of pupil in the areas is not entering the elementary school and lack of basic knowledge. Sub-project area communes are dominated by single women groups, it means that heavier manual labour is carried out by the group in a village. Therefore, with sub-project implementation, creating the opportunity to the group and increase their incomes.

In additional, the access road can be contributed good situation to the local road users and economic development.

5.3. Negative impacts on environment and society

5.3.1. The historical negative impacts and mitigation actions

5.3.1.1. The historical negative impacts

a. Flood events

There are lots of river networks in Quang Ngai province, but almost the rivers and streams are short, high slope and high velocity. Heavy rains in rainy season have caused irregular floods at the receiving catchments led to the flood with high water level at many areas, landslide of river bank, resulting in the destroying of navigation and irrigation constructions, loss of harvest, in turn, led to the adverse impacts on the social security and the living of local people.

The flood occurred in 1999 has destroyed some parts of flood weir, the water level has reached approximately the top level of dam. In 2003, government has invested to repair some parts of weir such as: poured concrete layer thickness of 3 cm to reinforce threshold of flood weir, poured concrete layer in the last segment where water flows to stilling basin but at present the mortar of the threshold has been peeled virtually, the concrete at the segment of stilling basin has been broken. Since 2003 until now, the construction has not been repaired.

b. The biodiversity degradation

Floods, droughts have decreased the forest area led to the decrease of biodiversity. Besides, the irregular discharge has not guaranteed the minimum flow of downstream led to the decrease of aquatic and riparian system. Constructed dams without channel for fish migration have reduced the biodiversity of the region, especially the rare and endemic species with high commercial value, resulting in the decrease of income of local people.

c. Droughts, desertifications and salinizations

Droughts have caused impacts on: (1) the lack of water at the irrigation control construction, especially water pump has led to the water shortage for agriculture at the downstream; (2) The risk of desertification at the downstream: due to the water detention of the reservoir at the upstream has led to the formation of dead river at the downstream of reservoir resulting in water shortage for irrigation in many agricultural land; (3) Erosion and landslide of river bank; (4) salt water intrusion.

5.3.1.2. Mitigation actions

(1) Works have been carried out prior to the storms and floods

Flood control committees of commune and district have worked together for 24/24 hours to understand the situation and to predict the worst situations; there is a need of close collaboration between local forces and assistance forces to steer the respond activities timely and effectively. The plans and scenarios have been conducted to prevent and rescue human and assets of local people.

(2) Flood evacuation organization when the storms is coming to the commune

The evacuation of local people has given priority to intersperse among s and communes; and has followed 5 regulations “location, time, object, number, and

leader" and has decided by the head of local district who will take responsibility to the local people and superiors.

The commune committee and the flood control committees have organized to evacuate the households from risk places such as high risk collapsed houses and high flood depth, to ensure the safety of local people.

1. Assign the members of the flood control commune committee to directly take charge of the happening situations at the commune, which are to check and to organize and to conduct evacuation plan carefully and safety for local people.

2. Mobilize the forces including: military, police, health, red cross, youth union, and facilities to evacuate people fast and safely..

3. Arrange forces to carry out the tasks including: ensuring security, sanitation, caring for people living in shelters and protection of property, houses of people in relocated area.

The managers have developed scenarios, detail plans to evacuate people at lowland area such as riparian area with high risk of collapse and high flood depth. The evacuation management, the priority is given to intersperse among s and communes, to relocate people to stable places such as concrete building, primary and secondary schools, committed offices and resettlement areas.

5.3.1.3. Existing issues

a) Earth dam

Dap Lang is a homogenous earth dam, with dam crest elevation of 31.1m; dam crest length of L = 135m, dam crest breadth of B = 3.0m, maximum height of H_{max} = 13.1m; Currently, the structure of dam crest is made of earth, convex and concave in many locations. Local residents' travel forms trails and hollows.

- Dam crest

The dam crest has no wave-retaining wall, lighting system, deformation monitoring mark. The dam has no seepage monitoring system for dam body.

- Upstream dam slope

The upstream dam slope with a coefficient of m = 3.0 is reinforced by rip-rap masonry. Currently, rip-rap masonry is peeled and damaged; trees and weeds overgrow; there are settlement and hollow in many places on the slope. The upstream slope has no hydrometrical post to measure water level in the reservoir.

Figure 5-1:Grass on dam slope upstream

- Downstream dam slope

The downstream slope with a coefficient of m = 2.5 is now convex and concave in many places, with no drainage ditches, and overgrowth of shrubs. Local residents' cattle grazing on the downstream slope occurs regularly. Such cattle not only eat the grasses protecting the slope but their movement also makes soils turned up, resulting in erosion when it rains. On the slope, there is the appearance of erosion and slide traces which are 37m far from the dam head in the right dam shoulder. The slide traces extend from the elevation of +30.0 to the elevation of 28.0, with the length of 5.0m, an breadth of 50cm; On the downstream slope, no seepage monitoring equipment is installed.

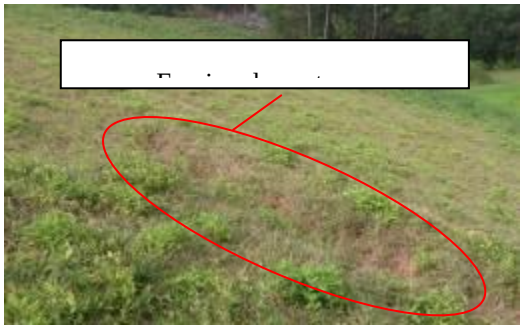


Figure 5-2:Erosion traces along the dam slope

Figure 5-3:Dam slope is convex and concave in many places

On the downstream slope, there is the existence of 3 seepage points. The first one is 33.0m far from the dam head in the left dam shoulder at the elevation of +22.0 downwards. At the foot of the dam at the elevation of +19.0m, strong seepage point appears, with the scope of 15m, in which water run into flows and stagnates on the ground.

The second one is located in the middle of the dam, downstream dam foot, at an elevation of +18.2m, with the scope of 20m. At the time of survey, the downstream dam foot is paddy field with water, so it is not possible to observe directly the seepage flow, but the trace of seepage flow exists quite obviously.

The third one is in the right dam shoulder, located 10.0m of the centerline of water intake culvert, with the scope from the elevation of +21.0m to the dam foot at the elevation of +18.17m. Length of seepage point is 18.0m.

At the time of survey, water level at the elevation of 26.0m, 2.8m lower than 28.8m NRWL even though it is just at the end of flood season. Seepage is strong and the culvert cannot close valve gate, leading to quick water loss in the reservoir.

The rear of drainage equipment in the downstream dam using rip-rap for slope paving is filled with soils for planting cassava, seriously affecting the drainage of seepage water and resulting in the rising of seepage saturation line in the dam body. In addition, there are large gaps in the slope paving equipment; stones are displaced, leading to no assurance in terms of technical conditions of such equipment.

Figure 5-4: Stones for paving the downstream slope are displaced, and large gaps exist.

b) Flood spillway

Flood spillway in the left dam shoulder is free overflow, broad-crested sill, with the breadth Bspillway = 20m. The structure of sill bottom and lateral walls of the sill is made of ashlar stones, and the elevation of the sill is 28.8m. The narrowed section is 11.2m-long, 20.0m – 10.0m-wide, at the gradient of i = 12%. The structure of the bottom narrowing section is made of reinforced conrete, with ashlar stone lateral walls. Chute is 68.2m-long, with the breadth B = 10.0m, at the bottom gradient of i = 12%. The structure of the chute bottom is made of reinforced concrete, with ashlar stone lateral walls. Following the end of the chute is the dissipating yard which has the reinforced concrete bottom structure, with ashlar stone walls. Its breadth varies from từ

10m to 14.00m; its length is L=15.60m; the elevation of the bottom of the dissipating yard is 17.93m. Following the dissipting yard is the dissipator which has the reinforced concrete bottom structure, with ashlar stone walls. Length of the dissipator is 17.55m, its breadth is 14.00m; its depth is d=0.70m; the elevation of the bottom of the dissipator is 16.04m.

Downstream discharge canal has trapezoid crosss-section. The breadth of cancal bottom is B=27.8m, coefficient of canal slope is m = 2; canal bottom and slope are reinforced using ashlar stones with the length of 30.0m in the section behind the dissipator. In 1999, large flood occurred, damaging the whole reinforcement structure for downstream discharge canal. Currently, the downstream discharge canal has still not been invested and repaired, leading to deep erosion behind the dissipator and destabilize the walls and bottom of the dissipator.

Figure 5-5: Bottom of the inlet in front of the sill of flood spillway is eroded

Figure 5-6: Ashlar stones in the sill bottom are eroded

- The yard before the spillwat sill is reinforced using ashlar stones. In the left direction adjacent to the wall and inlet, there is an eroded and damaged location. The ashlar stone structure of the bottom is 2m-long and 2.0m-wide.

- In the adjacent location between sill bottom and narrowed section bottom, the mortar veins of ashlar stones in sill bottom are eroded, forming gaps and causing no link, with 3.0m in length and 0.5m in breadth.

Figure 5-7:Bottom of narrow section has cracks

Figure 5-8:Chute bottom in the section adjacent to the dissipator

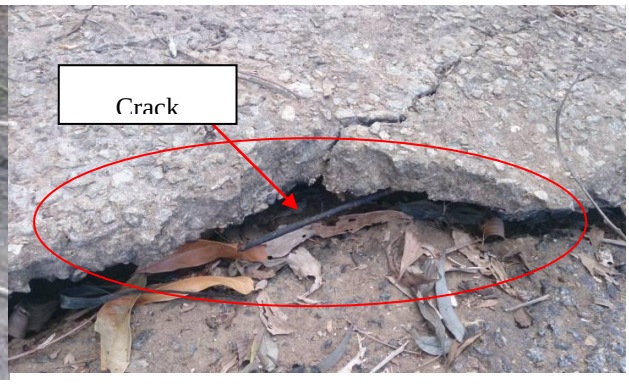


Figure 5-9:Chute bottom in the section adjacent to the dissipator

- The bottom of flood spillway sill has the ashlar stone structure. In 2003, it is invested and filled with an additional 3.0cm-thick concrete layer. Now, such concrete layer is eroded, broken and washed way in many places on the sill; there are 5.0m-long and 2.0m-wide locations.

- The bottoms of narrowed section and chute have longitudinal and horizontal cracks in many places; the length of cracks develop from 1-3cm, the breadth of cracks is from 3 to 5cm.

- At the end section of the chute, before the dissipator, there are strong settlement and cracks. The scope of cracks extend to the end of chute breadth. Crack breadth is from 5 to 10cm. Settlement difference in the upper and lower parts of cracks is from 10 to 20cm. Such cracks expose the reinforcement.

Figure 5-10:Lateral walls of the chute

Figure 5.11:Flood spillway's chute

- The lateral walls of the sill and chute are made of ashlar stones, are peeled in many places. Mortar veins are eroded, forming gaps and leading to the walls' instability.

- On the top of the lateral walls of the spillway, local residents plant trees for colleting woods (acacia, eucalyptus are of high body and dense branches). Such trees are easily fallen down upon large winds, increasing the potential collapse of lateral walls of the spillway. In case the trees fall down into the diversion bed, it will hinder the flood drainage of the spillway.

Figure5-12:Dissipator

Figure 5-13:Downstream discharge canal

- The dissipator of the spillway is still in a stable operating condition; downstrean discharge canal is eroded, causing the complete breakage of ashlar stone structures of the bottom and slope. Two sides of the slope are slided.

c) Water intake culvert

Water intake culvert is located in the right dam shoulder. The elevation of culvert bottom and inlet is +23.0m. The structure of culvert body is made of buse with diameter D=800mm; the closing and opening are conducted using upstream valve; hydraulic regime is the unpressurized flow.

Now, the culvert is degraded seriously; water leakage occurs in the walls of the culvert; the upstream valve, guardrail systems are broken and damaged. Hand-operated V5-type closing and opening machine is deteriorated. The closing and opening valve gate is not watertight; the wall of the culvert outlet is broken and cracked; the following discharge canal section behind the culvert has rectangular cross-section; the collapse length of the ashlar stone wall structure is 20cm-long.

Figure 5-14:Valve system of the water intake culvert

d) Management road

Management road is in the right dam shoulder, with the length of L=700m. The breadth of pavement is B= 3.0 – 4.0m; currently, the road is of earth type, its pavement is convex and concave. The management road is the road for local residents' travelling. The vehicles transporting timber and materials form deep ditches and hog-backs, make the pavement become degraded, resulting in difficult management and operation.

Figure 5-15:Management road

Figure 5-16:Management road is adjacent to the head of the dam

5.3.2. Impact during pre-contruction phase

5.3.2.1. Activities

- **Land acquisition and resettlement: two types of land acquisition for construction, are:**
  - 39,875m^2 temporary acquistion of agricultural land to make sheds, yards for material storage construction.
  - 13,778m^2 permanent acquisition of land of planting crops for road construction.
- **Activities of land clearance include tree cutting and gathering, ground levelling for camping site, and managing material storage;**
- **Building disposal site**
- **Preparation of materials regrouping zones, waste dumps, construction camps for personnel ... in preparing the construction area.**
- **Machinery site, equipments and construction materials areas.**
- **The expected time in pre –construction phase is 30 days.**

5.3.2.2. Sources of impacts

a. Waste related source

In preparation phase, impacts related waste are mainly from the leveling surface process, preparing construction materials (excavators, computer fraud, digging mechine, cars).

- Dirt rairises primarily from sources: increase amount of dust due to lossing the plant cover after emitting activity, leveling surface, demoliting old building.
- Waste gas raises from machines' activities which use diesel oil during the leveling process including: CO, SO_2, NO_2 VOC.
- Solid waste: from cleaance activity (peel the plant layer and soil layer), building the extra items, waste from daily live of workers.
- Waste water is from workers' activities.

b. Waste unrelated source

There is the impact from clearance grounds, mainly is:

- Taking permanent and temporary land.
- Noisy from demoliting old building, road constructing.
- degradation of infrastructure because of transporting material and moving equipment from outside area to construction site.

- Changing of plant cover, infrastructure surface and garden acreage by leveling grounds to construct main sub-project items.

5.3.2.3. Social impacts

In long term, the sub-project construction will affect to 13,778 m^2 of agriculture land from 22 households in Tan Phu 2 village, one household is affected by the narrow of aquaculture área, 266 houldholds is affected agriculture area due to cutt off water resource when rebuild the Dam. There is no ethnic minority's house hould is affected.

Total permanent land acquitision is about 13.778 m^2 (the soil waste dump overflow the dam base 13.578m^2; far from the dam manager house is 200 m^2) the permanent lands acquitision is including agricultural (7.758 m^2) and aquacultural land (6.020 m^2).

The PMU should have the compensation plan, clearance plan that are appropriate with the requirement of Quang Ngai province as well as limit the impact as less as possible to people.

Effects on income:

The sub-project implement can affect to people's livehoods such as clearance stores, near by some sub-project items that can not do business, the construction affect to transportation, traiding activities, or carring the goods,... These are the potential options damage to production and business, and thereby affect to personal income in sub-project area.

The land acquitision for construction can be affected to person's income. In addition, people loss produce land, they are also affected by lossing plants, crops planting on the lost land. The clearance land needs to use 5.3653ha agriculture and forest land. 100 percent of cleared tree is timer trees that are 2-to-3-year-old acacia trees. The cut off water for construction also affect to 431.920 m^2 rice area of 266 households which may not plant rice within one season. Otherwise, Dap Lang's reservoir surface water could not conduct aquaculture (freshwater) within one year.

The sub-project does not require relocation of the houses for local communes.

The average income affected of households is about 94.460.87million/ household/year, this is quite high level of the average income if compared to the average income of the commune. The construction affects the income of people, so there should be suitable compensation.

Effects on people's mental health:

Land acquisition for the sub-project affect people's psychology, the affected households both land permanently or temporarily, especially for poor households are vulnerable due to increased risk unemployment and poverty. Therefore, the resettlement plan of the sub-project should investigate careful to these households. 02 households of all are poor, no household's header is by single women, no ethnic minority households. Therefore, the PMU renovated Dap Lang's reservoir should cooperate with the Quang Ngai's Department of Agriculture and People's Committee of Nghia Hanh Commune do in compensation and land clearance well.

Effects on people's health: the noisy resource can be following those activities: cutting down tree, demolition old buildings and transport the waste to disposal site. The machines such as: one 110CV bulldozers, one excavators 1,6m^3; 6 trucks from 7 to 10 ton will operate alternately on many areas. In particular, the noise level at a distance of 1m from the corresponding device as follows: from 77 to 95 dBA for bulldozer, from 72 to 82,5 dBA for excavator, and truck is 82 - 94dBA. As the distance increases, the noise level with 10m spacing decreased from 22 to 25%; 50m respectively, the noise level dropped from 38 to 40%. However, the noise is resonance because of the same working time of the machines

According QCVN 26: 2010/BTNMT, noise in public and residential area is allow at 50 to 70dBA (from 6 to 21 h), so the noise only affects the local radius of 50m. Therefore, the affected one by noise can only be workers on this site, this impact can be controlled by the mitigation measures.

The leveling, construction road, transport materials for the construction are lead to air pollution, direct affect to the people around the construction area and along roads. The risk of respiratory disease for the people will also increase in this area because quality of environment air is decrease. Therefore, the sub-project management should have measures to minimize the impact from beginning to limit the impact of activities to people.

In addition, the gathering of machines, motor vehicles will also increase the risk of traffic accidents around the sub-project area. Therefore, the mitigation measures such as set up traffic light should be done in the beginning.

Effects on social security, the risk of increasing infectious diseases: The preparation phase is the period starting collect workers, some work as leveling. Thus the risk of infections, malaria can be occur, unsafe social due to conflict between

workers and local people also appears. However, this impact is considered low due to the number of workers at this stage, living in isolated camps for workers in the public sector should not cause serious conflict.

This effect is only partial in the sub-project area and during prepare time.

Effects on infrastructure: transportation of material, collecting machines, etc. will contribute to degrade the roads from residential to work place. Especially the roads like Route 624B, inter-village roads, inter-commune roads, and roads from pits to work. To overcome this effect, the investor should consult with local authorities in using roads, bridges in the area and take measures renovations appropriate.

5.3.2.4. Environmental impacts

- A*ir environment*: The demolition, transportation, leveling the ground to prepare the surface lead to air pollution by its dust and noisy. However, this affect is not so large due to the small demolishing volume and short preperation time (a month).

- *Water environment:* The main impact to water environment during preparation phase is mainly water surface due to the waste water from workers' actitities. This impact can be considered small because the amount of waste water is very small (it's about 6,4m^3) compared with the amount of river flow, and it will be diluted quickly that can not affect to the quality of water environment. The groundwater could be polluted if the drilling activities are not conducted technique properly.

- *Soil environment*: The sub-project will do permanently land acquisition about 13,778 m^2 and temporary affect to 39,875 m^2 of personal land. The land acquisition, prepare surface and luminescence plants around construction site bring about the degradation of soil environment. Moreover, soil environment can be polluted by waste from workers' actitities. This affect is only partrial, and during preparation phase (one month) and can be minimized by mitigative measures.

- *Biological environment*: Preparation phase is the clearance ground for the sub-project, the constractor and authority will clearance ground as well as encouraging people to extrembly exploite resource in the acquisition land. So, a part of forest will be cut downfor firewood and use ground, amount of plant will be lost. Clearance ground phase will disappear about 42,945ha forest. Moreover, amount of fish in Dap Lang reservoir may be affected because of the last fishing of people before construction activities. The wild animals are also affected because their habitat losses. However, it's not so big impact because of the small forest and land acquitision.

There is no conservation nature in sub-project site, so there is no impact to rare animals and plants.

5.3.3. Impacts during construction phase

5.3.3.1. Activities

The activities of dam repairing include:

(i) Reinforcing upstream by the concrete slabs underneath cement bags lining rehydration XM mortar, followed by the particle layer, bottom geotextile liner.

(ii) The design flood discharge overflow overflow freely, peppered bottom, structural concrete overflow M2000.

(iii) Repair off-take: Dismantling of old drain completely, rebuild new culvert with concrete encased steel tube downstream regulator valve, the drain is designed as culverts with a diameter D400mm.

The expected construction time is 9 months (From January – September).

5.3.3.2. Impact sources

- Dust and gases: earthworks, exploitation, transport and unloading of materials, mixing concrete, operation of transporting truck system, operation of construction equipments such as bulldozers, excavators, etc..

- Liquid waste: water for washing stone, sand, gravel, oil is applied in machines and discharged, domestic wastewater of workers at the construction site.

- Solid waste: exploitation of construction materials such as sand, gravel, soil, rocks, domestic wastewater of workers at the construction site.

- Noise and vibration arising from the machinery, equipment, motor vehicles during construction process of work items, such as excavators, bulldozers, concrete mixer, crushing and screening machines, compaction machines, dredgers, etc.

- Degradation of infrastructure due to material transport and movement of equipment from outside to the construction site.

- Variation in the social structure, the number of mechanical migrants begin to rise. Community conflicts are arising between locals and construction workers from other areas.

- The process of gathering materials to build causing traffic congestion of roads.

5.3.3.3. Social impacts

- **Impacts related to infectious diseases**

The sudden increase in the number of construction workers in the sub-project area can bring strange diseases and spread to the local population.

Water source pollution, air pollution caused by living habits with lack of awareness of workers on the construction site is environment for mosquitoes to develop infectious diseases, the risk of malaria, dengue fever increases. Besides, intestinal diseases such as cholera, dysentery, typhoid related to water pollution is also likely arise.

Subjects susceptible to the diseases listed above are migrants from other places to work and live. The reason is that their immunity is poor, especially for malaria. Therefore, this impact is considered negative effects, however, the possibility is small because there is no number of migrants, people coming to live are mainly construction workers and a part of local residents to help reduce the gap by moving. That inevitably increases the social costs, including medical expenses, reduces labor hours, service fees and other indirect costs.

Health facilities in the sub-project area is relatively complete, but project management board also need to establish mobile medicine cabinet in the work to control in time the diseases if they occur.

- **Conflicts between workers and local residents**

In many cases, conflicts between workers and locals may occur due to the following reasons:

- Differences in practices and in income.
- The trespass of workers to the traditionally historic and cultural vestige of the local people.

However, in this sub-project, the issue is predicted to not happen due to a number of workers will be recruited locally, they understand the customs and traditions of the locals. Moreover construction workers will live in separate camps with residential areas or live in their homes leading to contact between workers and local residents will be limited.

- **Impacts on society**

Social management issue that may arise while handling the compensation of land acquisition. This may not lead to conflict if it is satisfactorily resolved under the laws associated with the aspirations of the population.

For workers from other regions need to comply with the provisions of the law on administrative and demographics management. It is the job of the basic management levels of the locals and the Management Board of the work to avoid regretful social conflicts that may arise.

- **Impacts on traffic in the area**

  - Increasing traffic density in the area:

Construction mean is mainly road to transport materials such as soil, rock, rubble, sand, cement, etc.. So in the construction phase of the sub-project, it will increase the volume of traffic on the roads and may affect other vehicles on the road as well as increase in the number of road traffic accidents.

  - Damaging to roads

The process of transporting machinery, equipment and building materials of hundreds of times of traffic within one-year construction will certainly degrade the main roads. Therefore there needs to have a reasonable transportation plan, avoiding traffic jams, and have plan to repair and upgrade the road after construction.

- **Impacts on the economy, occupation of people in the sub-project area**

  - During construction time, it can affect any part to agricultural production activities of households in the catchment area of the river, especially households with income mainly from agricultural production. So the income of residents in the area will be reduced during construction.

  - In addition to this negative effect, there is also positive effects, namely:

+ The concentration of people in the field will increase the demand for food and entertainment at local, contributing to promote trade and service development, forming the facilities of business, services, contributing to solve the problem of employment and income increase for local people.

+ Create employment opportunities for workers and restructuring local labor in local area. Depending on the capabilities, local workers will be recruited to work in some parts of the construction site. Thereby, it gradually raises the level of knowledge

of themselves, positively affect on the perception, as well as the cultural life of local communities.

- **Impacts on domestic and production water resources of residents in the area:**

There will not have sources of water supplying for the production area of rural farmland of s of Tan Phu 1 and Tan Phu 2 in the time of construction. Thus, with the area of 431,920 m^2 of paddy land will not be able to produce in 1 crop time of 266 households. In addition, the surface area of the Dap Lang reservoir also can not conduct aquaculture (freshwater fish farming) during 1 year. Water source for production of the affected households are taken from irrigation Dap Lang reservoir, thereby as upgrading the dam, not only 23 households are directly affected but also 266 households in the s of Tan Phu 1 and Tan Phu 2 are affected the paddy area for 2 crops.

Water sources for feeding and drinking and life are taken from groundwater of wells and drilled wells resulting in water cutting for the renovation of the dam construction does not affect the living water source of the people in the sub-project area.

The implementation of the sub-project may affect the life activities of local households causing small impacts such as affecting drinking, feeding and living water source of the households because water source of Dap Lang reservoir no longer reduce groundwater levels, pollute the environment and air, affecting the movement of households having forest land areas in Dap Lang reservoir as entering to take care and exploit forestry products.

These impacts have been assessed to be negligible and local in the time of construction.

5.3.3.4. Environmental impacts

a) Air environment

- **Dust**

In the area, dust diffusion rate depends much on the volume of earth dam. The amount of emitted, diffused dust into the atmosphere (MB) is calculated based on the pollution factor (E) and the volume of soil that is excavated and embanked (MD). The work volumes in the work items are shown in Table 5-1.

Table 5-1: Earthwork volumes in the work items

No.	Work items	Units	Earth dam	Overflow	Sewer	Total
1	Excavated soil	m^3	24 472	4 023	5 920	34 415
2	Embanked soil	m^3	37 230	1 902	1 109	40 241
3	Excavated soil	m^3	3 924	239	26,45	4189,45

Source: Final Report of the sub-project on the renovation of Dap Lang Reservoir

According to the estimation methods of the World Health Organization (WHO), with the above volume of earthworks, the amount of estimated dust is 261,296 to 391,944 tons. Estimated construction time is one year so that average generated dust load is 71.59- 107.38 kg /day.

Dust pollution from the rock exploitation process:

Construction rocks are purchased from local quarries, rock excavation process by means of mine blasting will cause dust pollution. According to the plan of construction, excavated rock volume is about 4189.45 m3. Technology of rock excavation using mines and excavators, combining craft rock chopping. As mine blasting of average 1 m3 rock will create 400g dust. Therefore, mine blasting for exploiting rocks to serve works will create dust of 1.68 tons of dust. With the construction period is 1 year, loads of dust arising from the rock excavation process is 4.59 kg/day.

Compared with QCVN 05:2009/BTNMT, the amount of dust generated during earthworks for construction of the dam, and the process of landfill levelling is significant.

Scope: pollution of air environment caused by dust from the earthworks activities taking place mainly in the area of the dam construction and levelling of landfill, quarry. Affected time is construction time (01 years).

Dust generated by the operation of transport vehicle, machinery, construction equipment:

Emissions: On average, activity on the construction site during the peak time has about 6 vehicles/day with 7T dump trucks, the average distance of 44km/truck/day. Estimated dust load caused by transport means is 8.25 mg/s.

Scope: This activity takes place mainly in the construction area, along with the transporting road from sand-bank, gravel of Ve river to construction site and from the An Hoi quarry to the construction site.

Dust impact assessment: the above projected results are calculated with the possibility of largest emissions (in conditions of the highest construction intensity). However, the possibility of emissions not only depend on the volume and intensity of construction at each point in the construction phase, but also depends on the conditions of seasonal temperature, humidity, wind resulting in dust concentrations polluting air environment during the dry season is likely to be greater than that in rainy season, in the rainy season it is much smaller than the calculated results. However, the execution time is mainly in the dry season, so that this impact is significant needing appropriate mitigation measures.

The effect is local, primarily at the time of transporting and unloading of mainly rock, mud and construction materials resulting in the effects of dust is not intimidating, simultaneously it can be controlled by measures of irrigation or covering materials and shielding construction area which has the potential to cause large dust.

- **Emitted gases**

Components of emitted gases: mainly consist of CO, NOx, SO_2, VOC.

Emissions: According to estimates method of Hanbook of Emmision, Industrial and Non-Industrial Source, Netherland and WHO, the number of vehicles operating at peak times is about 6 trucks, 7T dump trucks, transporting distance of 44 km/truck/day, continuously operating in 1 shift of 8hrs. So the maximum load of air causing air pollution can be predicted:

Table 5-2: Forecast of emitted gases and dust arising from the transportation means

Parameters	**SO_2**	**NO_x**	**CO**	**Dust**
For 6 trucks having weight of 3,5÷16 tons (g/s)	0.016	0.11	0.055	0.024

Based on the experience, content of the gases concentrates at high level only in radius <100m from the emission sources, beyond the radius of 200m it is influenced slightly and beyond the radius of 400m it is regarded as negligible. So, this will affect households along the road from Provincial Road 624B to the work.

Pollution of dust and emitted gases during loading and unloading of materials and machinery operation on construction site: Currently, there is no specific formula to

calculate the amount of dust and emitted gases arising from material handling items and machinery operation on construction site. However, based on real experience, suspended dust content measured at unloading areas ranges from 0.9 to 2.7 mg/m3 3-9 times higher standards of air quality around, dust and emitted gases contents measured in areas taking place machinery operation are also at risk of exceeding QCVN 05:2013/BTNMT.

Pollution of air quality due to emitted gases (NOx, SO_2, CO) generally is at small level, temporary and partial (in areas having construction activities or along the roads). Therefore, the monitoring measures at points that are likely to have contaminated air will help project owners evaluate the effectiveness of the mitigation measures implemented and require measures to strengthen, if necessary, especially with dust pollution.

Table 5-3: Load of emitted gases from soil excavation and embankment operation with equipments using oil in the construction phase

No.	Items	Earthwork volumes (tons)	Used oil (tons)	Emitted gases (mg/s)		
				SO_2	**NO_2**	**CO**
1	Excavated soil types	34 415	6.9155	0.33	32.89	13.16
2	Excavated rock types	40 241	10.3732	0.49	49.33	19.69
3	Embanked soil types	4189.45	3.0192	0.14	14.36	5.74

Note: Diesel is calculated for diesel oil of Petrolimex Hanoi, DO 0.05S with S concentration is 500 mg/kg

Scope: mainly in the area of the construction of earth dams, overflow of flood discharge, water drain and along roads from the city of Quang Ngai to the construction area, from the An Hoi quarry to the construction area.

Assessment of the impact of emitted gases:

Although the machinery, trucks serving the construction are machinery having quite high contamination coefficient. However, the number of vehicles and equipments is not many and the project area is ventilating, emitted gases are quickly diluted in the surrounding environment. Therefore pollution of emitted gases from construction equipments is not too large, purely local (construction site and scope of 200m around the site). Construction period of all items is within 1 year resulting in negligible pollution.

- **Noise:**

Forecast of noise levels around the construction area is shown in Table 5-4.

Table 5-4*:* Forecast of noise levels in surrounding area of construction location

The distance from the noise source	**Types of vehicle**	**Unit (m)**					
		15	**30**	**60**	**120**	**240**	**480**
Noise levels (dB)	Heavy trucks	73÷99	67÷93	61÷87	56÷81	50÷75	44÷69
	Bulldozer	80÷98	74÷92	68÷86	62÷80	56÷74	50÷68
	Compaction machines	75÷91	69÷85	63÷79	57÷73	51÷67	49÷61
	Tractor	76÷99	70÷93	64÷87	58÷81	52÷75	46÷69
	Concrete mixers	74÷88	68÷82	62÷76	56÷70	50÷64	44÷58
	Soil digging machines	75÷99	69÷93	63÷87	57÷81	51÷75	45÷69
	Excavators	75÷86	69÷80	63÷74	57÷68	51÷62	45÷56
	Power generators 50KVA	70÷82	64÷76	58÷70	52÷64	46÷58	38÷52

b) Water environment:

- **Surface water:**

Impacts on water quality due to overflowing rainfall:

Rain falls and flows through the surface areas such as areas of fuel tank, parking, motorcycle repair mills, mechanics, warehouse of additives, chemicals, etc. or landfill of domestic solid waste where is not shielded carefully can make water be contaminated dust, oil and other organic, chemical contaminants. Rainfall runoff through the construction site sweeps oil, debris, dirt, rock dust on the ground into the reservoir and downstream of the reservoir, making greasy scum water, turbidity and suspended solid content increase strongly. Rainfall runoff will sweep with the rock, soil through the dumping sites of materials and waste soil leading to increased turbidity in the water thus filling the drainage ditches around the area, obstructing the flow.

Rainfall runoff within the work area is calculated equal to the annual average runoff water layer, multiplied by the entire area of the work which is 8.85 ha equal to 138 652.950m^3/year.

Impact assessment: The impact is inevitable, however, local in area of the works and contractors, investors need to take measures to mitigate such as clearing drains on the surface, etc.

Impacts on water quality due to wastewater of the construction process:

As renovating the work of Dap Lang Reservoir, it must construct many work items, in which the processes that strongest affect water source quality are: Improving earth dams, drain construction for water, mining the ground sites for construction land.

Pollution of river water due to increased pH: Activity from the concrete mixing plants during construction time will create alkaline wastewater source and waste materials such as cement paper, plastic that can block the flow, as being decomposited resulting in water pollution. The effects are local, can be temporarily reduced.

Water pollution due to waste oil: waste oil has a tremendous impact on the quality of the river water, is significant and most important source of pollution in the process of construction. Oil is mainly arising from the bases of mechanical, motorcycle repair. The average amount of oil used for one replacement time is about 18 liters/time/truck, the average number of replacement times per year is 4 times/truck/ year. With about 6 operating vehicles, the amount of oil discharged in the construction time will be about 432 liters. The amount of this waste oil causes significant harm to the quality of surface and groundwater, so it should take measures to collect and treat appropriately to minimize the impact.

If waste oil is leaking into the environment, it will cause serious consequences to aquatic ecosystems received because of creating a membrane layer on the surface water making oxygen does not dissolve in water. However, the risk of waste oil taking place during construction time only has a local impact to the sub-project area.

Impacts on water quality due to domestic wastewater:

+ Composition: domestic wastewater contains mainly organic matter, suspended solids and microorganisms.

Table 5-5: Composition and quality of domestic wastewater

No.	Analyzed parameters	Units	General drain wastewater	Particular drain wastewater	QCVN 14:2008/BTNMT (Colume A)
1	pH		7,0 ÷ 7,8	7,2 ÷ 7,8	-
2	TSS	mg/l	100 ÷ 250	150 ÷ 350	50
3	DO	mg/l	0,5 ÷ 2,0	0 ÷ 1,5	-
4	BOD_5	mg/l	80 ÷ 250	150 ÷ 350	30
5	COD	mg/l	120 ÷ 400	180 ÷ 600	-
6	Total nitrogen	mg/l	5 ÷ 30	8 ÷ 35	-
7	Total Phosphorus	mg/l	1,5 ÷ 3,5	1,5 ÷ 4,5	-
8	Coliform	MNP/100ml	10^4÷ 10^7	10^5÷ 10^7	3000

Source: Tran Duc Ha, Waste and wastewater treament.

+ Pollution Load:

During the construction phase, the average workforce number is about 80 people /day. With the water supply requirements for construction workers is 100L/person/ day, the estimated load of domestic wastewater is 80% of the water supply, the amount of waste water per day is: Q = 80% x 100 l /person/day x 80 persons = 6.4 m^3/day

Domestic wastewater mainly contains bacteria, organic matter and suspended solids. However, this impact will be remedied by measures of suitable collection and treament.

Table 5-6: Forecast of load of pollutants in wastewater in the construction phase

No.	Parameters	Load (kg/day)
1	TSS (Suspended Solids)	0,96 ÷ 2,240
2	DO	0 ÷ 0,001
3	BOD_5	0,96 ÷ 2,240
4	COD	1,152 ÷ 3,840
5	Total nitrogen (calculated according to N)	0,0512 ÷ 0,224
6	Total Phosphorus (calculated according to P)	0,001 ÷ 0,029

7	Coliform	$6.4.10^5 \div 6.4.10^9$ MNP/day

With this result, it can be concluded that the amount of pollutants in domestic wastewater is enormous, exceeding QCVN 14: 2008 / BTNMT many times.

Impact assessment:

Domestic wastewater discharge of workers compared to flow discharge of receiving source of Rau river is small, on the other hand, this amount of waste water will be processed preliminarily through the temporary toilets before being discharged into the river, leading to not much affect the quality of the river water. These effects are only local during construction time.

- **Groundwater:**

Construction process affect the quality of surface water and topography, geomorphology of the sub-project area so that also have certain influence on the quality, reserves of the ground water in the area such as increase of concentrations of pollutants, affecting the permeability of the soil which leads to reduce ability to store water ground. However, TDA has an small area affecting land, pollutants in waste water from the construction process are also not harmful so that this impact can be considered to be negligible. There is no research, assessment on the issue of the impact of surface water quality in the construction phase on ground water quality. So, to prevent and provide appropriate solutions, in the construction process it should have observation, monitoring of groundwater environment.

c) Soil environment:

- **Impacts on soil environment caused by the construction solid waste:**
  - Components: waste soils and rocks, cement sheaths, excess materials, sheath of wood casks containing equipment, mops ... construction waste is mainly inert and non-toxic.
  - Impact assessment: Causing change of the physical properties of soil, breaking of soil structure, forming of loose material.
- **Impacts on soil environment caused by domestic waste:**
  - Components: Contain compounds which are derived from organic substances such as vegetables, residual food (about 50% of total volume) and inorganic substances (types of packaging, the packaging of food, drinks, the resins, plastics, glass, metals such as cans, etc.).

- Volume:

With the emission factor of 0.5kg/person/day (according to Report on Observation of the environment of Vietnam in 2004, the Solid Waste of the WB), estimating the amount of domestic waste on the construction site.

Table 5-7: Calculation of domestic waste in the construction process

Position	Number of workers (person/day)	Waste (kg)	
		1 day	1 construction year
Entire construction site	80	40	14 600

- Impact Assessment: Soil environment pollution because of bringing in a large amount of microbial pathogens, organic matter, inorganic matter, changing the physic-chemical structure of the surface, reducing permeability, drainage of soil.
- The amount of domestic waste has volume which is not too large, but because the construction area is crowded in a long time (1 year) so it is still required proper mitigation measures, collection and treament.

Impacts on soil environment caused by spilling and discharging the retained soil which is material and scrap and waste: with the composition of unconsolidated, this soil may spill into the surrounding land along the Rau river banks, cultivated land near the construction area, causing soil degradation.

e) Biological environment

- **Impacts on the aquatic environment**

Electric light shining in the construction areas and camps also causes negative impacts on the lives of the animals living in the area, particularly animals looking for food at night such as birds, amphibians, mice and other insects. Impacts to wetland ecosystems in reservoir area, dam construction area are evaluated in terms of loss of biological values, caused by the pollution of water and sediment (pollution of suspended solids, solid waste, oil and heavy metals). Floating ecological value of the study area is the value of aquatic ecosystems in the reservoir area, maintained and evolved from primary to high-level animals through the food chain and is the factor sustaining ecological balance of the reservoir. So, different from the pollution of water, the scope of the space and time to impact on aquatic ecosystems is often wide

and prolonged due to characteristics of accumulation and transformation of pollutants in the organism.

Water is contaminated by suspended solids and turbidity:

The risk of water resoucre contamination of Rau river by suspended solids and turbidity are presented above. High turbidity of water limits photosynthesis of phytoplankton types - primary biological products, the food sources for all the animals in the next food chain. If the pollution of water by suspended solids will end after construction ending, the impact on biological diversity due to water pollution caused by turbidity has consequences over the longer term because it takes time for the recovery of the food sources. Therefore, appropriate measures should be taken to minimize the impact of suspended solids to water quality in rivers and lakes.

Water and sediments are contaminated by solid waste containing oil:

Oil pollution in water causes great harm, they can bind to aquatic organisms, limiting the photosynthesis of phytoplankton, preventing respiration of organisms, killing ova, larvae, preventing oxygen exchange processes between surface water and air.

Water and sediments are contaminated by solid waste:

Solid waste following rainwater running into the reservoir and irrigation channel can float or sink to the bottom. When dropped into water bodies, heavy hard materials such as cement, steel, iron sink right down to the sediment surface. When floating, solids make landscapes bad, reducing the ability of algal photosynthesis. When sinking to the bottom, heavy things kill benthic organisms due to collision, light things coat settled regions of benthic organisms. The filter feeders moving slowly will be suffered first. The dark patches around the solid will develop the pests, killing other species. Water ecological balance of the water is changed for the worse.

- **Impacts on landscape**

With large amounts of disposed soil during construction time above, it is required to have disposal. If there are no reasonable alternatives, the dumping would cause adverse impacts on the environment and landscape. Besides, collecting the construction materials to be piled up in a long time also makes a change in the landscape of the construction site ground but not serious because this activity is only temporary, unavoidable and takes place in a short time. Contractors and locals should have plans of landfill disposal and appropriate treatment measures.

5.3.4. Impacts during operation phase

When the construction is complete, the existing land use, landscape, local income and social economic are change tending to positive situation. Some will change the status quo than in the past. In addition some negative impacts are not significant, can be eliminated

5.3.4.1. Activities

The main activities within the sub-project's scope which are impact resources in the operational phase include: (1) The operation of repairs and maintenance of dams and canals; (2) agricultural cultivation.

5.3.4.2. Sources of impacts

In this phase, the source of the environmental impact can be some kinds of solid, liquid waste of people planting forest in the region higher than the water level and beneficiary area. This is also a source of impact on environmental quality, but the scope of the impact depends on the number of households and land use.

- Solid waste from residential area and agricultural production.
- Solid waste from the use of fertilizers and pesticides in agriculture.
- Domestic and industrial wastewater;
- Change the design of works

5.3.4.3. Social impacts

The investment in the construction of Dap Lang reservoir will change the economic structure of Hanh Tin Tay commune in particular and Nghia Hanh district in general, contributing to irrigation water supply for agriculture, livestock, aquaculture and other economic sectors, synchronously to improvement of ecological environment in the region. Firstly, the improvement of the dam will ensure the safety of life and property for over 300 households downstream, safety of crops in irrigated area of hundreds of hectares.

- **Development of agricultural production:**

During the operational phase, Dap Lang reservoir will ensure water supply for 60 hectares of water paddy within 2 seasons, 40 ha secondary crop, households rasing aquaculture sparsely in the beneficial area.

Aquaculture Development: Expansion and stabilization of water level in the reservoir facilitate fisheries of the sub-project area to develop, contributing to improve economic efficiency, local nutrition. In terms of economic value, with a surface area of

Dap Lang reservoir of 13.38ha, beneficial effect of fisheries are estimated with the average annual fish productivity is 200kg fish/ha / year, with estimated sales of 30,000 VND/kg fish, excluding the cost of raising 40%, the obtained annual interest of raising lake fish is 48.168.000 VND.

However, it is needed to consider the development of fisheries that affect water quality, thereby affect downstream water quality or not. With the experience of the aquaculture rasing of the people, the density of fish often released is 2,000 breeding fish/1000m^2, after 1 year, this number of fish is only 70% and the average weight of each fish is about 0.4 kg, obtained yield per 13.38 hectares will be: 70% x 2000 x 10 x 0.4 x 13.38 ha = 74 928 kg. So, with the fish yield estimated by the report is at 200 kg/ha here, fish stocking density is very low, about 5 fishes/1000 m^2, much smaller than the natural density. On the other hand, these fish feed mainly green food such as grass, weeds, dirt, leaves, corn, etc. Water source can not be contaminated by aquaculture because the reservoir is always circulated, fish stocking density is low, breeding process is natural, no additional food. People feeding fish in the reservoir will be trained to ensure to not use drugs and banned antibiotics for fish in the reservoir, not use methods such as blasting, electric shocks, etc. to fishing in order to avoid damaging fishery resources and ecological environment of the reservoir.

In addition, the Dap Lang reservoir going in stable operation also contributes to improving the ecological environment in the region, contributing to attract eco-tourism for the region.

- Service opportunities:
- The renovation and upgrading Dap Lang reservoir also lead to potential service opportunities to improve infrastructure (roads, bridges, irrigation systems), alter the rural areas, improve health, enhance cultural and spiritual life of the people in region**.**

The area of agricultural land of the region will increase. Ensure sanitation of the environment, better living environment for residents.

5.3.4.4. Impact on environment

a) Water

- **Water quality:**

Once in operation, surface water quality of upstream area is nearly unchanged. During the first 5 years, water quality may be reduced due to the decomposition of

biomass in the reservoir from the process of increase of flooded area of the reservoir area. However, this effect is negligible because increase of flooded area is very small (0.18ha) compared with the total area of the reservoir (17.25ha).

After 5 years, the majority of organic substances are decomposed and Dap Lang reservoir becomes a natural reservoir, thereby the water quality will be better.

The process of repairs and maintenance of dam can also cause surface water pollution from oil in the process of maintenance, but this effect can be minimized and controlled.

The expansion of cultivated area and changes of plant structure during operation time of the sub-project involves increasing the amount of pesticides PPCH, these residues can be washed down following rain water into the channel, affecting surface water sources.

Waste from the process of repairs, maintenance of dams, channels can affect surface water resources of the region.

The sources of impacts related to waste in the operation phase of the sub-project is presented in the following table:

Table 5-8: Summary of impact resources related to waste generated during the operation phase

No.	Related to waste	Waste types which are likely to be generated
1	Operation of repairs and maintenance of dams, roads on dams	Solid waste, waste, waste oil
2	Agricultural cultivation	Solid waste, residues of pesticides PPCH

- **The impact on the flow regime:**

After completion of construction of work items and going into use, the flow regime of the river, volume and area of river water switching from dynamic flow regime to static one increases. When the reservoir is in operation, the water level ranges from DWL (24m) to MWL (29.19m) depends on the operating mode of the reservoir. The water level will always be at a low level in the first months of the flood season and the water storage will reach MWL at the end of the flood season. During the dry season, the reservoir water will decrease gradually to DWL. Thus, the

amplitude of the water level in year will fluctuate between 5-7m. The high water level is at approximately MWL will remain for a long time 2-3 months. In the dry-season months, fluctuation of water level of the reservoir is much larger than the natural river level. Compared with the flow regime before having the work, water level after having the work is more stable, static.

Because the reservoir is located upstream, thus during flood season, the reservoir has stored a large volume of water equal to ultra-high capacity and therefore Dap Lang reservoir also play a role in slowing flood downstream. With climate characteristics of concentration of 70-80% of the rainfall in the flood season, so the storage of water in the flood season can significantly reduce water volume downstream, reducing downstream flooding during the rainy season.

Rivers downstream are mainly small rivers and streams, irrigation canal system in the dry season has almost no water. Therefore, storing water in reservoirs downstream of the dam will be increased significantly helping maintain ecosystems and farming in the region.

- **Impact on topographic and landform processes:**

The impacts on the topography and geomorphology that can happen are recreating lakeshore and aggradating reservoir caused by erosion. However, these effects can be controlled and minimized to the maximum extent by calculations in the design process and the mitigation measures will be presented in Part 7.

Recreating lakeshore and aggradating reservoir caused by erosion: According to the survey, geology, stratum of reservoir has 6 geological layers as described in Part 2, there is no landslide. This makes the process of reform does not need dredging the reservoir and recreating lakeshore. Sedimentation capacity of water storage of the work is 879m^3/year, high level of sediment after 50 years of reservoir operation is 23.75m while high level of DWL is 24m leading to no need to dredge mud or discharge bed sediment.

- **Flooded and haft-flooded:**

In the reservoir area, there is not currently inhabited, no buildings, offices, etc. So, constructing the works in flooded and haft-flooded areas inundation does not affect residents.

The geodynamic processes in the reservoir:

- **Earthquakes stimulation:**

According to the research results on the risk of stimulated earthquake of more than 100 reservoirs in the world, strong stimulated earthquake can occur in the following conditions:

+ Water volume of the reservoir is greater than 1 billion m^3

+ Reservoir depth is greater than 90 m

+ Reservoir is located in areas with complex geological conditions, especially the active tectonic destruction zones.

+ Compared with data from the great lakes above, the capacity of the Dap Lang reservoir is small VTB = 463.567 x103 m^3 plus design process of dam and Dap Lang reservoir has applied design standards for enduringness and stability of dam. Thus the possibility of stimulated earthquake excitation causeing a dam break in the work is under control, can not happen.

- **Assessment of water holding capacity of the reservoir:**

Reversoir area to plans of dam lines has the nearly similar conditions of water storage capacity, geology of the work. Water storage capacity meets the design requirements when the design with altitude MWL is + 29.19m. When increasing the water level of the reservoir up to designed altitude, it is less likely to seepage losses over the next basin through upstream water parting line, because the water parting line in 2 reservoir banks is high and tens of kilometers thick, formed mainly by granite blocks, large gabrodiorit, having low permeability to waterproof.

For downstream of the dam, reservoir has permeability to water loss downstream through the foundation and main shoulders of the dam, but when designing the works, it has been studied waterproofing measures leading to the potential loss of water through the dam and the foundation is inconsiderable.

- **The problem of erosion and sedimentation in the reservoir, downstream:**

According to the hydrological calculation, sediment deposited in the reservoir annually 879m^3/year, so during the life of the work, the total amount of deposited sediment is 43,950 m^3, sediment elevation is 23.75m, DWL is 24m resulting in not affect the ability of taking water of the reservoir.

Considering the possibility of erosion of the banks and river bottom right behind the dams as flood discharge, the report found that this possibility can not occur because the work line is very large, earth dam has length of 148.50m, scope of flood overflow and discharge in left bank is large ΣB = 19m, on the other hand, the design

process was calculated the dissipation capacity after downstream. Moreover, Dap Lang has been built and put into use for a long time, so after renovation, there is almost no possibility of causing erosion due to changes in flow and sediment.

- **Raising the ground water level:**

The formation of reservoirs and addition of water sources for the canal system increase groundwater levels in downstream sub-project, thereby enriching the water supply for wells, drilled wells of the residents. Therefore, when the sub-project is operating, groundwater level rising high has very big role in the addition of water sources, avoiding domestic water scarcity in the dry season, especially when weather conditions have unexpected development like these days.

b) Air environment

After going into operation, air environment is only affected by the repair and maintenance processes of the dam. However, this effect is negligible due to repair and maintenance activities of the dam do not generate much dust.

In general, when put into operation phase, quality of air environment in the sub-project area will be improved significantly since the land area occupied temporarily has been reimbursed, restored forest. The stable restore of water in the reservoir also helps microclimate environment more harmonized.

c) Soil environment

When the sub-project exists, plant area, crop are increased, leading to all kinds of pesticides BVTV, chemical fertilizers tend to increase, which will have an impact on the soil environment, reduce fertility, soil tends to be hardened, etc., but this effect is not significant because the people currently are applying measures in scientific, sustainable agricultural cultivation such as integrated pest management (IPM), etc.

The positive impact of the operation of the reservoir can be seen very clearly: When operating the reservoir, control of irrigation water is better resulting in people cultivate land more often, avoid land fallowing and discolorment.

Changing terrain, landscape:

The sub-project is the renovation and upgrading of earth dams and buildings of focal clusters of water basin of Dap Lang reservoir. The terrain types of hills, lakes, rivers have been formed before and do not change much during the operation of the reservoir. Trespass problem on mineral resources:

So far, it has not yet detected any kind of valuable minerals within construction scope. Area of old Dap Lang Reservoir has been surveyed and reasonably handled in trespass issue of mineral resources in the reservoir area.

d) Biological environment

- **Impacts on flora:**

  - In the area of upstream of the reservoir

The area of upstream of the reservoir has vegetation which is mainly planted forest of people, the sub-project also has no programs of building, renovating infrastructure of the upstream area leading to the impact of the flora can be considered as small. The main impacts to vegetation in upstream reservoir are:

After the renovation of the reservoir, earth dam with good infrastructure will attract people more interested in the plantation area, a majority of people outside the region will penetrate to exploit the plantation resources in primary forest areas upstream. This affects the ecosystem and landscape. On the other hand, the improvement of infrastructure also attracts people to expand the planting forest area, increasing the area of coverage and changing biodiversity and biological landscape.

  - At the canal area:

The process of sub-project operation does not cause any adverse effects to plant resources in this area. After operating the sub-project, the amount of harmonized water helping ecosystem along the channels is more stable, some areas form half-submerged ecosystem (the position of the former earth channels without water), however, this area is negligible and half-submerged situation does not happen often.

- **Impacts on fauna**

  - In the area of upstream of the reservoir:

The impact of the sub-project on the fauna must be confirmed to be the negative impact because the transformation from the rivers and streams into the reservoir contributes to increase access to higher forest plots upstream, thus increasing the hunting and trapping wild animals of the area's residents and immigrants. However, this effect is only indirect and small level of impact since in fact there is no formal studies confirming the existence of rare animal species needed to be protected here.

Besides, it must be realized that the operation phase also bring positive effects to the variety of animals since full reservoir will make its climate becomes more

pleasant. To ensure the reservoir water sources, it is certain that the protection of forests and planting upstream forests are strengthened. That is the factor helping the fauna here be maintained and developed, in particular:

The reservoir formation also contributes to increasing the number of individuals of the species having lives associated with water such as otters, water snakes, turtles, frogs, imitation tortoise, etc.

Forests upstream and forest along the reservoir will be protected as well as planting more, trees will be developed plus the quietness will be a positive factor in attracting many species, especially small and medium-sized mammals, species birds coming to live.

- **Impacts on aquatic environment**

  - In the area of canal

The process of sub-project operation does not cause any adverse effects to animal diversity in the area, but only help to the region ecosystem be more stabile and the shrimp, crab, fish are more developed.

  - Reservoir area

The operation of the Dap Lang reservoir virtually does not make much change to the aquatic environment of the reservoir. The available species continues to live and grow, mainly species of carp, tilapia, frog, parody, etc. and aquatic species available in the region. This ecosystem has been formed relatively long, so relative stabile in the number of species and number of individuals in the species.

Characteristics of distribution of components as well as the number of plankton of reservoirs in general, Dap Lang reservoir in particular, are related to characteristics of nutrient salt distribution and some other environmental factors. In general, the qualitative as well as quantitative distribution of plankton tends to change very distinctly following hydrological seasons. With the type of reservoir, the density of plankton in general is higher than the river waters like today. It will form a gradient of density of plankton in vertical direction of the reservoir. During the dry season plankton density is lowest in the upstream area, highest in the middle area near upstream and lower gradually to the downstream area. During the flood season, plankton density is lowest in the upstream area, gradually higher in the downstream area, highest in the area near the dam. Besides, plankton are distributed vertically the quantity, the highest in the surface layer and lower gradually in deeper water layers.

For benthic organisms, little silk worms will grow in shallow water areas, soft bottom, the distribution of molluscs is in waters near the shore, the group of insects, larvaes distribute mainly in the middle and upper areas, where water flows.

For fish, generally species who are herbivorous and eating organic humus adapting to vertical water will grow, fish species adapting to river waters will reduce both the quantity and the number of species, these species distribute upstream, where there is a change in the flow and drain for water, where there is flow. The amount of food for fish is mainly food source in organism layer at the high bottom of the reservoir. Because the water level is deeper, the amount of light will reduce compared to the old reservoir. So available algae and plant and herbivorous fish are less than the old reservoir. In the early stage of submerging decayed vegetation in new inundated areas, it will also increase the amount of food for the fish in the reservoir.

Recommending that the development of fish of the reservoir following the natural farming way to ensure water quality.

- Impacts caused by reduced discharge

The process of sub-project operation still ensures the amount of water for maintenance of flow downstream during the dry season and especially does not the depletion of water. The sub-project will help keep water from flood season and maintain in dry season instead of no water in the downstream currently. Thus, the operation of the sub-project helps stabilize the amount of water and almost has no negative impact.

On the other hand, the diversity of vegetation downstream of the dam is quite poor so affecting terrestrial vegetation due to lowering the water level is small.

Moreover, to the extent, it is not detected fish species to have migration behavior to upstream for spawning so that there is no impact on species extinction.

Impacts caused by change of water quality:

Operational Phase hardly alters water quality of the reservoir leading to there is almost no impact casued by water quality change.

PART 6. ALTERNATIVE ANALYSIS

Several alternatives have been considered in feasibility study of the sub-project, includes:

6.1. No action alternative

The main purpose of the sub-project is to ensure and safe for the people living in downstream areas of the dam, to stable irrigative to 83 ha agriculture land at Tan Phu 1, Tan Phu 2 and Tan Hoa villages, modernization operational management, improve ecology systems condition and freshwater aquatic cultivation combination.

Dap Lang Irrigation reservoir was built and used since 37 years ago, it brings high economic efficiency to the local resident and improve social conditions. To date, the headwork of the construction was damaged and degraded. Without the sub-project, the risk of dam failure is dramatically increase, and it will impact to 83 ha agriculture land of owned by 364 households living in Hanh Tin Tay commune, as well as damage all the infrastructures, civil and industry facilities in the region. Thus, the sub-project is relatively effect to upgrade and improve the existing conditions of the dam. In the long term period, it will bring more efficiency to the local resident by reducing the risk of dam failure and its appurtenant structures, improve the efficiency of the exploitation of reservoir and water resources sustainable development in the regional.

6.2. With project implementation alternative

Soil in material station 1 with 25000m^2 area, at the low hills with elevation change from 3000 to 5400m, and slopes 15-300. Currently, Acacia tree planted at the right area of the reservoir. Distance from the Station 1 to the dam is about 600m. However, after considering the probable impacts which affected to the reservoir as erosion, sedimentation, affecting on aquatic ecosystems, turbidity of the reservoir. Environmental consultant agency has been considered in feasibility study of the sub-project and find other alternatives. Therefore, the priority that using 2 soil in material stations (Station 2 and station 3) instead of three material station.

This selection will reduce so much impacts on environmental and residential areas; specially reduce negative impacts on aquatic system in the reservoir and water quality, even the selection needs taking a larger areas and more local households than first option. Two soil samples in material stations are selected:

- Station 2 (mountain): clay sand and small pieces of stone, organic materials that is thick from 0.2 to 0.3m.
- Station 3 (low mountain): clay sand and small pieces of stone, organic materials that is thick from 0.2 to 0.3m.

PART 7: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

7.1. ESMP objectives

- To ensure compliance with applicable regulations, laws, standards and guidelines at provincial and national level.

- To ensure that there is sufficient resources allocated based on the sub-project budget for the implementation of ESMP related activities.

- To ensure all environmental and social risks of the sub-project that shall be properly managed.

- To respond to environmental issues which cannot be expected and have not been identified in the environmental impact assessment report of the sub-project.

- To provide feedbacks against the continued improvement of environmental performance.

7.2. Mitigation measures

7.2.1. Potential impacts and mitigation measures

The details of negative/positive impacts of Dap Lang, Quang Ngai province sub-project have been analysed and mentioned in part V. The activities of Dap Lang, Quang Ngai sub-project implementation is not increase the water storage capacity of the reservoir. The most issues are happen in the construction phase. The negative impacts generated due to site clearance, disposal site operation and camping site construction have to take more attention and the sub-project owner should response to the issue. The reparation of appurtenant structures of dam (embankment, spillway, outlet works), wastes disposal, construction materials transportation are the direct effect not only to workers on site, but also to local communities, environment and social aspect. However, these impacts assessed at low level, localized and reverse able. The impact on environmental and social will limit if PPMU and construction contractor would apply an appropriate mitigation measures, follow national policies, the safeguard policies of WB, etc. The safeguards policies are mentioned in detail in ESMF document.

Table 7-1: The environmental and social impacts and mitigation measures in the preparation phase

Potential impacts	Mitigation measure
Loss of living land	Mitigation measures shall be taken as drafted in the Resettlement Plan.

Potential impacts	Mitigation measure
or farming land for the households	Site clearance and resettlement shall be at the account of Compensation and Resettlement Committee of the district.
Risk of dam break	Detailed researches on geographical, terrain, geological, meteorological and hydrological conditions will need to be done in order to select appropriate design and construction method, in taking advantage of favorable factors and compliance with natural, socioeconomic conditions at the sub-project site and minimizing risks of dam leakage or break.
Dust emissions	Water trucks shall be arranged to spray roads. Water shall also be sprayed at leveling sites and along roads where material is transported.
Air emissions	Obsoleted machinery and equipment shall not be used for construction work. Provide appropriate maintenance for machinery and equipment, and conduct periodic environmental quality monitoring.
Noise	Conduct appropriate maintenance and ensure proper function of the construction machinery and equipment and transport vehicles
	Highly noise producing activities shall be implemented during day time
	Appropriate arrange transport schedule to prevent collision at the site
Waste generation	Containers to collect domestic solid waste Collect and make use of construction waste
	Containers to collect and contain waste oil/grease
	Containers to contain oil contaminated cloths
	Mobile septic tank toilets

Table 7-2: The environmental and social impacts and mitigation measures in the construction phase

Potential impacts	Mitigation measures
1. Dam safety risk	Most of the activities that upgrading the dam, drain water should be carried in the dry season.
	Speed up the construction
2. Air pollution due to dust or other emissions (CO, H2S, CH4, NOx, SOx, etc)	Vehicles need to be appropriately registered, inspected and maintained on due deadlines to ensure they meet technical safety and environmental standards
	- In handling construction material, workers shall be provided with personal protective equipment to minimize the impacts from dust and such toxic gases as H_2S and CH_4.
	Conduct environmental quality monitoring at required frequency.
	- Frequently spray water at the construction site twice per day on

Potential impacts	Mitigation measures
	sunny days, spray water along the roads where construction material is transported twice per day.
	- For transport vehicles: (i) transporting construction material such as excavation or backfilling rock and soil shall not be overloaded and covered appropriately to prevent rock and soil from being scattered along the way; (ii) transporting waste such as waste shall need to use special purpose trucks from the environmental company which are provided with a covered container.
- The noise generate from construction equipment	- Arrange appropriate schedule for transport vehicles and construction equipment shall not operate during period from 21:00 pm to 6:00 am next day. Except when it is needed, do not use too many machinery and equipment at the site which can generate high noise level at a time to prevent noise impacts on the local community.
	- Inform the construction plans regularly to communities and local government by phone, speakerphone, text, or on the notice board of the Commune people's committees
	- Provide noise proof equipment and personal protective equipment for workers working with high noise level equipment.
- Surface water pollution due to waste, chemicals, effluent or contaminated land	Make available and apply living rules, arrange dustbins and toilets properly and in accordance with hygiene requirements. Waste generated by human, particularly waste and waste water shall be collected and treated properly. Provide training to improve awareness for the workers directly working at the construction site and local residents about environmental protection in general and water sources protection in particular. Oil should be stored in a safe area, with concrete floors and roof that avoid rainwater and floodwater.
	The contractor shall need to provide workers with awareness in collecting waste and do not discharge waste unorganized to prevent environmental impacts in general and water quality impacts in particular. At the same time, the contractor shall need to cooperate with local residents for support in the collection of waste and identification of appropriate dump sites for waste landfilling and/or disposal.
	- Ensure waste water is collected and pre-treated by means of temporary toilets and sedimentation tanks

Potential impacts	Mitigation measures
	Reuse all the waste water from aggregate washing at the sites, vehicle washing and domestic waste water by using this water to spray site surfaces or vehicles washing. Waste water from site cleaning, vehicles washing and domestic waste water shall be lead to a deposition tank with dimension of at least 2x2x5m, to ensure collection of minimum water from the mixing of a concrete batch. A trash rack shall be provided right in front of the deposition tank to collect waste and water from the deposition tank shall be reused. Deposited waste shall be collected for treatment in the same way as for construction waste.
3. Soil pollution from spilling and leaking oil or other chemicals	Manage and control sources of pollutants during construction phase and unorganized waste discharge is strictly now allowed.
	Make available measures against environmental accidents: Oil leakage, alum contamination, preventing waste from being swept away with rain water runoffs which can cause soil and surface water pollution.
	In addition, ensure all the soil and rock from excavation process shall be transported to a specific place. Rock and soil shall be moved away as soon as the excavation takes place
	Prevent soil erosion around the reservoir area and downstream region of the dam by means of technical solutions such as energy dissipation tank, water flow slow down walls, reinforcement of foundation, slopes, enhanced cover, planting, and ensuring proper protective forest intensity (in combination with ecosystem impact mitigation measures).
	Minimize impacts on the soil quality due to overspills at waste storage yards for sake of preventing construction material overspills or fall-offs at the yards for progressive use and awaiting for transport to dump field for disposal when dumping into farming land areas, the following measures shall be taken: dump fields shall be not too large, with height of <1.5m, dump fields shall be surrounded with geotextile fabric. Losses caused by overspills farming production and other losses shall be considered for appropriate compensation as agreed with the affected people.
	Packaging shall be collected and sold out or reused. At the end of construction phase, rock and sand at the dump fields shall be used for backfilling excavation holes or reinforcing road slopes. The remaining waste shall be arranged and transported to dump fields and all the waste shall be compacted in accordance with regulations and the dump fields are to be arranged within a site area of two dump fields of 12 252m^2 and total storage capacity of 12 252 m^3.

Potential impacts	Mitigation measures
	Soil excavated from the removal of surface heavy soil (if any) shall not be kept at the site. Instead, it shall be used for backfilling of the slope for growing grass. After the waste soil is moved away, these dump fields shall be leveled off, compacted and built with sub-project items as designed
	The contractor shall bulldoze and compact and plant trees when dump fields are fully filled with waste to ensure soil slide or erosion at the dump field shall not be happening where it may be swept into nearby water bodies.
4. Impacts on landscape	Restoration of landscape after completion of construction activities: After construction is complete, do the afforestation in the temporarily occupied land area
	Develop a plan to enhance the protection of front line forest and forest controls for controlling forest products in the region
	Enhance forest rangers to minimize pressure and prevent illegal logging or hunting
	Public security police, army forces and market managers shall need to cooperate closely with forest rangers in order to fulfill their respective responsibilities in inspection, identification and fining those illegal loggers.
	In addition, unions or mass organizations shall cooperate with local authorities to promote public awareness about forest protection. Incorporate in the education program the topic of forest protection and nature conservation for workers at the construction site and local residents by means of specific exciting activities in order to minimize forest logging and hunting.
	Make full use of the dump fields for reuse and for growing grass at slopes in the downstream region of the dam, dikes, and protective walls to prevent erosion r landslide caused by flood water.
5. Cultural impacts	- To prevent these impacts, the sub-project owner and the local authorities shall need to pay special attention to the conservation and promotion of traditional cultural values of the local community. Measures are to be taken to provide workers with awareness on local cultural value conservation and security.
6. Cutting of water while reinforcing structural spill disrupts water supply capacity for production in downstream areas impact	-Distribute sub-project information to the community in two affected villages, namely Tan Phu 1 and Tan Phu 2 -Conduct socioeconomic investigation, surveys and consultation with the affected people and beneficiaries in the sub-project area in order to propose appropriate mitigation measures and ensure the benefits

Potential impacts	Mitigation measures
266 households with 431.920 m^2 of rice field and 01 household with aquaculture production (in 2 villages: Tan Phu 1, Tan Phu 2)	for the affected people. - Conduct socioeconomic investigation, surveys and consultation with the affected people and beneficiaries in the sub-project area in order to propose - Prepare RAP
7. Impacts of social security and people's life	- Improve public awareness.
	- Provide specific rules on working and rest time for all staff and workers.
	- Enhance the participation by the mass organizations.
	- Make available and apply bonus and fine policy for those violate labor law.
	- Strictly manage workers, make human resources declaration to local authorities appropriately.
	- Make it serious that construction workers shall strictly ensure social security and shall not come into conflict with local residents. It is completely not allowed to gamble or abuse drug among the workers at the site. The sub-project owner shall propose to local authorities to increase social security officers at the head work items. Cooperate with local public security police to fine those workers violating working rules and applicable laws if any.
	- Trading shall completely be not allowed near the construction site.
8. Impacts on community health	- The main contractor shall cooperate with local health clinics to apply preventive measures against such popular diseases as malaria, common fever, etc.
	- Provide mobile medicine cupboards at the units present at the construction site.
	- Work with local health clinics to provide periodic medical check-up and treatment for staff, workers at the site, spray preventive medicine to prevent disease.
	- Frequently check and provide instructions on the prevention of popular diseases for staff and workers.

Potential impacts	Mitigation measures
	- Improve public awareness on keeping environmental hygiene at workplaces; Provide preventive injections against some diseases; Killing of mosquitoes and insects; Enhancing medical devices, medicine and doctors, nurses and ambulance cars.
9. Risk of increasing conflict between workers and local residents	- Construct small scale sports field for local residents and workers can play sports together and share cultural and recreational activities;
	- Support local residents in changing their careers.
	- Give priority to recruitment of local workers for those petitions that do not require complicated skills
	For workers coming from other localities, work with local authorities and competent agencies to organize programs such as: Introduce the workers about the local traditional customs and practices in order to prevent misunderstanding between workers and the local residents.
	- Labor contract between the sub-project owner and contractor shall state down clearly a workers management plan where workers are not allowed to go hunting, cutting down trees at the construction site. Workers recruited shall have sufficient skills and self-awareness in environmental protection.
10. Constructive workers temporary stay in the locality may cause social problems, affecting the lives of people	Consult local authorities about rent house for workers instead of setting up camp. It has more advantages in solid waste management.
	Orientate workers how to communicate with the community, guiding them about protecting their health, sanitation, prevention of infectious diseases
	Orientate workers how to prevent infectious diseases such as HIV / AIDS, other social evils such as gambling, whoredom, theft, etc.
	Workers should be strictly banned to exploit the local resources.

Table 7-3: The environmental and social impacts and mitigation measures in the operation phase

Potential impact	Mitigation measures
1. Natural disaster cause the insecurity	- Dap Lang operational management unit closely coordinates with the local people to promptly report the risks related to the dam safety for timely handle measures
	- For the flood discharge problem, the flood inundation mapping for

	downstream area will be made. The plan will be informed to people at least 01 days before to prevent people and reduce the damage
	- Build a safe corridor for the flood (if necessary) based on forecast scenarios on the impact of space due to dam failure.
2. Reservoir regulatory, flood discharge in the case of large flood affecting downstream	Managerial and operational unit must notify prompt and accurate about flood discharge in order to help people in the community have the prompt response.
	At the time that the safety might be prone to insecurity as the rainy season, the reservoir should be observed regularly to ensure the reasonable water regulation
	People and the local government should have an active plan to cope with the disaster.

7.2.2. Estimated cost of mitigation measures

The environmental and social management plan (ESMP) formulates impact mitigation measures, monitoring and institutions to be implemented throughout the construction and operation phases of the sub-project or to prevent or control adverse environmental and social impacts and necessary actions to be taken in order to realize the mitigation measures. ESMP shall create useful links between adverse impact mitigation measures and ensure that these mitigation measures shall be appropriately implemented.

The ESMP presents responsibilities of implementation, implementation monitoring, implementation budget, and timeframe for these mitigation measures as mentioned in Part 7. A summary of the environmental and social management plan of the sub-project is as follows:

Table 7-4: Environmental and social impacts, mitigation measures and estimated costs

Project phase	Environmental and social impacts	Mitigation measures	Budget	Implementation Responsibility
Pre-construction	Loss of part of livelihood opportunity of the residents. Project construction shall displace permanently 13,778 m^2 of farming and forest land of 22 households in Tan Phu 2 village, with one household having affected aquaculture area	+ An independent Resettlement Action Plan (RAP) is conducted by an independent consultant. The plan mentions the following issues: + Compensation shall be made for household head/land owner in accordance with price frame issued by Quang Ngai province and in line with the WB policy + Consultation with stakeholders and affected people shall be implemented + Listing of loss is undertaken in accordance with applicable regulations, particularly is participated by the affected people	Budget is mentioned in the RAP	Project owner - Hanh Tin Tay commune people's committee - District site clearance committee - Land stock center
	- Increasing risk of road accidents. - Generating dust and noise along the roads.	- Warehouses that store gasoline or oil shall be isolated from the residential areas and construction site at a distance as such to ensure safety - Provide 05 extinguishers and fire alarm devices - Provide 05 road signs, signs to indicate the presence of on road structures - Provide 06 cover tents for trucks that do not have or for replacing old tents. + Ensure vehicles and construction equipment are properly maintained and function properly.	2 million/canvas x 6 pieces = 12 million Water spraying: 5 million Speed limit road sign: 5 sign x 0.3 million/piece = 1.5 million Extinguishers	Contractor

		+ During sunny days, trucks that carry material need to be sprayed with water when they pass through residential areas and schools at peak hours. + Provide speed limit (15km/h) and instruct drivers to get familiar with the limit and ensure compliance. + The contractor shall propose construction methods which need to be accepted by the PMU in order to minimize time needed for site clearance, construction and temporary material storage.	and alarm devices: 5 units x 0.3=1.5million	
	- Noise, dust and space occupation	- Make a plan to relocate, concentrate machinery and equipment properly to prevent impacts on the life of local residents		Contractor
	Disturb the life of local residents	+ Registered temporary residence for the workers to the local authorities + The contractor shall guide workers how to communicate and interact with local authorities and local community + The contractor shall request workers to comply with regulations when they live together with local community such as (do not come into conflict with local residents, do not gamble or convict theft cases.)	Contractor	Contractor
Construction phase	Undermine air quality due to dust, waste gases, noise and vibration	- Do not use obsolete equipment and provide periodic maintenance for machinery and equipment at a frequency of every 6 months	10 million/time * 2 times/1 year = 30 million.	Contractor
		- Periodically spray water at the construction site and along transport roads	Depending on days of implementation	
		- Provide cover for the material storage yards, and material transport trucks.	2 million/canvas * 6 pieces = 12 million	
	-Generate	- Collect and treat rock and soil excavated from construction activities	20 million	Contractor

	construction hazardous waste, scattered rock and soil, hazardous waste (waste oil/grease and oil contaminated waste cloths) which result in environmental pollution and undermining local biodiversity	which is scattered around the construction site		
		- Provide waste dustbin at each construction sites to collect the waste, including 02 dustbins for hazardous waste, 02 dustbins for normal waste	1 million/dustbin x 04 piece x 1 location = 4 million	Contractor
		- Frequently clean up and collect scattered material and place in a specific place - Collect and treat hazardous waste in accordance with applicable regulations	Collection and treatment cost: 1 million/month * 12 months = 12 million.	Contractor
	Rain water runoffs, waste water from vehicle and material washing	- Efficient use of water sources	10 million	Contractor
		- Construct collection pits to collect construction waste water, vehicle washing waste water for treatment of sedimentation.		Workers at site
	Impacts on labour safety, working conditions and health of workers at site.	- Develop a proper work schedule - Provide sufficient personal protective equipment for workers - Organize training to improve awareness about labour safety and environmental protection before construction starts. - Provide periodic medical checkup for workers at the site	-Provide personal protective equipment: 20 million/year. -Organize training on labour safety: 20 million/training *1 time = 20 million. -Provide periodic medical checkup: 10 million/year *2 times = 20 million.	Contractor
	Environmental accidents: natural disaster, typhoons, oil leakage, fire, and explosion	- Prepare a plan on typhoon, tropical low pressure, whirlwind preparedness - Popularize response plan. - Organize rehearsal.		Competent agencies

	Water supply cutoff during construction shall impact 266 households with 431.920 m^2 of rice field and 01 household with aquaculture production	Distribute sub-project information to the community in two affected villages, namely Tan Phu 1 and Tan Phu 2 Conduct socioeconomic investigation, surveys and consultation with the affected people and beneficiaries in the sub-project area in order to propose appropriate mitigation measures and ensure the benefits for the affected people. Conduct socioeconomic investigation, surveys and consultation with the affected people and beneficiaries in the sub-project area in order to propose		- Hanh Tin Tay commune people's committee
	Soil and water pollution due to waste water from machinery and equipment washing.	- Efficient use of water sources - Construct collection systems and pits to treat waste water before discharging it to external water bodies.	Share the budget for construction of collection pits for waste water	Contractor
	Dust, waste gases, noise due to concrete mixing and pouring	- Conduct periodic maintenance for machinery and equipment		Contractor
	Air pollution due to noise, dust, waste gases from material transport vehicles	- Material shall be transported during specific hours - Trucks shall carry standard load with proper cover for the container. Provide 20 canvas pieces for trucks that do not have canvas or for replacing old canvas. - Trucks shall follow speed limit.	02 million/piece x 6 pieces = 12 million	Contractor
	Impacts on local traffic infrastructure			
	Increasing risk of road accidents to by-passers along the road			

	Domestic waste water	Rent 05 mobile toilets.	3 billion/unit 5 units = 15 million	Contract a supplier
	Domestic waste	- Provide 02 dustbins for domestic waste, 200l each - Frequently do cleaning - Contract a local environmental hygiene company for transport and treatment of domestic waste	0.25 million/piece x 02 pieces = 0.5 million Transport and treatment cost: 15 million/year *1 year = 15 year	Contractor
	Protect roads in the sub-project region	- Restore and upgrade road sections that show damage, subsidence and in bad condition	40 million	Contractor
	Ensure environmental parameters in the sub-project region meet standard values	- Take sample and conduct environmental monitoring at the construction sites (1 year)	Details as in Section 7.2.5	Competent company contracted by the sub-project owner
	Make public information, and ensure participatory consultation process	Implement information publicizing plan, and participatory consultation process	4.75 million (Details as in appendix)	
Operation phase	- Generate solid waste	- Dismantle workers' hatches, road signs - Collect and sell waste to end users. - Concentrate and remove machinery and equipment away. - Backfill and decommission material mines.	20 million	Contractor
	- Ensure safety for	- Provide periodic maintenance.	Budget for sub-	PPMU

	residential area, farming land, construction works and infrastructure	- Timely detect and fine those convict illegal occupation or usage of the canal corridor.	project maintenance	
	To support the inspection and timely identification for rescue and relief in case of accidents	- Organize training on emergency response at a frequency of once a year in accordance with the proposal by provincial department of agriculture and ruraldevelopment.	Project operation budget	PPMU
	To prevent sedimentation which can cause environmental pollution and change hydrological regime of the canal, rivers	- Flexible operation of conduits; - Conduct observation and monitoring to detect sedimentation or erosion; - Conduct periodic dredging of the canals, rivers to ensure proper environmental flow	Project operation budget	PPMU
	This can cause stagnant water within the rice field and influence the quality of surface water	- Frequently monitor the saltiness, hydrological regime in the region - Flexible and proper operation of the conduits	Project operation budget	PPMU
		Total estimated budget	**265.250.000 VND**	

7.3. Environmental and social monitoring plan (ESMoP)

7.3.1. Environmental monitoring program

This part aims to describe a proposed environmental monitoring program that shall be carried out in the period of sub-project implementation. The program will include: (a) monitoring the compliance of implementation of environmental mitigation solutions that given in ESMP; (b) monitoring the environmental quality.

Supervised by PPMU: PPMU will supervise the implementation of safety policies of the sub-project during the phases of preparation, construction, and operation. PPMU will assign supervising consultants who will collaborate with PPMU to supervise the daily implementation. PPMU will also contract with an environmental consulting unit to monitor periodically the implementation of solutions that proposed in phases of detail design, bid, and construction. This unit will also be responsible for consulting community and local authorities. The environmental impact mitigation solutions can be regulated according to the reality based on agreement between main stakeholders. Discussion results and reports will be kept carefully for further consideration by CPMO and WB. The cost for this mission will be extracted partly from the monitoring cost of PPMU. At the same time, PPMU ensures to be conformable with the Government's policies and regulations that related to environmental impact assessment.

Supervised by community: Local authorities and residents will supervise daily implementation of the sub-project as well as negative impacts. This will contribute to minimize potentially unexpected impacts. Moreover, environmental troubles will be reported immediately to the sub-project owner for timely solutions

7.3.1.1. Preparation phase

Dam Safety Inhibilitation Report (DSIR): Provides general methodologies on dam safety, developed by professional engineers, considered carefully by technical experts of consultant team. A DSIR will be prepared and submitted to CPMO and WB.

7.3.1.2. Construction phase

PPMU will implement dam safety solutions in the construction phase so as to ensure quality, equipment, operation and maintenance, as well as be ready for emergency situations, including detection and providing recommendations for the sub-project owner.

The sub-project owner needs to check on-site conditions in this phase and review significant modifications on the sub-project design. The review should include the dam

operation planning for the first time of water storage, door-closed schedule, maximum water storage level, measurement and emergency discharge plan.

In the progress report submitted to investor, PPMU will have to mention to the dam safety management. Accordingly, the investor can also check the implementation by organizing visits to the field. WB (WB), a component in the periodical monitoring activities, always can visit selected construction routes to check their conformation with which mentioned in the report. The investor will facilitate WB to confirm information related to dam safety management such as documents, reports in construction supervision, quality control and management, trouble areas, and improvement solutions.

Environmental factors need to be monitored: air, surface water, and groundwater.

(a) Air monitoring:

- Parameters: Microclimate, total suspended particulate (TSP), NOx, CO, SO_2, noise.
- Comparative standards: Labor hygiene standard 3733/2002/QĐ-BYT, QCVN 05:2009/BTNMT (Ambient air quality) and QCVN 26:2010/BTNMT (noise).

(b) Surface water monitoring:

- Parameters: SS, DO, BOD5, COD, pH, NO3, NO2, NH4, PO4
- Comparative standards: QCVN 08:2008/BTNMT, column B1

(c) Groundwater monitoring:

- Parameters: pH, TDS, Iron (Fe), Lead (Pb), Arsenic (As), Chromium (Cr6+), Manganese (Mn), NH4+ (calculated by N)
- Comparative standards: QCVN 09:2008/BTNMT.

(d) Soil (mud) monitoring:

- Parameters: As, Cd, Pb, Zn,
- Comparative standards: QCVN 03:2008/BTNMT.

(Monitoring sites were given in the Appendix 5)

7.3.1.3. Operation phase

Dam safety periodical monitoring: After water storage and operation of the dam, the sub-project owner has to be responsible for monitoring periodically the dam safety. This mission has to be performed by professional and independent experts who have not been relevant to the dam surveying, design, construction and operation processes. Annually, the monitoring has to be implemented before and after flood season, in accordance with the

Government's Decision (No 72/2007/ND-CP) on Dam Safety Management. After fulfilling related components, the dam operation will be pertained to the dam owner while the role of PPMU will be ended.

Reservoir operation procedure: The dam owner has to develop a procedure to regulate water level, water storage and water discharge both in usual and emergency situations. The procedure will be submitted to the related Governmental agencies for approval and implementing organization. The procedure should specify the operation and manipulation steps for every valve gate of every structure (hereinafter mentioned as structure operation).

(a) Surface water monitoring:

- Parameters: COD, BOD_5, pH, NO_3^-, SS, DDT, Coliform, salinity
- Comparative standards: QCVN 08:2008/BTNMT.

(b) Groundwater monitoring:

- Parameters: pH, TDS, Fe, Pb, As, Cr6+, Mn, NH4+ (calculated by N)
- Comparative standards: QCVN 09:2008/BTNMT

(Monitoring sites were given in the Part 7.3)

The monitoring will use professional and standard equipment; analysis methodologies and monitoring reports will be conformable with the related regulations issued by the Ministry of Natural Resources and Environment.

Monitoring sites, frequency, and cost were given in table 7-5.

During construction phase, consultant experts will monitor periodically environmental management requirements that specified for each contractor and mentioned in the bidding document. In case of ineffective environmental impacts mitigation, donors can always ask the contractor for modification.

7.3.2. Social monitoring program

The compensation, support and resettlement for local residents will be checked in order to ensure progress of the sub-project which given in the Resettlement Action Plan (RAP). Unexpected extension of land clearance should be avoided.

The environmental management in working places will be monitored quarterly: minimum environmental requirements for workers should be conformed such as clean water, sanitation toilets, hygiene waste dumping places, etc.

The safety plan, equipment, and training schedule of contractors should be checked, including:

- Plan to respond to emergency situations such as accident and problems related to community and environment;
- Solutions to minimize social evils caused by the sub-project;

The implementation of solutions to minimize impacts on water supply capacity during construction phase will be monitored. At the same time, it is necessary to monitor the ESMPloyment creation for local residents by recruiting them in the sub-project's activities.

The detail monitoring program and responsibility of stakeholders were given in table 7-6 and table 7-7.

Table 7-5: Environmental and social monitoring program

No	Factor	Actions need to be monitored	Monitoring sites	Methodology	Frequency	Person in charge
1	**Preparation phase**					
	Compensation, land clearance	Monitor compensation for land clearance according to Government's and WB's policies	Areas need to be cleared	Checking document, consulting community	Once before construction	Investor
	Bomb, mine clearance	Monitor bomb and mine clearance both in depth and width	Project location	Checking document, on-site observation	Once before construction	Investor, independent supervising consultants
2	**Construction phase**					
	Total Suspended Particulate (dust)	- Check water sprinkle when dry weather - Check canvas cover of transport trucks	Construction sites, material transport roads	On-site observation, community consultation, air monitoring	TGT and contractor: daily; investor: every 2 weeks; environmental consultants: every 3 months (supervision) and every 6 months (monitoring)	Contractor, supervising consultants, independent supervising unit, investor
	Emissions, noise	- Check registration of transport vehicles - Check regular maintenance of equipment	Office of contractors	On-site observation, community consultation, air monitoring	TGT and contractor: daily; investor: every 2 weeks; environmental consultants: every 3 months (supervision) and every 6 months (monitoring)	
	Wastewater	- Check treatment of wastewater generated from domestic activities	Construction sites, workers'	On-site observation,	TGT and contractor: daily; investor: every 2 weeks;	Contractor, supervising

		- Check construction of hygiene toilets for workers - Check system of overflow collection ditches and construction wastewater sedimentation ponds - Check collection of oil and grease waste	camps	Surface water and groundwater monitoring	environmental consultants: every 3 months (supervision) and every 6 months (monitoring)	consultants, independent supervising unit, investor
	Flow modification	- Check construction of water channels to ensure sufficient water for downstream during construction phase - Check removal of auxiliary dykes after construction	Construction sites	On-site observation	TGT and contractor: daily; investor: every 2 weeks; environmental consultants: every 3 months	Contractor, supervising consultants, investor
	Soil	- Check collection of and handling soil and stone waste, dumping sites. - Check cover of digging land - Check planting trees in exploited soil mine	Soil exploitation area, dumping areas, backfilling sites	On-site observation, mud monitoring	TGT and contractor: daily; investor: every 2 weeks; environmental consultants: every 3 months (supervision) and every 6 months (monitoring)	Contractor, supervising consultants, independent supervising unit
	Landscape	- Check restoration of space after construction - Check cutting trees in sub-project location	Construction sites	On-site observation	TGT and contractor: daily; investor: every 2 weeks; environmental consultants: every 3 months	Contractor, supervising consultants, independent supervising unit, investor

	Domestic waste and construction waste	- Check collection of and handle with domestic solid waste - Check collection of and handle with construction waste - Check quality of material transport roads - Check installation of traffic signs - Check and repair damaged roads by sub-project - Check arrangement of residence slopes	Construction sites, material transport roads	On-site observation, community consultation	TGT and contractor: daily; investor: every 2 weeks; environmental consultants: every 3 months	Contractor, supervising consultants, investor
	Social environment	- Check employment of local residents - Check temporary residence registration of workers - Check implementation of solutions for sanitation and diseases prevention in sub-project location and surrounding areas - Check propaganda of HIV/AIDS and social evils to workers	Workers' camps	On-site observation, document review, community consultation	TGT and contractor: daily; investor: every 2 weeks; environmental consultants: every 3 months	Contractor, supervising consultants, investor
3	**Operation phase**					
	Water quality	- Check construction of hygiene toilets for workers - Check rubbish collection in reservoir - Check dumping domestic waste of local residents	Relevant locations	On-site observation, document review, Surface water and groundwater	Every 6 months	Operation unit

		- Check regulation of water flow		monitoring		
4	**Risks and problems**					
	Traffic safety	- Check installation of traffic signs, speed limit signs in construction sites	Construction sites, workers camps, material/fuel stores	Onsite observation, community consultation	TGT and contractor: daily; investor: every 2 weeks; environmental consultants: every 3 months	Investor, contractor, supervising consultants, operation unit
	Labor safety	- Check supply and use of labor safety equipment - Check propaganda of labor safety regulations - Check first aid boxes - Check signs, barriers in danger areas				
	Fire and explosion	- Check fire and explosion prevention equipment - Check gathering inflammable materials and electric system				
	Dam safety, floods, salinity intrusion	- Check quality of structures - Check consolidation of dam foundation - Check operation and maintenance of structures - Check plan of floods prevention, water regulation and use, problems responding plan	Dam location	Review and check documents	TGT and contractor: daily; investor: every 2 weeks; environmental consultants: every 3 months Operation unit: weekly	Investor, contractor, supervising consultants, operation unit

Table 7-6: Environmental monitoring program

No	Type of sample	Monitoring site	Frequency	Parameter	Person in charge
A	Preparation phase				
1	Air – 04 locations	1. Earth dam location – Dam roof (KK1); 2. 03 households closed to roads (KK2, KK3, KK4)	Twice before construction	- Temprature, humidity, wind speed - Noise LAeq - TSP - SO_2 - CO - NOx	Independent supervising unit
2	Soil – 03 locations	1. Existing earth dam (Đ1) 2. Left side of reservoir (Đ2) 3. Right side of reservoir (Đ3)	Twice before construction	- Arsenic (As), - Cadmium (Cd) - Lead (Pb), - Zinc (Zn)	Independent supervising unit
3	Surface water – 04 locations	1. Left side of reservoir (NM1) 2. Right side of reservoir (NM2) 3. Dam roof near spillway gate (NM3) 4. Centre of reservoir (NM4)	Twice before construction	- pH - DO - TSS - COD - BOD_5 - NO3- (calculated by N) - PO43- (calculated by P) - As - Total oil and grease - Coliform	- Independent supervising unit
4	Ground water – 03 locations	1. Household in Tan Phu 1 2. Household in Tan Phu 2 3. Household in Tan Hoa	Twice before construction	- Hardness ($CaCO_3$) - TDS - Iron (Fe) - Lead (Pb) - Arsenic (As) - Chrome (Cr6+) - Manganese (Mn) - NH4+ calculated by N	Independent supervising unit

B	Construction phase				
I	Monitoring management of waste generation sources				
1	Generation source	Workers camps Dumping sites	Every 3 months	Solid waste quantity, number of toilets, camps, wastewater treatment system Hazardous waste quantity Waste components	
2	Waste management	Construction sites Workers camps Dumping sites	Every 3 months	Number of rubbish bins Receipts of collection and transportation Number of rubbish bin	
II	Monitoring impacts on natural environment				
1	Air – 02 locations	1. Earth dam construction location near beginning of road 1 (GS1); 2. Dam construction location near beginning of road 3 (GS2)	Every 6 months twice/day/time	- Microclimate: Temp., humidity, wind speed - Noise LAeq - TSP - SO2 - CO - NOx	
2	Surface water – 02 locations	1. Dam location near beginning of road 3 (GS N1) 2. Command house (GS N2)	Every 3 months	- pH - DO - TSS - COD - BOD_5 - NO3- (calculated by N) - PO43- (calculated by P) - As - Total oil and grease - Coliform	
3	Landslide and erosion	Flooding discharge structure construction area	Once	Magnitude and size	
III	Monitoring impacts on society				
	Social impacts	Downstream location	Every 6 months	Income, employment; number of planting seasons, average productivity, irrigation	

				schedule; information and complains of local residents	
IV	Monitoring environmental sanitation and labor safety				
1	Environm-ental sanitation	Construction site Workers camps Material storage areas	Every 3 months	Quantity and situation of toilets Quantity and situation of hygiene equipment First aid boxes Medical condition Quantity of patients Propaganda program on community health	
2	Labor safety	Construction site Workers camps Material storage areas Dumping sites	Every 3 months	Labor safety equipment Safety signs Quantity of accidents	
C	Operation phase				
1	Monitoring impacts on natural environment				
	Surface water – 01 locations	1. Dap Lang reservoir	Twice per year	- pH - DO - TSS - pH - DO - TSS - COD - BOD_5 - NO3- (calculated by N) - PO43- (calculated by P) - As - Total oil and grease - Coliform	
	Ground water – 01 locations	1. Household in Tan Phu 2 near sub-project location	Twice per year	- Hardness ($CaCO_3$) - TDS - Iron (Fe) - Lead (Pb)	

				- Arsenic (As) - Chrome (Cr6+) - Manganese (Mn) - NH4+ calculated by N	
2	Monitoring erosion of river banks, reservoir:				
	Landslide, erosion	Downstream of dam	Twice per year in 2 years	Magnitude and size	
3	Monitoring impacts on society				
	Social impacts	Beneficiary communes	Twice per year	Income, employment; number of planting seasons, average productivity, irrigation schedule; information and complains of local residents	

7.3.3. Estimated cost for environmental and social monitoring

Table 7-7: Cost estimation for monitoring environment and society in construction phase

No	Content	Unit	Quantity	Unit price (VND)	Amount (VND)
I	Monitoring management of waste generation sources				***10000000***
1	*Generation source*	*Time*	*1*	*5000000*	*5000000*
2	*Waste management solution*	*Time*	*1*	*5000000*	*5000000*
II	Monitoring impacts on natural environment				***27248000***
1	Air monitoring (2 locations *4 times/year = 8 samples/parameter)			971000	7768000
	Temperature (t^0)	*Sample*	*8*	*7000*	*56000*
	Humidity (%)	*Sample*	*8*	*7000*	*56000*
	Wind speed (v)	*Sample*	*8*	*7000*	*56000*
	CO	*Sample*	*8*	*300000*	*2400000*
	NO_2	*Sample*	*8*	*300000*	*2400000*
	SO_2	*Sample*	*8*	*300000*	*2400000*
	TSP	*Sample*	*8*	*50000*	*400000*
2	Surface water monitoring				14480000
	pH	*Sample*	*8*	60,000	*480000*
	Temperature (t^0)	*Sample*	*8*	30,000	*240000*
	BOD_5	*Sample*	*8*	120,000	*960000*
	COD	*Sample*	*8*	100,000	*800000*
	DO	*Sample*	*8*	60,000	*480000*
	Total dissolved solids (TDS)	*Sample*	*8*	60,000	*480000*
	NH_4^+	*Sample*	*8*	80,000	*640000*
	Cl-	*Sample*	*8*	80,000	*640000*
	NO_3^-	*Sample*	*8*	80,000	*640000*
	NO_2^-	*Sample*	*8*	80,000	*640000*
	PO_4^{3-}	*Sample*	*8*	80,000	*640000*
	Fe_{TS}	*Sample*	*8*	80,000	*640000*
	Cd	*Sample*	*8*	80,000	*640000*
	Pb	*Sample*	8	80,000	*640000*
	Hg	*Sample*	*8*	120,000	*960000*

No	Content	Unit	Quantity	Unit price (VND)	Amount (VND)
I	Monitoring management of waste generation sources				***10000000***
1	*Generation source*	*Time*	*1*	*5000000*	*5000000*
2	*Waste management solution*	*Time*	*1*	*5000000*	*5000000*
II	Monitoring impacts on natural environment				***27248000***
	Cu	*Sample*	*8*	80,000	*640000*
	Zn	*Sample*	*8*	80,000	*640000*
	Total oil and grease	*Sample*	*8*	300,000	*2400000*
	E.coli	*Sample*	*8*	80,000	*640000*
	Total coliform	*Sample*	*8*	80,000	*640000*

3	Monitoring landslide	*Time*	1	5000000	5000000
III	Monitoring impacts on society				***5000000***
	Impacts on society	*Time*	1	5000000	5000000
IV	Monitoring environmental sanitation and labor safety				***5000000***
	Environmental sanitation	*Time*	1	2500000	2500000
	Labor safety	*Time*	1	2500000	2500000
V	Personal expense: 3 staffs x 3 days		9	350000	***3150000***
VI	Sample collection and analyzing vehicle (approximately VND 5 million per trip)	Trip	1	5000000	***5000000***
VII	Writing monitoring report	Report	1	4000000	***4000000***
VIII	Total cost of one monitoring time (Sum I-VII)	*Time*	1		**59398000**
IX	Total cost per year	*Time*	2		**118796000**
X	MANAGEMENT COST	TT*20%	C		23759200
XI	Total cost before Tax		TC		142555200
XII	Tax GTGT: (VAT)= 10% x (TC)		VAT		14255520
XIII	Cost for land clearance in construction phase		G		156810720
Total (VND)					**156,810,000**

Table 7-8: The cost of capacity building and training implemention

Content		Trainees	Quantity	Cost (VND)	Fund
Training on food hygiene, occupational safety and environmental protection		Workers and technical staff of contractors	All of workers, staff	50 people x 200,000 VND /person = 10,000,000 VND	To be included in the investor's contract with stakeholders
Training on Environmental Management	Control of emissions sources	PPMU staff	3 people	500,000 VND /person x 3 people = 1,500,000 VND	To be included in the investor's contract with stakeholders
	Impact assessment, environmental risk control	PPMU staff	3 people	500,000 VNd /person x 3 people = 1,500,000 VND	To be included in the investor's contract with stakeholders
	Environmental Monitoring	PPMU staff CSC staff	8 people (3 PPMU staff and 5 CSC staff)	500,000 VND /person x 8 people = 4,000,000 VND	To be included in the investor's contract with stakeholders
	Raising awareness and accessing to the environmental legal system	PPMU staff CSC staff	8 people (3 PPMU staff and 5 CSC staff)	500,000 VND /person x 8 people = 4,000,000 VND	To be included in the investor's contract with stakeholders
	Training and capacity building for environmental monitoring	CSC staff	5 people	5 people x 1,000,000VND/person = 5,000,000 VND	To be included in the investor's contract with stakeholders
Training for CSB		CSC staff	2 people/ 1 commune x 1 commune = 2 people	2 people x 1,000,000 VND/person = 2,000,000 VND	To be included in the investor's contract with stakeholders
Total (VND)				**28,000,000**	

Table 7-9: Cost estimation for monitoring environment and society in operation phase

No	Content	Unit	Quantity	Unit price (VND)	Amount (VND)
I	Monitoring impacts on natural environment				7640000
1	Surface water monitoring (1 location * 2 times/year)				1400000
	pH	Sample	2	60000	120000
	BOD5	Sample	2	120000	240000

No	Content	Unit	Quantity	Unit price (VND)	Amount (VND)
	COD	Sample	2	100000	200000
	Total dissolved solids (TDS)	Sample	2	60000	120000
	Fets	Sample	2	80000	160000
	As	Sample	2	120000	240000
	E.coli	Sample	2	80000	160000
	Total coliform	Sample	2	80000	160000
2	Groundwater monitoring				1240000
	pH	Sample	2	60000	120000
	Total suspended solids (TSS)	Sample	2	60000	120000
	Hardness	Sample	2	80000	160000
	DO	Sample	2	60000	120000
	E.coli	Sample	2	80000	160000
	Total coliform	Sample	2	80000	160000
	Fe	Sample	2	80000	160000
	As	Sample	2	120000	240000
3	Monitoring landslide	Time	1	5000000	5000000
II	Monitoring impacts on society				5000000
	Impacts on society	Time	1	5000000	5000000
III	Personal expense: 3 staffs x 3 days		9	350000	3150000
IV	Sample collection and analyzing vehicle (approximately VND 5 million per trip)	Trip	1	5000000	5000000
V	Writing monitoring report	Report	1	4000000	4000000
VI	Total cost of one monitoring time (Sum I-V)	Time	1		24790000
VII	Total cost of monitoring for the first two years (4 times)	Time	4	24 120 000	99160000
VIII	MANAGEMENT COST	TT*20 %	C		19832000
IX	Total cost before Tax		TC		118992000

No	Content	Unit	Quantity	Unit price (VND)	Amount (VND)
X	Tax: (VAT)= 10% x (TC)		VAT		11899200
XI	Cost for land clearance in operation phase		G		130891200
Total					**130,900,000**

Table 7-10: Total cost for environmental monitoring and management

No	**Total cost for environmental monitoring and management**	**Person in charge**	**Amount (VND)**
I	***Planning social and environmental management***	*Investor*	***265.250.000***
II	***Social and environmental monitoring***		***287.710.000***
1	Construction phase	Independent supervising unit	156.810.000
2	Operation phase	Independent supervising unit	130.900.000
III	***Traning and capacity building***	*PPMU*	***28.000.000***
	Total cost (I + II + III)		**580.960.000**

7.3.4. Monitoring report requirement

The monitoring reports will be completed during implementation of monitoring program. Besides, reports on impacts or recommendations of local residents will be collected. These reports will be used to assess effectiveness of mitigation measures.

Table 7-11: Types of report on monitoring environment and society

Person in charge to make report	**Type**	**Content**	**Frequency**	**Receiver**
Contractor	Accident/ problem report	Collection of information on unexpected accidents and problems	During 24 hours after problem	PPMU, construction supervising consultants
	Violation report	Providing information on actions violated regulations of environmental and social management	Within 1 week after matter happened	PPMU, construction supervising consultants
	Detection report	Recording and reporting related authorities on ancient structures/objects that unintentionally detected in sub-project implementation	Within 24 hours after detection	PPMU, construction supervising consultants, Department of Culture, Sports and Tourism
	Report on implementation of ESMP	Results of implementation of solutions to minimize negative impacts on environment and society	Monthly	PPMU
Construction supervising consultants	Report on implementation of impacts mitigation solutions on environment and society	- Assessing implementation results - Results of solving and remediation of problems - Improvement solutions for existing problems in previous reports	Monthly	PPMU

Person in charge to make report	Type	Content	Frequency	Receiver
Independent environment consultants	Independent supervising report on social and environmental safety	- Results of onsite investigation - Monitoring results based on community - Summary of monitoring results of construction supervising consultants - Results of environment monitoring - Assessment of implementation results of ESMP and recommendations	Every 6 months/ every 3 months	PPMU, WB
PPMU	Report on environmental activities of the projec	Results of ESMP implementation	Every 6 months	CPO, WB

7.4. ESMP implementation arrangement

Table 7-12: Organizations in charge for implementing ESMP

Organization	Responsibility
PPMU	Implement safety policies of the sub-project; monitor daily activities; supervise and manage construction quality; supervise compliance with environment safety in construction activities
Contractor	Be conformable with regulations specified in the contract with PPMU
Construction supervising consultants	ESMPloyed by PPMU, and on behalf of PPMU for daily supervision and record of compliance of contractor with social and environmental safety policy
Independent supervising consultants on social and environmental safety	- Support PPMU in assessing effectiveness of impacts minimization solutions and proposing necessary regulations in implementation process; - Write monthly report on compliance of contractor with social and environmental safety policy and submit it to PPMU. This report will be used as a foundation for paying the social and environmental protection costs; - Report to PPMU detection during construction process.
Local authorities and community	Local supervising community board will be established according to the Decision 80/2005/QD-CP dated 18 April 2005 by the Prime Minister on regulation of supervising investment of community. This board in commune level has rights and responsibility to supervise construction activities, negative impacts on environment in order to ensure effectiveness of mitigation solutions. In case of problems that affected environment and community, they will notify the construction supervising consultants (CSC) and/or PPMU by submitting environmental safety information feedback sheets.
Reservoir operation and management agency	Maintain and check regularly the structures of dam
Department of Natural Resources and Environment/	Supervise compliance with environmental policies according to regulations issued by the Vietnamese Government

Division of Natural Resources and Environment	
Central Project Office (CPO)	Guide PPMU in implementation of social and environmental management plan of the Project; supervise Project's progress in construction phase and in the first year of operation phase.

7.4.1. Agencies and responsibilities

a. Responsibility of sub-project owner/sub-project management board

To take responsibility for performing safeguard policies of sub-project, supervising daily activities of sub-project, monitoring and managing the sub-project construction quality, supervising the conformity with the environmental safety in construction activities of sub-project.

b. Responsibility of contractor

Contractor has the responsibility for conforming to regulations during construction process as contracted with PPMU.

c. Responsibility of execution supervision consultant

Execution supervision consultant has been hired by PPMU and will be on behalf of PPMU to supervise and take note everyday about the conformity with environmental and social safety policies of construction contractor.

d. Responsibility of independent supervision consultant on environmental and social safety

- Assist PPMU in effect assessment of mitigation measures and propose the adjustment of application environmental and social safeguard policies in necessary case;
- Make monthly report on the conformity with environmental and social safeguard policies of contractor and submit to PPMU, this report will be the basis for contractor pay environmental and social protection expenses;
- Report to PPMU "detections" during construction time.

e. Responsibility of local authorities and community

The Community Supervision Board has been established according to "Decision No.80/2005/QĐ-CP dated 18/04/2005 of Prime Minister on investment

supervision status of community". Community Supervision Board of commune has right and responsibility for supervision construction activities and negative impacts caused by construction activities, ensure measures to minimize the potential negative impacts must be performed effectively. In case of environmental problems arising that affects to community, they will report to construction site supervision consultant (CSC) and/or PPMU to fill in the information feedback notes on environmental safety.

f. Responsibility of reservoir management and development agency

Take responsibility for maintenance and periodic supervision of sub-project works

g. Responsibility of CPO

Guiding provincial Project management Board to carry out environmental and social management plan of sub-project. Supervising progress of sub-project during construction time and the first operation year.

h. Responsibility of Department of Natural resources and Environment

Department of Natural resources and Environment has responsibility to carry out environmental policies as per regulations of Vietnam Government.

7.4.2. Assessment of existing environmental and social management practice and capacity for dam management

The management and operation of Dap Lang Reservoir are assigned by Hanh Tin Tay Commune People's Committee to the agricultural cooperatives for implementation. In terms of organizational structure, the apparatus consists of 04 people as yearly contractual personnel. The person taking main charge is the manager of the agricultural cooperatives. The responsibilities are assigned, including:

- Controlling and checking the management and operation.

- Regulating water.

- Clearing and dredging the main canals.

Among officers, there is not any officer specializing in water resources; only the officer taking main charge participates in the natural disaster project management training class organized by the WB5 program; 01 officer takes part in the survey training class.

The Work has no operating procedure. The closing and opening of the culvert, and monitoring the flows depend mainly on visual observation and experience.

The regular monitoring, checking and repairing are not carried out in accordance with the regulation.

Comments :

Within the work scope of Dap Lang Reservoir, there is a need to have a management unit having sufficient personnel with the trained profession on reservoir and dam. The management and operation need the establishment of operating procedure and comply with it. Annually, there is a need for checking, reviewing, reporting, proposing the corrective plans for damages, and maintaining the equipment periodically. The plans for flood, storm prevention and rescue in rainy and flood, storm seasons and emergency cases are needed.

7.4.3. Building capacity and improving the knowledge on the environmental and social protection training/coaching programs

In order to strengthen capacity and technique on environmental management of PPMU's staffs, relevant organizations and individuals, the PPMU will provide training courses on:

- Strengthening capacity on environmental monitoring and management
- Propagandize to raise awareness on environmental protection
- Training on fire prevention and fight
- Training on environmental regulations and standards
- Training on environmental health, labor safety, and environmental safety
- Training to raise awareness on dam safety
- Training to raise awareness on prevention of infectious diseases
- Training to raise awareness on gender equity
- Training to raise awareness on development of minority groups

7.5. Community development need assessment

Social and political organizations at the local (such as Farmer Union, Women's Union, Youth Union, Veterans Association, Association of the Elderly, Red Cross Association, ...) are organization involved in monitoring and implementation of the project, especially the period of land acquisition, compensation, assistance and resettlement of affected households to ensure compliance with policies and resettlement and the objectives of the sub-project. The community organizations are

where grasp the issues and responses of people related to the operation of the sub-project during the preparation, construction and put into use. The monitoring of these organizations to coordinate with the population groups in the community is crucial in helping the management and implementation units to adjust timely design, operation construction activities to minimize undesirable social impacts on people lives in the affected areas.

The hamlet: The grant works directly with the people, reflect the issues raised during the preparation, construction and putting into operation of the sub-project category. Hamlets will be the last place the activities implemented to provide information to residents of the sub-project and are the first place to receive the feedback of the people related to the sub-project. The role of village officials/neighbors very important, objectively and timely reflect the aspirations and legitimate petitions of the people for the monitoring of the sub-project implementation process to minimize the impact of sub-project to life of the people. In addition, the comments reflected from village officials, neighbors also make construction sub-project categories more relevant, bring economic benefits for society than community benefit area direct the sub-project.

PART 8: STAKEHOLDER CONSULTATION AND INFORMATION DISCLOSURE

8.1. Public consultation objectives

- To get the consent of the relevant agencies, local governments and communities in the sub- project implementation
- To share information about the scope of the sub-project and its impact on the environment and society
- To increase the encourage of the participation in the community for determining the impacts of the sub-project
- To collect information about the requirement and the responsibility of the local resident and local authority on the proposing mitigation measures of the sub-project owner, or to improve the mitigation measure in pre-construction phase or sub-project design

8.2. Social impacts assessment consultation

i) Consultation subject:

- People's Committee of Hanh Tin Tay commune
- Households affected in sub-project location

ii) Consultation content

- Introduced content, main components of the sub-project, financial sources;
- Presented benefits of affected people, complaint and complaint solving; compensation policy applied for types of land, existing structures, plants, and fruits.
- Presented potential impacts of the sub-project on resettlement and gender
- Community discussed on benefit policies and compensation applied for land, structure, plants and fruits.

iii) Consultation methodology

- From the beginning, local authorities at the levels of Hanh Tin Tay commune, Nghia Hanh district, and Quang Ngai province had been

reported about the sub-project. The affected residents had been invited to and discussed at the consultation meetings organized at commune.

iv) Consultation results

- At the consultation meetings, many viewpoints of participants had been given. The summary can be seen as below:
- Areas occupied by the sub-project are mainly forest land
- The sub-project Dap Lang reservoir occupies insignificant area due to the upgrading the dam shall be mainly constructed on the existing structure. Therefore, negative impacts can be minimized.
- The construction and upgrading structures aims to enhance dam safety effectiveness, life safety and property for beneficiaries, contributing to stabilize living of local residents
- Affected households are expecting to be updated the sub-project's progress
- Affected households are expecting to be fully, properly and transparently compensated according to the regulations
- Both man and woman had been invited to the consultation meetings and welcomed to propose solutions to the sub-project, and then gender aspect in the sub-project can be ensured
- The sub-project location and beneficiary location do not have minority groups. Only in the neighboring area of Hanh Tin Tay commune, the Hre population accounts for about 10.7%
- The woman and children trafficking has not recorded in the sub-project location
- AH people understand about positive impacts and beneficiaries of the sub-project, then they have been completely agreed to the sub-project implementation and expected that the sub-project can be implemented at the soonest.

8.3. Environmental impacts assessment consultation

Summary of community consultation activities implemented according to ESIA

a. Consultation attenders:

- People’s Committee of Hanh Tin Tay commune
- Fatherland Front Committee of Hanh Tin Tay commune
- Other local associations: Farmer Association, Women Association, Youth Union, etc.
- Beneficiary s head: Tan Phu, Tan Hoa 1, Tan Hoa 2
- Households affected in sub-project location (23 Households)

b. Consultation’s content

- Introduced content, main components of the sub-project, financial sources
- Presented potential impacts of the sub-project on environment and society
- Presented social and environmental management plan, including: impacts minimization and implementation plan
- Consulted environmental troubles and impacts on local environment and society happened in the history
- Community discussed on solutions to minimize impacts on environment and society
- People’s Committee and Fatherland Front Committee confirmed consultation results by document

c. Consultation methodology

A number of meetings were held with the participation of local authorities, related associations and agencies, representative of affected households. In order to facilitate residents express their opinion and expectation, the consultation meeting was taken place openly and used questioners on related information such as disasters in the past, expectation, requirement, etc.

d. Consultation results (Appendix A7)

Table 8-1: Consultation results

Organization/agency	**Place**	**Time**	**Participants/number of woman (people)**
Representatives of People’s Committee, Fatherland Front	Meeting-hall of People’s	2 PM 16th March	16/2

Committee of commune, s of Tan Phu, Tan Hoa 1, and Tan Hoa 2	Committee of Hanh Tin Tay commune	2015	
Representatives of People's Committee, Fatherland Front Committee of commune, residents of Tan Phu 2	Cultural house of Tan Phu 2	8 AM 17th March 2015	44/14
Representatives of People's Committee, Fatherland Front Committee of commune, residents of Tan Phu 1	Cultural house of Tan Phu 1	2 PM 17th March 2015	33/16
Representatives of People's Committee, Fatherland Front Committee of commune, residents of Tan Hoa	Cultural house of Tan Hoa	8 AM 18th March 2015	26/8

+ Opinion of local residents: Agreed with the sub-project and recommend: Investor should carry out the land clearance and compensate properly at the soonest; construct components according to the schedule and ensure usual living and production activities of local residents. The affected people by land clearance are expecting to receive fully (100%) their compensation by cash.

+ Opinion of People Committee of Hanh Tin Tay commune: Agreed with the sub-project (construction solutions, negative impacts on environment, impacts minimization solutions which given in the attachment with consultation document). They also recommended that the investor should collaborate closely with local authorities; create employment for local labor; construct components according to the schedule.

+ Opinion of Fatherland Front of Hanh Tin Tay commune: agreed with the sub-project (construction solutions, negative impacts on environment, impacts minimization solutions which given in the attachment with consultation document). They also recommended that the investor should prevent dropping construction materials and waste; create ESMPloyment for local labor; compensate properly to prevent dispute and conform to the given commitments in the document.

+ Commitment of investor: The sub-project owner highly appreciated the opinions and recommendations to regulate timely the sub-project document and

commit with the highest efforts to implement effectively impacts minimization solutions on environment caused by the sub-project's activities

8.4. ESIA disclosure

Information disclosure: According to the WB's policy on access to information, all draft safeguard instruments, including the /ESIA/ESMP/ESMoP, are disclosed locally in an accessible place and in a form and language understandable to key stakeholders and in Vietnamese and English at the CPO and InfoShop before the appraisal mission. ESIA is locally disclosed at the sites and in the Vietnam Development Information Centre of the WB in Hanoi

The report of ESIA of the sub-project will be published in Vietnamese version on the website of the Ministry of Agriculture and Rural Development, CPO, People's Committee of Quang Ngai province. ESIA summary will be sent to the Department of Natural Resources and Environment of Quang Ngai, Nghia Hanh District People's Committee, the CPC Hanh Tin Tay to the community and interested organizations can access, monitor the plan of ESMP implement.

CONCLUSIONS, RECOMMENDATION AND COMMITMENT

1. Conclusions

(i) The project belongs to B category of environment according to the environmental safeguard policies of WB

(ii) The sub-project does not locate in environmentally sensitive location and does not violate any "unconformable" items of WB;

(iii) The Report determined and evaluated fully significant impacts in all three phases of the sub-project: preparation, construction, and operation; proposed minimization solutions of impacts; presented consultation of local authorities and affected and vulnerable residents;

(iv) An Environmental and Social Management Plan (ESMP) and an Environmental and Social Monitoring Plan (ESMoP) to supervise impacts on environment and society have been established, in order to support decision making, update regularly the sub-project's progress;

(v) The upgrading and improving Dap Lang reservoir in Quang Ngai province has its investor of Department of Agriculture and Rural Development and managed by the management board of irrigational works under the Quang Ngai Department of Agriculture and Rural Development. During the construction, the sub-project can cause both potential negative and positive impacts:

Potential impacts in preparation phase

At the preparation phase, the sub-project will occupy about 13,778 m^2 of agriculture and forestry land; affect temporarily 39,875m^2 forestry land in the location for auxiliary works.

Potential impacts in construction phase

The sub-project includes construction of dam, auxiliary works, roads, etc. causing several negative impacts such as: a) increasing risks of health due to rising transportation means and waste; b) increasing noise, dust, emissions, and vibration due to operation machine, equipment; c) causing social evils such as robbery, gambling, drugs, and infectious diseases; d) waste of soil, stone and construction materials can fall into water flows, paddy rice, etc.

Potential impacts in operation

During operation, dam can be break, threatening residents in the downstream. Besides, during flood season, the high water level at overflow gate can affect

livelihood of residents in the downstream, including paddy rice, fish pond, husbandry farm, etc.

Impacts mitigation solutions in construction phase

During construction, a number of solutions can be considered to mitigate negative impacts, including: a) implementing resettlement plan; b) implementing solutions to minimize dust, emissions, noise, vibration; optimizing machine operation; arranging reasonable working schedule (avoid rainy day); selecting safety methods in construction; c) managing appropriately human resources (selection, training on health, safety, disease prevention, solutions to handle with violation); d) communication to local community (working with authorities, announcing residents, preferring local employment, etc.)

Impacts mitigation solutions in operation phase

The sub-project management unit check regularly the safety of reservoir; collaborate closely with People's Committee of communes and local residents to update and report timely risks related to dam safety for remediation activities; assign staffs to supervise and regulate water level in the dam during flood season; publicize flood-discharging plan to community.

Supervising environment-society

The contractor needs to prepare ESMP used as foundation for supervising environment that is implemented by the governmental agencies, PPMU and supervising consultants. An environmental monitoring system approved by WB will be applied during the sub-project implementation process. The supervising consultants will submit monthly reports to PPMU. These reports shall be independent from provincial environmental compliance report that will be prepared and submitted to the PMU.

2. Recommendation

Based on the environmental assessment and environmental-social management plan (ESMP), the following recommendations can be considered:

(i) Impacts mitigation measures mentioned in ESMP will be established as a vital component in the construction-bidding document. The contractor will analyze carefully workload and determine the total cost estimation for implementing impacts mitigation measures. This cost will be considered as a safe level for

environment and this cost is only disbursed when effectiveness of these measures shown.

(ii) Based on the Environmental and social impact assessment, safety policy consultants and PMU propose related governmental agencies and WB to approve the report of environmental and social impact assessment of the sub-project "Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province". The approval will be baseline to implement following steps in order to meet the sub-project's schedule.

3. Commitment of investor

All consultation results from local community has been appreciated. Based on that, the investor commit to implement the impact mitigation measures given in Chapter 6 of this report. The investor also commit to use strict measures to remind and punish contractor who does not implement the mitigation measures.

In summary, the investor commits:

1. Comply strictly and ensure the environmental parameters to meet the National Environment Standards of Vietnam (National Technical Standard of Vietnam/ National Standard of Vietnam) according to existing regulations on environmental quality.
2. Perform all measures to protect water resources and environment to mitigate the negative impacts given in the ESIA and ESMP.
3. During operation of the sub-project, investor will be faced with Vietnamese Law for any actions, which violate international conventions and National Environment Standards of Vietnam, as well as lead to serious environmental troubles.
4. The investor commits to perform strictly regulations on compensation, remediation of environmental troubles caused by the sub-project.

REFERENCES

1. FS report of sub-project "Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province";
2. Main report of sub-project "Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province";
3. RAP report of sub-project "Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province";
4. EIA report of sub-project "Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province"
5. Sub-reports of sub-project "Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province";
6. Design proposal of the sub-project "Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province";
7. Report on social-economic status of Hanh Tin Tay Commune, Nghia Hanh District, Quang Ngai Province, 2014;
8. Results of environmental analysis in the area of sub-project "Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province";
9. Maps:

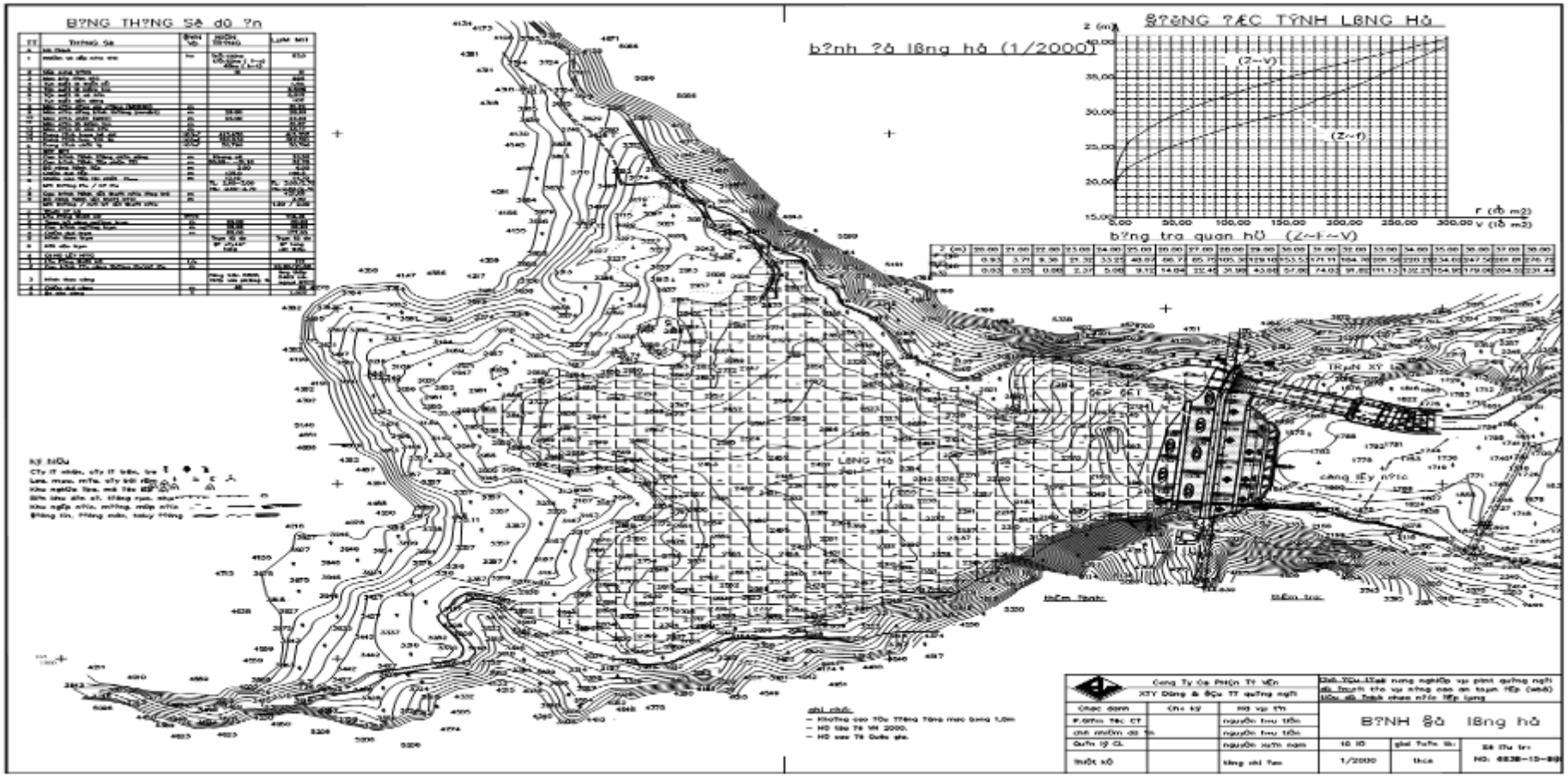
   - Map of sub-project area

   - Map of current and planning land users in the sub-project area

APPENDIXES

APPENDIX A - ENVIRONMENT

APPENDIX A1: Drawing of the main work



APPENDIX A2: Types of map

APPENDIX A3: Policyframework, institution and regulation

A3.1. Policies and regulations of Vietnam for ESIA

A3.1.1. Legal framework on environment

- The Law on Environmental Protection No.55/2014/QH13 approved by the National Assembly on June 23th, 2014 regulating issues related to strategic environmental assessment, environmental impact assessment and environmental protection commitments for development activities.The report of environmental impact assessment was carried out simultaneously with the process of setting up an investment project (feasibility report).
- Decree No. 18/2015/ND-CP dated February 14, 2015, on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plans.
- Instruction No.26/CT-Tg dated on August 25, 2014 of the Government on implementation the Law on Environment Protection.
- Circular No. 01/2012/TT-MONRE dated on March 16, 2012 of the Ministry of Natural Resources and Environment regulation on setting-up, assessment, approval, inspection and certification of the implementation of detailed environmental protection project; setting-up and registration of simple environmental protection project.
- Circular No. 16/2009/TT-BTNMT 07/10/2009 by the Ministry of Natural Resources and Environment of the Socialist Republic of Viet Nam regulations, national technical regulations on the environment, air quality and a number of toxic substances in the surrounding airenvironment.
- Decision No.22/2006/QD-MONRE dated on December 18, 2006 on the compulsory application of Vietnam's standards about the Environment.

A3.1.2. Legal framework on using and requiring land in the investment projects

- Land Law No. 45/2013/QH13 approved by the National Assembly on November 29th, 2013.
- Decree No. 43/2014/ND-CP dated on May 15, 2014 guiding in some articles of the Land Law 2013.
- Decree No. 44/2014/NĐ-CP dated on May 15, 2014 on land prices.
- Decree No. 47/2014/ND-CP dated May 15th, 2014 by the Government for regulation on compensation, assistance and resettlement when the Government acquires land.

- Circular No. 37/2014/TT-BTNMT dated June 30th, 2014 about detailed regulation on compensation, assistance and resettlement when the Government acquires land.
- Circular No.23/2014/TT-BTNMT dated on May 19, 2014 on land use right, owners of houses and other land-attached assets.

A3.1.3. Legal framework related to use and management of construction investment projects

- Law on Construction No. 50/2014/QH13 approved by the National Assembly on August 18th, 2014.
- Decree No.15/2013/ND-CP dated February 6, 2013 of the Government on quality management of construction works.
- Decree No. 207/2013/ND-CP dated on December 11, 2013 of the Government amending and supplementing a No. of Articles of the Decree No. 48/2010/ND-CP dated May 07, 2010 of the Government on contracts in construction activities
- Decree No. 12/2009/ND-CP dated on February 10, 2009 on management of investment projects on the construction of works.
- Decree No.32/2015/ND-CP dated on March 25, 2015 on cost management of construction works.
- Circular No. 04/2010/TT-BXDdated on May 26, 2010 approvedby the Minstry of Construction for Giudelines on management of construction invest projects.
- DecreeNo. 03/2013/QĐ-UBND dated January 09, 2013 approved by Quang Ngai Provincial Pepole's Committee for Regulations on investing management of basic construction activities in Quang Ngai province.

A3.1.4. Legal framework related to the exploitation of water resources; protection forest, cultural heritage and biodiversity

- The Law on Water resources No.17/2012/QH13, approved by the National Assembly on June 21st, 2012.
- Decree No.42/2012/ND-CP dated on May 11, 2012 of the Government on management and use of rice – farming land.
- Decree No. 112/2008/ND-CP dated on October 20, 2008 of the Government on management, protection and integrated exploitation of resources and

environment of hydro-power and irrigation reservoirs.

- Decree No. 120/2008/ND-CP dated on December 01, 2008 of the Government on river basin management.
- Decree No. Decree No. 149/2004/ND-CP dated on July 17, 2004 on the issuance of permits for water resource exploration, exploitation and use water resource and letting out water.
- Law on Protection and Forest Development No. 29/2004/QH11 approved by by the National Assembly on 03/12/2004
- Nghị định số 23/2006/NĐ-CP ngày 03/03/2006 của Chính Phủ về hướng dẫn thi hành Luật Bảo vệ và phát triển rừng
- Quyết định số 57/QĐ-TTg ngày 09/01/2012 của Thủ tướng Chính phủ phê duyệt kế hoạch bảo vệ và phát triển rừng giai đoạn 2011-2020.
- Law on Cultural heritage No. 28/2001/QH10 of June 29, 2001 approved by the National Assembly on July12th, 2001. Article 13 - strictly prohibit the following acts: Appropriating and distorted cultural heritage; Destroying or risk destruction of cultural heritage; Unauthorized excavation of archaeological sites; illegal construction, encroachment of land belonging to historical - cultural, scenic.
- Law No. 20/2008/QH12 on Biodiversity dated November 13, 2008. Chapter III of Conservation and sustainable development of natural ecosystems, and Chapter IV of Conservation and development of organisms.

A3.1.5. National policies on Dam safety

- Decree No.72/2007/ND-CP dated May 07, 2007 of the Government on Dam safety management.
- Governmental Direction No. 21/CT-TTg dated October 14, 2013 to enhance the safety management of reservoirs.
- Circular No. 34/2010/TT-BCT dated on October 07, 2010 on dam safety management of hydro-power works
- Project “Upgrade monitoring system of reservoirs” approved in 2009.
- Programme on Resevoir Safety approved by the Prime 1734/TTg-KTN 21/9/2009.

A3.1.6. Resetlement policies

Constitution of the Republic of Socialist Vietnam (1992) asserted the right of citizens to own and protect the housing ownership. In addition, the Government has promulgated a number of laws, decrees, and regulations constitute the legal framework for land acquisition, compensation and resettlement. The main texts include:

- Decree 79/2003 / ND-CP notification provisions of the exercise of democracy in communes, including the request for consultations and the participation of local people.
- Land law No. 45/2013 / QH13 taking effect on July 01, 2014.
- Decree No. 43/2014 / ND-CP dated 15/05/2014 Detailing the implementation of a number of articles of the Law on Land;
- Decree No. 44/2014 / ND-CP dated 15/05/2014 Regulations on land prices;
- Decree No. 45/2014 / ND-CP dated 15/05/2014 Regulations obtained the land use rights;
- Decree No. 47/2014 / ND-CP dated 15/05/2014 Regulations on compensation, support and resettlement when the State recovers land;

The laws, decrees, and regulations related to land management, land acquisition and resettlement include the Construction Law 16/2003/H11 on compensation and relocation of people affected by the work of the clearance for investment projects, Decree 16/2005-ND-CP on the implementation of the Construction Law, Decree 182/2004/ND-CP on sanctioning of administrative infringements in the land, Decree No. 12/2009/ND-CP dated 12/2/2009 on the management of construction projects, Decree 131/2006/ND-CP on the management and use of official development assistance (ODA) and Decree 70 rules that all registration dossiers family assets and land use rights to the name of both spouses. The decision of the provincial projects related to compensation and resettlement in the province will be applied to each sub-project respectively.

The decree relating to the protection and preservation of cultural property in Decree 186/2004 / ND-CP, which requires the area to be recognized as cultural relics and historical sites within the boundaries of waterway safety corridors must be preserved, no infringement under the current legislation.

Office of the Central Management Board of Irrigation projects ofMARD, through the Division of Environment and Resettlement, which is responsible for ensuring the effective implementation of the RPF in close consultation with the

departments and provincial levels.

Besides the general policy of the Government of Vietnam, Quang Ngai province has also introduced legislation to apply the Decree of the Government circulars and instructions of the departments of land acquisition and release ground. The following decision issued regulations on compensation and assistance when the State recovers land in Quang Ngai province:

- Decision No. 08/2013/QD-UB of the People's Committee of Quang Ngai province on 28 May 2013 on the promulgation of regulations on compensation, support and resettlement when the State recovers land applied in the province of Quang Ngai;

- Decision No. 25/2014/ QD of People's Committee of Quang Ngai province on June 6, 2014 on the promulgation of regulations on the compensation rate for the structures when the State recovers land for defense and security purposes; socio-economic development for national interests in Quang Ngai province;

- Decision No. 64/2014/QD-UBNDapproved by Quang Ngai PPC on December 17, 2014 for regulations on plant density and unit price to implement the compensation and assistance when the State recovers land in Quang Ngai province;

- Decision No. 67/2014/QD-UBNDapproved by Quang Ngai PPC on December 31, 2014 for regulations on land prices in Quang Ngai province applied to five-year period (from 2015 to 2019).

A3.1.7. Gender policies

- Law No.73/2006/QH11 on Gender Equality approved by the National Assembly on November 29, 2006;
- Directive 07/2007/CT-TTg 3/5/2007 Government on the implementation of the Law on Gender Equality;
- Decree No. 55/2009/ND-CP dated 10/6/2009 of the Government on sanctioning of administrative violations of gender equality;
- Decree No. 48/2009/ND-CP dated May 19, 2009 providing for measures to assure gender equality;
- Circular No. 191/2009/TT-BTC dated 01/10/2009 of the Ministry of Finance guiding the management and use of funds for operating activities of gender equality and the advancement of women;

- Circular No. 191/2009/TT-BTC dated 01/10/2009 of the Ministry of Finance guiding the management and use of funds for operating activities of gender equality and the advancement of women;
- Decision No. 2351 / QD-TTg dated 24/12/2010 of the Prime Minister approving the National Strategy on Gender Equality 2011-2020.

A3.1.8. Regulations related to hunger eradication and poverty reduction

- Circular No. 06/TT-UBDT dated September 20, 2007 of Ethnic committee gilding service support, improvement livelihood of communities, support technique to enhance the law knowledge of citizen following Decision No. 112/2007/QD-TTg.
- Decision No. 33/2007/QD-TTg dated July 20, 2007 approved by the Prime Minister on allowance policies to enhance the law knowledge of citizen following 135 program, second period.
- Decision No. 05/2007 / QD-CEM's Day 06/9/2007 Commission approved three regional ethnic minority and mountainous areas based on the development status.

A3.1.9. Legal documents related to implementation of sub-project

Decision No. 193/QD-NN&PTNT dated 28/06/2007 of the Department of Agriculture and Rural Development of Quang Ngai province on the decision to establish Management Board of Project of investment and construction of irrigation in Quang Ngai;

Official document No. 232/SNNPTNT dated 04/02/2015 of the Department of Agriculture and Rural Development of Quang Ngai on assignment of tasks to implement project preparation, repair, improve safety of dams, seriously degraded reservoirs of Quang Ngai (including Dap Lang reservoir).

- QCVN 04-01:2010/BNNPTNT:contents of project proposal, economic and technical report of irrigation works
- ISO 4116-85: Structure of concrete and hydraulic reinforced concrete.
- TCVN 8421:2010 - Loads and forces acting on works due to wave and ships
- TCVN 4118-2012: Irrigation channel systems - Design Standards
- TCVN 4253-2012: Foundation of Hydraulic Works
- TCVN 9151-2012:Procedure of hydraulic calculation of deep culvert

- 14TCN 197-2006:Water intake culvert that covered by concrete, coated steel - Design guidelines;
- TCVN 8216-2009: Design criteria for earth dam with compacted soil
- TCVN 9160-2012: Design requirements for flow diversion in construction.
- TCVN 9147-2012: Process of hydraulic calculation for spillway.
- TCVN 8215:2009:The main provisions for design of arrangement of monitoring equipment for focal work ensembles;
- TCVN 8213-2009: Calculation and assessment of economic efficiency of the Irrigation project serving for irrigation
- TCVN 9162:2012: Constructingroad - Design requirements

A3.1.10. National regulations related to environmental protection

(i) Water environment:

- QCVN 08:2008/BTNMT: National technical regulation on surface water quality;
- QCVN 09:2008/BTNMT: National technical regulation on groundwater quality;
- QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater;
- QCVN 40:2011/BTNMT: National technical regulation on industrial waste water

(Ii) Air environment:

- QCVN 05: 2013/ BTNMT: National technical regulation on ambient air quality;
- QCVN 06: 2008/BTNMT: National Technical Regulation on certain hazardous substances in the ambient air

(iii). Soil environment

- QCVN 03: 2008/BTNMT: National Technical Regulation on the permissible limits of heavy metals in the soil;
- QCVN 04: 2008/BTNMT: National technical regulation on chemical residues of plant protection in soil;
- QCVN 43: 2012/BTNMT: National technical regulation on sediment quality.

(iv). Management of solid waste:

- QCVN 07: 2009/BTNMT: National technical regulation on hazardous waste threshold.

(v) Vibration and noise:

- QCVN 26:2010/BTNMT: National technical regulation on noise
- QCVN 27:2010/BTNMT: National technicalregulation on vibration

(vi). Health and Safety

A3.2. WB policies on dam safety

According to the policies of WB (WB), ESIA report should combine analysis on economic, financial, institutional, social and technicalissues of the project to ensure that environmental and social aspects are paid fully attention during selecting the sub-project, locations and decisions on technological solutions. The following policies should be applied in this sub-project:

- Environmental Assessment (OP/BP 4.01)
- Natural Habitats (OP/BP 4.04)
- Physical Cultural Resources (OP/BP 4.11)
- Indigenous Peoples (OP/BP 4.10)
- Involuntary Resettlement(OP/BP 4.12)
- Safety of Dams (OP/BP 4.37)

APPENDIX A4: Environmental and social screening

Table – A.4.1: Eligibility screening

No.	Screening questions	Yes	No	Remarks (If yes)
1	Does the proposed sub-project lead to an increase in the dam height and/or reservoir's design storage capacity?	X		This sub-project leads to increase the dam height from 13.1m to 14.7m.
2	If the answer of the question 1 is yes, does the increase is not necessary from safety management perspective?		X	The sub-project will only conductrepairsandupgrades. There is no construction of big dam. Therefore, the increase is not necessary from safety management perspective.
3	Does the proposed sub-project encroach on a critical natural habitat, a protected area of natural habitat, a national park of nature or a nature reserve and would lead to temporary orpermanent acquisition land in that habitat, park or reserve?		X	
4	Does the sub-project displace, disfigure or render inaccessible any structure or site of great cultural or historical value to the country, to an ethnic group or to the local community?		X	
5	Does the sub-project use land that is currently occupied or regularly used for natural forest areas, defensive forest or leads to a change in the land use of forest lands during project implementation?		X	

Table - A.4.2: Screening and environmental categorization

No.	Issues	Assessment	Description
1	**Impacts on the natural environment**		
	Loss or degradation of land and water areas where there are native species, and where human activity has not significantly alter the fundamental ecological functions	No Impact	The project has only improved and has not built the new construction; therefore there is no rise of water level and water volume which have not any impacts on the natural environment.
	Loss or degradation of natural habitats	No Impact	The Dam Lang reservoir, which has

No.	Issues	Assessment	Description
	such as: important conservation areas, areas protected by traditional local communities (e.g. sacred forest), biodiversity; rare, vulnerable, migratory or endangered species.		earth-dams, have not worked well. In dry season, the bottom is dry, therefore, there is no protected species and surrounding area is planted forest and no protected area nearby.
2	**Impact on physical cultural resources**		
	Loss or degradation of the material culture resource, structures, groups of structures, characteristics, natural landscape with importance of archaeology, palaeontology, history, architecture , religion, aesthetic, or other importance of culture.	No Impact	This is ancient reservoir therefore there is no potential to cause any adverse impacts on physical cultural resources
	Result to conflict with national laws or international obligations under treaties or international environmental agreements, including the World Heritage Convention of UNESCO or affect famous, scientific and important heritage sites.	No Impact	The Quang Ngai archeology experts have confirmed that there is no conflict or impact
3	**Impacts on land and related natural resources used by ethnic minorities**		
	May result to impacts on land or traditionally owned territory, or used or customary tenure, and where access to natural resources, which is vital for the sustainability of the culture and livelihood of ethnic minorities.	No Impact	There are no ethnic groups
	Likely to lead to impact on cultural and spiritual values symbolized for the land and natural resources or impact on management of natural resources and the long-term sustainability of resources affected.	No Impact	There are no ethnic groups
4	**Displacement of home and/or livelihood**		
	Result to the displacement of people or land acquisition, property affecting their lives and difficulty in restoring	No Impact	There is no new construction or increase the hight of dam, thus the water level is the same as before,

No.	Issues	Assessment	Description
	livelihoods.		therefore, there is no evacuation. Howerver, the construction of the project will have long term impacts on agricultural land with area of 13,778 m^2 and forestry land of 22 households living in Tan Phu 2. There is a household affected aquacultural land and there are 266 households affected agricultural land during the repairing time of dam due to the lack of irrigation water. There is no ethnic household. Besides, the operation of cutting off water will have impacts on 266 households having agricultural land at the downstream of the dam. Therefore, there is a need of measures to reduce the impacts and difficulties of local people. The influence of land, house, construction, architectural objects and plants and crops will be evaluated at the replacement cost. The cost of this project to pay and support for the affected households is calculated based on the cost issued by Quang Ngai provincial committee. The evacuated household will be resettlement at nearby residential areas to ensure the living condition and livelihood which are not different from those before conducting the project. The results from the affected households interview have revealed that the affected households agree with the implementation of this project and just want the investors to have a reasonable compensation.
5	**Dam Category**		

No.	Issues	Assessment	Description
	Does the sub-project require construction of a large dam? Dams with height of 15 meters or more, or those with between 10 to 15 meters height but with complex designs, are considered large dams. Regardless of height, dams that impound more than 3 million cubic meters of water is also considered large.	No Impact	This sub-project will replace the old dam with the height of 14.7 m and the useful volume of 362 561 m^3. However, the sub-project will only conductrepairsandupgrades. There is no construction of big dam. The Dam safety report for Dap Lang reservoir has been conducted to ensure the safety policies of Vietnam and WB which have been met.
	The operation of the sub-project depends on the efficiency of an existing large dam or large dam under construction.	No Impact	Construction phaseis in the dry season, at present thereisinadequate waterfor irrigation, thus there is a need of cooperation with commune authorities to minimize thedamageofthe peopleaffectedby the projectduringthe constructionphase. Damconstruction is currently available.
6	**Use or purchase of pesticides**		
	Does the sub-project lead to procurement or use of pesticides?	No Impact	To ensure the increase of irrigation productivity from 60ha to 83ha and to convert rice paddy from one crop to two crops per year, there will be a increase in demand of plantprotection products. However, the purchase or utilization of pesticides is not in the portfolioofsub-project.
	Does sub-projects have potential to cause irreversible effect or impact not easy to mitigate? Lead to loss of regional recharge aquifers, affecting the quality of water storage and water storage areas responsible for providing drinking water to large population centers. -Lead to any impact occurring in relatively long period, affecting to large geographical area or intense impact.	No Impact	The subproject aims to improve the water supply for agriculture. It does not affect to the water quality of any water storage area related to clean water supply for domestic purpose. The construction activities including upgrading, repair of Dap Lang reservoir is considered done in the dry season, the influence of water to benefit area during construction almost did not happen. The reservoir will be repaired to ensure the

No.	Issues	Assessment	Description
			safety of the people at the downstream dam and provides a stable and effective water contributing to community economic development.
7	**Does the subproject have potential to lead to a wide variety of significant adverse effects?**		
	Many construction sites in various locations are affected, each impact cause loss of habitat, natural resources, land or significant depletion of resources quality.	No Impact	The construction site located around the base of dam with a small area have no huge adverse impacts.
	The significant potential adverse effects capable to expand beyond the construction site or works.	No Impact	There are noise, dust from construction, however the construction tim of one year is not too long thus the impact is small.
	The impact across the border (in addition to a small change in the waterway activities are taking place).	No Impact	A small reservoir is located withinamountainous commune.
	The need for public road, tunnel, canal, power transmission corridor, new pipeline, or borrowed area and disposal areas in underdeveloped region.	No Impact	The infrastructures are available
	Interrupt the cycle of migration of wildlife, wild animal or grazing animal, nomads or semi-nomads	Yes	Noise from construction activities can be affected to some terrestrial fauras and florasliving surrounding the reservoir. However, there is no rare, vulnerable, migratory or endangered species at risk of extinctionin surrounding the Dap Lang reservoir. The sub-project construction can affect to the living area of underwater species. However, this is interrupted and temporary impacts.
8	**The subproject does not have precedent work, does it?**		
	No precedent at national level?	Yes	There have been many similar projects to be implemented at national and provincial level. Similar projects funded by the World Bank has been implemented at national level in some

No.	Issues	Assessment	Description
			provinces such as Ha Tinh, Nghe An, and Thanh Hoa, etc.
	No precedent at provincial level?	Yes	There have been manysimilar projectsto beimplemented.
9	**Is subproject controversial and likely to attract the attention of NGOs and national or international social organizations?**		
	Considered as risk and likely to have special controversial aspects	No impact	There is not any negative point that leads to the attention of civil society organizations, NGOs.
	May lead to protests of those who wish to express or prevent construction.	No impact	Consultation results showed that both the local government and the people fully agreed and supported implementation of the subproject. The subproject will bring greatly efficiency in terms of environment and society to local people.

Table – A.4.3: Additional requirements and suggested tools

No.	Does the sub-project entail these environmental impacts?	Yes	No	Requirements (If Yes)
1	Encroachment on historical/cultural areas		X	
2	Use of explosive and hazardous chemicals		X	
3	Use of sites where, in the past, there were accidents incurred due to landmines or explosive materials remaining from the war		X	
4	Construction that could cause significant disturbance to the transportation, traffic routes, or waterway transport?		X	
5	Increase flood levels to downstream and reservoir sedimentation		X	
6	Acquisition (temporarily or permanently) of land (public or private) for its development	X		RAP
7	Use land that is currently occupied or regularly used for productive purposes (e.g., gardening, farming, pasture, fishing locations, forests)	X		RAP

8	Displacement of individuals, families or businesses		X	
9	Temporary or permanent loss of crops, fruit trees or household infrastructure	X		RAP
10	Involuntary restriction of access by people to legally designated parks and protected areas		X	
11	Ethnic minority groups are living within the boundaries of, or nearby, the subproject.		X	
12	Members of these ethnic minority groups in the area potentially could benefit or be harmed from the project.		X	
13	Involve the construction of a large dam (i.e. higher than 15m or more than 3M cubic meter reservoir capacity)?		X	
14	Depend on water supplied from an existing dam or weir or a dam under construction?		X	

Table - A.4.4: Levels of potential environmental and social impacts to be addressed

No.	Does the subproject entail these environmental impacts?	Assessment level	Description
1	Encroachment on historical/cultural areas	No	The sub-project area has no historical/cultural area
2	Encroachment on an ecosystem (e.g. natural habitat sensitive or protected area, national park, nature reserve etc....)	No	The sub-project area has no natural habitat sensitive or protected area, national park, nature reserve
3	Disfiguration of landscape and increased waste generation	Low	There are the following solid waste sources arising from construction activities: (i) construction waste likes debrises from surface levelling activities, ciment bags, oil barrels (ii) domestic waste from tents of workers in construction site (iii) superfluous excavated soil. The above impacts is low and temporary because: - With type (i) and type (iii), the solid waste is unharmful, as for remaining material has been collected and moved fast to the landfill. - For the waste type (ii): In the high-levelled constrution phase there are around 25 people working in construction site thus the amount of potential waste is not much. - The amount of solid waste arising in construction phase can be easily managed as per regulation on solid waste management.
4	Removal of vegetation cover or cutting down of trees during clearance for construction	Medium	Implementation of the sub-project is based on the current status of the work, thus, there is not too much vegetation be demolished or damaged. But there are still two types of land acquisition for construction including: - 39,875m^2 temporary acquisition of agricultural land to make sheds, yards for material storage construction. - 13,778m^2 permanent acquisition of land of planting crops for road construction. Location: Tan Phu 2 village, Hanh Tin Tay commune Period: 8 months

No.	Does the subproject entail these environmental impacts?	Assessment level	Description
5	Change of surface water quality or water flows (e.g. Increase water turbidity due to run- off, waste water from camp sites and erosion, and construction waste) or long-term.	Low	Spilled oil from machinery and construction equipment or water when washing machines can pollute and decline water quality and aquatic ecosystems. Wastewater and oil compounds may be sunk into the ground and over time will gradually seep into aquifers and contaminate aquifers. Besides, wastewater from toilets of worker camps if not applied properly can also influence water quality of nearby. However, this impact is low and temporary because: - Location of camp, oil storage yard is far from water sources. - Construction of the subproject will take place in dry season when rainfall level is the lowest. Thus, the possibility of oil, grease or compounds washed and swept into water source is very little Wastes from petroleum products can easily be stored in a safe place in the standard containers (ie. containers with lids), and the contractor will have to collect and dump waste and hazardous waste damage at right places. Location: Tan Phu 2 village, Hanh Tin Tay commune Period: 8 months
6	Increased dust level or add pollutants to the air during construction	Low	During repair and upgrading of dam, water intake and auxiliary works, some activities described below will cause negative impacts such as dust, emissions affecting lives of local people: - The exploitation of earth fill materials. - The transportation of construction materials (earth fill, cement, sand, gravel, steel, etc) - Transportation of construction waste (soil weathering, surplus construction materials) - The operation of equipment and trucks and use of construction machinery The amount of dust and emission can cause respiratory disease or lung diseases to people (such as sinusitis, asthma, etc.) if people, workers directly contact with the pollutant sources for long time. However, this impact is low and temporary.

No.	Does the subproject entail these environmental impacts?	Assessment level	Description
			Location: Tan Phu 2 village, Hanh Tin Tay commune Period: 6.5 months
7	Increased noise and/or vibration	Low	Noise can be caused by the transportation of construction materials and construction equipment (excavators, bulldozers, road rollers, compactors) affecting households and schools along the road section for construction. However, this impact is low and temporary, because: - The subproject area is open space, with lots of plants and crops, which may dilute the noise. - The residential area adjacent to the road and construction works are distributed fairly sparse, with a low population density. - The number of equipment/facilities construction generating noise is not significantly large. Thus the noise level is not high. Location: Tan Phu 2 village, Hanh Tin Tay commune Period: 8 months
8	Resettlement of households? If yes, how many households?	No	The sub-project does not require relocation of the houses for local communes.
9	Use of resettlement site that is environmentally and/or culturally sensitive	No	There is not any relocated household.
10	Risk of disease dissemination from construction workers to the local peoples (and vice versa)?	Low	The temporary presence of workers residing in local households or in the camps and their interaction with local people can cause infectious diseases among workers with local people and vice versa. During construction process, the use of water without sanitary standards met of workers in the camps or at construction site may also cause gastrointestinal disease or the spread of disease transmission via insect (ie. dengue fever, malaria, etc.) when migrant infected workers are bitten by insects (mosquitoes) and then the disease is spreaded to others. Besides, various social diseases such as HIV/AIDS, syphilis also a risk, etc. are also at risk. However, this impact is low and temporary, because: - The large terrain leads to easily dispersed of

No.	Does the subproject entail these environmental impacts?	Assessment level	Description
			dust in the wind; - The latrine is designed under standards of the Ministry of Health; - Controlling the spread of thepathogenic insect as well as propagating the prevention ofpathogenic insect for workers; - The Contractor regularly checks the health for employees in the recruitment process; - The local government and Center of Health Services will have the propagandic activities when the signs of infectious disease appear in the province. Location: Hanh Tin Tay commune. Period: The effects will last during project implementation, the impact of dust will strong on dry days, meanwhile the insects will operate during the rainy season.
11	Potential for conflict between construction workers and local peoples (and vice versa)?	Low	During construction period, there may be conflict between the local labors and labors from elsewhere due to disagreements about the culture or communication or disputes on employment opportunities. However, these effects are low and temporary because: - According to state regulations, the contractor will have to declare temporary residence, temporary absence of all the local workers to live and work during the project implementation to Hanh Tin Tay commune. - Migrant workers are disseminated, guided by contractor on how to communicate, notify with local government and people. In addition, contractor shall develop provisions in management of workers. - A number of workers will be hired locally to perform simple tasks such as shoveling dirt, cutting trees, portering construction materials. Location: Hanh Tin Tay commune. Period: 8 months
12	Use of explosive and hazardous chemicals	No	Explosives or toxic chemicals will not be used during construction process of the subproject.
13	Use of sites where, in the past, there were accidents incurred due to landmines or explosive materials remaining from the war	No	Subproject will carry out with the existing situation of dam and reservoir where is never occurred mine accident or explosive materials since the Vietnam war.

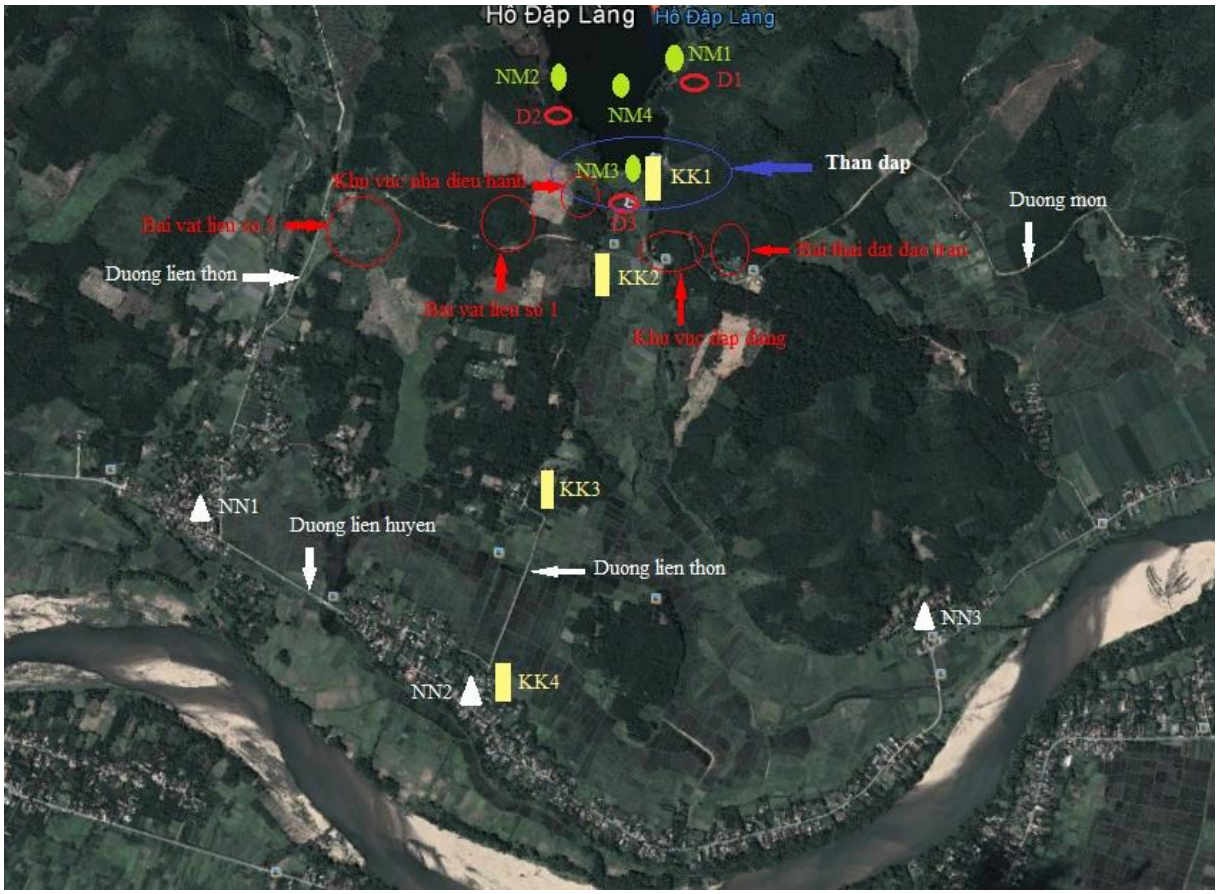
No.	Does the subproject entail these environmental impacts?	Assessment level	Description
14	Construction that could cause disturbance to the transportation, traffic routes, or waterway transport?	Low	Construction period may impact on local travel, transportation, as well as the risk of accidents: i) increase risk of accidents due to the increase of the means through inter-commune roads and construction sites (where the excavation activities are carried out, and where the construction equipment, waste locate on or next to roads, works, etc.). It may danger local people, especially at night when visibility is limited; and suspended dust particles reduces visibility; ii) the construction of the dam and auxillary works such as management road will limit the ability of people to travel as well as access to social infrastructure such as schools, markets, etc. However, these effects are low and temporary because: - The transportation routes of construction materials will pass through the sparsely populated areas. Thus, use of this routes for material transportation will not obstruct traffic much. - A part within the scope of the contractor is to ensure the health and safety on construction sites for individuals and construction site; it is not allowed to have the risk to the safety of people. Therefore, the contractor shall take measures to minimize the impact during construction period. - The transportation routes of construction materials will not pass through the Commune People's Committee and the schools. Thus, use of this routes for material transportation will not obstruct traffic much. Location: Main dam, management road and road to transport material and waste in Hanh Tin Tay commune Period: 8 months
15	Construction that could cause any damage to the existing local roads, bridges or other rural infrastructures?	Medium	The construction materials or waste transportation on rural roads can damage the road if the trucks are overloaded and operate much in rainy season. Other rural infrastructures such as canal system, electric cable system, communication cable system are not affected by the

No.	Does the subproject entail these environmental impacts?	Assessment level	Description
			construction of the sub-project, because these work lie in the safety corridor of the main roads. There is no electric cable system or communication cable on the management road. The others are also far from construction area of the sub-project. Thus, these social infrastructures are not likely to be affected by the construction activities. The impact is low and temporary because: - The construction is carried out mostly in dry season, thus material transportation vehicles cause low impacts on quality of the road. - The volume of construction materials and the number of vehicles transporting materials is relatively small.
16	Soil excavation during subproject's construction so as to cause soil erosion	No	The report found that this possibility of erosion can not occur because the work line is very large, earth dam has length of 148.5m, scope of flood overflow and discharge in left bank is large ΣB = 19m. On the other hand, the design process was calculated the dissipation capacity after downstream. Moreover, Dap Lang has been built and put into use for a long time, so after renovation, there is almost no possibility of causing erosion due to changes in flow and sediment. Location: Dap Lang reservoir, dam surface and water intake. Period: 8 months
17	Need to open new, temporary or permanent, access roads?	No	It is no need to develop a temporary and permanent service road, because the current roads are capable to transport construction materials or waste. Within scope of the subproject, only one management road will be upgraded.
18	Separation or fragmentation of habitats of flora and fauna?	No	Flora and fauna in the reservoir will not be affected by the project and will not create an impact on water quality or water. For terrestrial flora: There is no position as habitat of flora and fauna around the subproject area and area indirectly affected.
19	Long-term impacts on air quality	No	The sources of air pollution mainly rise from dust caused by the transportation of construction materials, waste transportation, etc. running on the roads in Hanh Tin Tay commune. In addition, the air may be polluted

No.	Does the subproject entail these environmental impacts?	Assessment level	Description
			by emission from construction machinery, vehicles. However, it is very few source of emission and it only appears in certain time. Therefore, there is no long-term impact on air quality but a temporary impact on air environment.
20	Accident risks for workers and community during construction phase	Medium	Construction process can make risk of accidents due to operating machinery, digging and filling soil or transporting materials in case that the workers do not comply with regulations on occupational safety. In addition, the construction can also cause accidents for community if the access of people into the construction area is not limited. However, the impact is low because: - Number of construction machinery is few; - Much activities will be carried out manually such as partnering material, concreting, etc. Thus, risk of accident will be reduced. - Construction activities are mostly undertaken in dry season, accident is also reduced. - Construction site is far from residential areas. Location: Construction site and along the material and waste transportation routes. Period: 8 months of contruction stage
21	Use of hazardous or toxic materials and generation of hazardous wastes	No	There is no need to use hazardous or dangerous material or generate hazardous waste. Only a low amount of oil use for machinery can leak to environment.
22	Risks to safety and human health	Low	During construction, there may be accidents for communities in case of unlimited local people accessing the construction area. In addition, the waste during the construction handled not well can also cause negatively affects to the health of the local population.
Does the sub-project entail land acquisition or restriction of access to resources?			
23	Acquisition (temporarily or permanently) of land (public or private) for its development	Low	The area should be recovered for construction, including: - 39,875m^2 temporary acquisition of agricultural land to make sheds, yards for material storage construction. - 13,778m^2 permanent acquisition of land of planting crops for road construction. This impact is low because there is not any households of relocation.

No.	Does the subproject entail these environmental impacts?	Assessment level	Description
			Location: Hanh Tin Tay commune Period: Preparation stage of the sub-project
24	Use land that is currently occupied or regularly used for productive purposes (e.g., gardening, farming, pasture, fishing locations, forests)	Medium	Implementation of the subproject will permanently acquire 13,778m^2 of planting crops land and 39,875m^2 temporary acquisition of agricultural land. These will effect on 23 households living in Tan Phu 2.
25	Displacement of individuals, families or businesses	No	There is no displacement of individuals, families or businesses in the sub-project.
26	Temporary or permanent loss of crops, fruit trees or household infrastructure	Medium	There is about 39,875m^2 temporary acquistion of agricultural land to make sheds, yards for material storage construction and 13,778m^2 permanent acquisition of land of planting crops for road construction in the sub-project. There is no ethnic minority households affected by the Dap Lang reservoir sub-project.
27	Involuntary restriction of access by people to legally designated parks and protected areas	No	No preserved park or conservation area locating in subproject area, thus it is not likely impact.
Are ethnic minority peoples present in the subproject area?			
28	Ethnic minority groups are living within the boundaries of, or nearby, the subproject.	No	There is no ethnic minority group is living within the boundaries of, or nearby, the subproject
29	Members of these ethnic minority groups in the area potentially could benefit or be harmed from the project.	No	There is no ethnic minority group is living within the boundaries of, or nearby, the subproject
Does the subproject entail construction of or depend upon a dam?			
30	Involve the construction of a large dam?	No	
31	Depend on water supplied from an existing dam or weir or a dam under construction?	No	

APPENDIX A5: Diagram of sampling and monitoring environment



Sampling label

NM: Surface water

NN: Ground water

KK: Air quality

Đ: Soil quality

Environmental Monitoring

Surface water sampling

Soil sampling

Underground water sampling

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APPENDIX A6: Analysis results of environmental samples

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No:

RESULTS OF ENVIRONMENTAL MONITORING

DAP LANG TERMINAL RESERVOIR REPAIR AND IMPROVEMENT

QUANG NGAI PROVINCE

Type of sample Air quality

Sampling date 05-02-2015

Sampling person Tran MinhDung

No	Parameters	Units	Analytical method	QCVN 05: 2009/ BTNMT	KK1	KK2	KK3	KK4
1	Noise (Leq)	dBA	TCVN 7878 – 1,2	60	38.1	41.2	44.3	42.2
2	Total Suspended Particles (TSP)	µg/m^3	TCVN 5067-1995	300	90	140	140	150
3	CO	µg/m^3	Chromatographic method	30000	KPH	600	700	800
4	SO_2	µg/m^3	Thorin spectro photometric method	350	KPH	KPH	KPH	KPH
5	NO_2	µg/m^3	TCVN 6138-1996(ISO 7996:1985)	200	KPH	KPH	KPH	KPH
6	O_3	µg/m^3	-	-	-	-	-	
7	Pb	µg/m^3	-	-	-	-	-	
8	Dust ≤10µm (PM10)	µg/m^3	-	-	-	-	-	

Sampling location:

No	Sampling label	Sampling date	Location
1	KK1	05-02-2015	Roof of the reservoir
2	KK2	05-02-2015	Households along the road of Tan Phu 2 village
3	KK3	05-02-2015	Households along the road of Tan Phu 2 village
4	KK4	05-02-2015	Households along the road of Tan Phu 2 village

RESEARCH CENTRE FOR ENVIRONMENTAL GEOLOGY (RECENGE)

ANALYTICAL ENVIRONMENTAL DEPARTMENT

Address: Dong Ngac, Tu Lien, Hanoi

Phone: (84-4)3 8389002 Fax: (84-4)3 8389633 Email:haidctv@yahoo.com

Note:

- Noise level has compared to QCVN 26:2010/BTNMT- National standard for Noise
- QCVN 05: 2009/BTNMT: National technical regulation on ambient air quality - Average one hour
- KPH: Not detected
- "-" No regulation

Lab Technician	Technical Manager	Lab Leader

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Phone: (84-4)3 8389002 Fax: (84-4)3 8389633 Email:haidctv@yahoo.com

No:

RESULTS OF ENVIRONMENTAL MONITORING

DAP LANG TERMINAL RESERVOIR REPAIR AND IMPROVEMENT

QUANG NGAI PROVINCE

Type of sample:	Soil	Starting of Analysis sample	06-02-2015
Sampling date	06-02-2015	Ending of Analysis sample	13-02-2015
Sampling person	Tran Minh Dung	Analytical person	
The sense organs			

No	Parameters	Units	Analytical method	QCVN 03:2008/ BTNMT	Đ1	Đ2	Đ3
1	Asen (As)	mg/kg dry soil	TCVN 6496:1999 (ISO11047:1995)	12	1.02	1.07	1.03
2	Cadimi (Cd)	mg/kg dry soil	TCVN 6496:1999 (ISO 11047:1995)	2	0.48	1.02	0.46
3	Đồng (Cu)	mg/kg dry soil	TCVN 6496:1999 (ISO 11047:1995)	70	40.34	45.33	40.35
4	Chì (Pb)	mg/kg dry soil	TCVN 6496:1999 (ISO 11047:1995)	100	24.55	27.27	25.29
5	Kẽm (Zn)	mg/kg dry soil	TCVN 6496:1999 (ISO 11047:1995)	200	32.00	33.02	32.00

Sampling location:

No	Sampling label	Sampling date	Location
1	Đ1	06-02-2015	Left side of the reservoir
2	Đ2	06-02-2015	Right side of the reservoir
3	Đ3	06-02-2015	Existing land area of the reservoir

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Note:

- QCVN 03-2008/BTNMT: National technical regulation on the allowable limits ofheavy metals in the soils

Lab Technician	Technical Manager	Lab Leader

RESEARCH CENTRE FOR ENVIRONMENTAL GEOLOGY (RECENGE)

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No:

RESULTS OF ENVIRONMENTAL MONITORING

DAP LANG TERMINAL RESERVOIR REPAIR AND IMPROVEMENT

QUANG NGAI PROVINCE

Type of sample:	Surface water	Starting of Analysis sample	06-02-2015
Sampling date	06-02-2015	Ending of Analysis sample	13-02-2015
Sampling person	Tran Minh Dung	Analytical person	

No	Parameters	Units	Analytical method	QCVN 08:2008/ BTNMT B1 colunm	NM1	NM2	NM3	NM4
1	pH	-	Quick measure - Insitu Troll 9500	5.5-9	7.1	6.8	6.8	6.9
2	DO	mg/l	TCVN 5499-1995	≥ 4	4.8	5.0	6.2	4.9
3	Total Dissolved Solids	mg/l	TCVN 6625-2000 (ISO 11923- 1997)	50	36	36	37	31
4	BOD_5	mg/l	TCVN 6001-1: 2008	15	4,1	3,7	3,6	3,7
5	COD	mg/l	TCVN 6491-1999 (ISO 6060-1989)	30	27,3	27,1	28,1	28,2
6	NO_2-	mg/l	EPA 352.1:1996	0.04	0.03	0.03	0.03	0.03
7	NO_3-	mg/l	EPA 352.1:1996	10	4.3	4.3	4.2	3.7
8	Crom III (Cr^{3+})	mg/l	TCVN 6222-1996 (ISO 11969-1996)	0.5	<0.02	<0.02	<0.02	<0.02
9	Crom VI (Cr^{6+})	mg/l	TCVN 6222-1996 (ISO 11969-1996)	0.02	<0.02	<0.02	<0.02	<0.02
10	NH^{4+}	mg/l	SMWW4500 NH_3-. B. F: 2012	0.5	0.25	0.31	0.34	0.29
11	Coliform	MPN/ 100ml	TCVN 6187-1-1996 (ISO 9308-1-1990)	7500	460	1500	1490	1460
12	E-coli	MPN/	TCVN 6187-1-1996	100	28	35	39	35

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		100ml	(ISO 9308-1-1990)					

Sampling location:

No	Sampling label	Sampling date	Location
1	NM1	06/02/2015	Left side of the reservoir
2	NM2	06/02/2015	Right side of the reservoir
3	NM3	06/02/2015	Dam's roof near the overflow outlet
4	NM4	06/02/2015	Central of the reservoir

Note:

- QCVN 08-2008/BTNMT: National technical regulation on surface water quality. B1 column = Using for irrigation or other purposes may require similar water quality

- This result is valid only in analysis sample

Lab Technician **Technical Manager** **Lab Leader**

RESEARCH CENTRE FOR ENVIRONMENTAL GEOLOGY (RECENGE)

ANALYTICAL ENVIRONMENTAL DEPARTMENT

Address: Dong Ngac, Tu Lien, Hanoi

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No:

RESULTS OF ENVIRONMENTAL MONITORING

DAP LANG TERMINAL RESERVOIR REPAIR AND IMPROVEMENT

QUANG NGAI PROVINCE

Type of sample:	Under ground water	Starting of Analysis sample	06-02-2015
Sampling date	06-02-2015	Ending of Analysis sample	13-02-2015
Sampling person	Tran Minh Dung	Analytical person	

No	Parameters	Units	Analytical method	QCVN 09:2008/BTNMT	NN1	NN2	NN3
1	pH	-	Quick measure - Insitu Troll 9500	5.5-8.5	6.9	7.1	7.2
2	Hardness ($CaCO_3$)	mg/l	TCVN 2672-78	500	103	114	111
3	Total Dissolved Solids	mg/l	TCVN 6625-2000 (ISO 11923- 1997)	1500	95	94	97
4	COD	mg/l	TCVN 6491-1999 (ISO 6060-1989)	4	3.1	3.2	3.4
5	NO_2-	mg/l	EPA 352.1:1996	1.0	0.08	0.12	0.13
6	NO_3-	mg/l	EPA 352.1:1996	15	3.9	3.5	3.7
7	Clorua (Cl^-)	mg/l	TCVN 6194-1996 (ISO 9297-1989)	250	34.7	36.9	32.9
8	Crom VI (Cr^{6+})	mg/l	TCVN 6222-1996 (ISO 11969-1996)	0.05	<0.02	<0.02	<0.02
9	A moni (NH_4^+)	mg/l	SMWW4500 NH_3- B. F: 2012	0.1	0.03	0.03	0.03
10	SO_4^{2-}	mg/l	TCVN 6656: 2000	400	34.1	33.2	29

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Sampling location:

No	Sampling label	Sampling date	Location
1	NN1	06/02/2015	Left side of the reservoir
2	NN2	06/02/2015	Right side of the reservoir
3	NN3	06/02/2015	Dam's roof near the overflow outlet

Note:

- QCVN 09-2008/BTNMT: National technical regulation on underground water quality
- This result is valid only in analysis sample
- The test is not in accordance with ISO / IEC 17025 : 2005

Lab Technician **Technical Manager** **Lab Leader**

APPENDIX A7: Public consultation minutes

VIỆN THUỶ ĐIỆN VÀ NĂNG LƯỢNG TÁI TẠO
ĐƠN VỊ: TRUNG TÂM CÔNG TRÌNH THUỶ ĐIỆN

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh Phúc

Tân Phú 2 ,Ngày 16 tháng 3 năm 2015

BIÊN BẢN LÀM VIỆC
THAM VẤN CỘNG ĐỒNG

Dự án: Sửa chữa và nâng cao an toàn đập (WB8)

Tiểu Dự án: Sửa chữa, nâng cấp hồ chứa đập Làng

I. Thời gian, địa điểm làm việc

- Thời gian:

Ngày 16/3/2015

- Địa điểm:

Nhà văn hoá thôn Tân Phú 2

II. Thành phần làm việc:

1. Đại diện nhóm cán bộ cơ quan

- Phạm thị Thuấn: cán bộ Môi trường
- Trần Minh Dũng: Trưởng đoàn tư vấn
- Lê Thanh Hà: Chuyên gia tái định cư - xã hội học
- Ng Huỳnh Khương: Giám đốc ban QLDA

2. Đại diện

- Mai Văn Toàn: Trưởng thôn Tân Phú 2
- Mai Văn Thường: Chủ tịch xã Mảnh Tín Tây
- Nguyễn Văn Linh: Bí thư thôn Tân Phú
- 3% đại diện của các hộ gia đình khu vực TDA

III. Nội dung làm việc:

Cơ quan tư vấn môi trường xã hội giới thiệu TDA và, Ban các đoàn tái định cư tác động môi trường xã hội của TDA. Sửa chữa, nâng cấp hồ chứa đập làng.

- Chủ tịch xã Mai Văn Thường phát biểu và nêu ý kiến đối với các hộ trong thôn Tân Phú 2 thôn có hồ tưới đập làng. Cũng là thôn bị ảnh hưởng bởi thu hồi đất.

- Trưởng thôn Mai Văn Toàn đã phát biểu đồng ý với việc thực hiện TDA, mong chủ đầu tư có sự hỗ trợ phù hợp đối với các hộ bị ảnh hưởng đất sản xuất.

IV. Ý kiến đóng góp

Đề nghị chủ đầu tư và nhà thầu đẩy mạnh tiến độ của DA để người dân có thể sử dụng nguồn nước thấp nhất với các biện pháp giảm thiểu những ảnh hưởng có hại đến môi trường xã hội của người dân địa phương
Người dân hoàn toàn nhất trí với việc thực hiện DA
Bên cạnh đó người dân bị mất đất cũng hoàn toàn ủng hộ việc thu hồi đất để thực hiện xây dựng công trình

V. Kết luận

Các ý kiến của người dân, đại diện địa phương đều chấp nhận với việc thực hiện DA

Nhà thầu, chủ đầu tư phải thực hiện nghiêm túc các biện pháp để tránh ảnh hưởng đến quá trình thi công

Cán bộ thực hiện	Đại diện
Phạm Thị Thuận	Mai Văn Toản

Mai Văn Tường

VIỆN THUỶ ĐIỆN VÀ NĂNG LƯỢNG TÁI TẠO
ĐƠN VỊ: TRUNG TÂM CÔNG TRÌNH THUỶ ĐIỆN

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh Phúc

DANH SÁCH THAM DỰ HỌP (TỜ.....)

Tên Dự án: .....
Sửa chữa, nâng cấp hồ chứa nước Đập Làng
.....

Nội dung họp: .....
Nhà văn hoá thôn Tân Phú 2
.....

Địa điểm họp: .....

Thời gian: .....

Ngày 16 tháng 3 năm 2015

STT	Họ và tên	Địa chỉ thường trú	Số tiền	Ký nhận
1	Nguyễn Văn Nhàn	Thôn Tân Phú II		
2	Nguyễn Đăng Thảo	Thôn Tân Phú II		
3	Nguyễn Văn Hải	Thôn Tân Phú II		
4	Nguyễn Lễ	Thôn Tân Phú II		
5	Nguyễn Ba	Thôn Tân Phú II		
6	Đinh Văn Cung	Thôn Tân Phú II		
7	Nguyễn Công Chính	Thôn Tân Phú II		
8	Nguyễn Hưng	Thôn Tân Phú II		
9	Đinh Công Mai	Thôn Tân Phú II		
10	Hồ Thị Thắng	Thôn Tân Phú II		
11	Đinh Quang Bảo	Thôn Tân Phú II		
12	Nguyễn Cho	Thôn Tân Phú II		
13	Đào Thị Nhị	Thôn Tân Phú II		
14	Đinh Văn Ngại	Thôn Tân Phú II		
15	Mai Văn Năng	Thôn Tân Phú II		
16	Nguyễn Thanh Ba	Thôn Tân Phú II		
17	Phan Văn Thái	Thôn Tân Phú II		
18	Nguyễn Tài Thúy	Thôn Tân Phú II		
19	Nguyễn Thị Nga	Thôn Tân Phú II		
20	Đoàn Thị Thiều	Thôn Tân Phú II		
21	Nguyễn Giá	Thôn Tân Phú II		

22	Nguyễn Đắc Hoàn	Thôn Tân Phú II		
23	Nguyễn Văn Thi	Thôn Tân Phú II		
24	Nguyễn Văn Thanh	Thôn Tân Phú II		
25	Trần Ngọc Hùng	Thôn Tân Phú II		
26	Lê Mỹ	Thôn Tân Phú II		Lê Vu
27	Lê Thị Thị	Thôn Tân Phú II		Thu
28	Trần Bằng	Thôn Tân Phú II		Bằng
29	Mai Văn Toàn	Thôn Tân Phú II		Toàn
30	Lê Văn Bình	Thôn Tân Phú II		Bình
31	Lê Thị Thủy	Thôn Tân Phú II		KT. Lê Thủy
32	Lê Thị Lưu	"		Lưu
33	Trần Anh Dũng	"		Dũng
34	Nguyễn Cường	Thôn Tân Phú II		Cường

VIỆN THUỶ ĐIỆN VÀ NĂNG LƯỢNG TÁI TẠO
ĐƠN VỊ: TRUNG TÂM CÔNG TRÌNH THUỶ ĐIỆN

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh Phúc

Tân Hoà, Ngày 18 tháng 3 năm 2015

BIÊN BẢN LÀM VIỆC
THAM VẤN CỘNG ĐỒNG

Dự án: Sửa chữa và nâng cao an toàn đập (LW.B8.)

Tiểu Dự án: Sửa chữa, nâng cấp hồ chứa đập Làng

I. Thời gian, địa điểm làm việc

- Thời gian: Ngày 18.3.2015

- Địa điểm: Nhà văn hoá thôn Tân Hoà

II. Thành phần làm việc:

1. Đại diện nhóm cán bộ cơ quan

- Trần Minh Dũng - Trưởng đoàn tư vấn
- Nguyễn Thị Hằng Thuý - Chuyên gia xã hội học
- Lê Thanh Hà - Chuyên gia tái định cư
- Phạm Thị Thuần - Cán bộ môi trường

2. Đại diện

- Huỳnh Khương - Giám đốc ban QLDA
- Đào Quốc An - Trưởng thôn Tân Hoà
- Đại diện cho các hộ trong thôn sử dụng nguồn nước từ hồ đập Làng

III. Nội dung làm việc:

- Ông Huỳnh Khương giới thiệu các hạng mục xây dựng công trình
- Ông Trần Minh Dũng nêu các vấn đề môi trường liên quan đến TDA
- Ông Lê Thanh Hà phát biểu các tác động của TDA có liên quan đến xã hội
- Tư vấn đưa ra các biện pháp giảm thiểu tác động

IV. Ý kiến đóng góp

- Tuyên truyền để người dân hiểu rõ phải thực hiện đúng các biện pháp của nhà nước

- Đề nghị đẩy nhanh tiến độ thực hiện để người dân có nước sử dụng cho sản xuất nông, lâm nghiệp

V. Kết luận

- 100% người dân ủng hộ việc thực hiện TDD

- Yêu cầu chủ đầu tư thực hiện đầy đủ các biện pháp để giảm thiểu các tác động của việc thi công lên môi trường và xã hội

Cán bộ thực hiện

Phạm Thị Thuần

Đại diện

TM/UBND.XÃ
CHỦ TỊCH

Mai Văn Tường

APPENDIX A8: Pictures of current status of sub-project area

Appendix A8-1. Pictures of construction site


Spilled channel and after spilled



Earth dam


Retrieving water

Dam’s surface

Body of dam

Reservoir side road

Appendix A8-2. Effected area of sub-project

Agricultural land acquisition due to construction sub-project

Aquaculture households are affected

Forest land at the left reservoir is effected

Forest land at the right reservoir is effected

Da Bridge - south of irrigated area

Rau Bridge – central of irrigated area

Lồ Ồ- Bridge - north of irrigated area

Road may be affected during the construction phase

APPENDIX B - SOCIETY

APPENDIX B1: Methodologies note

1. Objectives and research tasks

The main objective of the social assessment (SA) is to provide an integrated framework for social analysis in accordance with operational procedures of the WB. Because many social variables potentially affect activities and success of the project, SA has focused on investigating and assessing issues related to construction and operation of the project. The decision on which issue is important and how to resolve them have been consulted stakeholders as well as different methods must to be used to collect information and analyse data. SA has been implemented through the implementation of (a) a Social and Economic Survey (SES) at regional level and provincial level and (b) an Inventory of Losses (IOL) due to the project's impacts at household level.

In this context, SES has been designed to (i) provide baseline data on households and assess impacts of resettlement; (ii) ensure that proposed rights of people affected are satisfactory, suitable and can be used for monitoring of resettlement. Quantitative and qualitative methods have been used to collect socio-economic information about households. At a minimum, SES has collected information from a sample size of more than (70 samples) 30% of households in the sub-project area benefiting from the project, irrespective of gender and ethnicity. Data collected consists of socio-economic information about Householders (name, sex, age, livelihood or occupation, income, education, and ethnicity) and household members (number, livelihood or occupation, school-age children and children attending school, and the status of literacy, irrespective of gender, living conditions (access to water supply, sanitation, and energy for cooking and lighting, ownership of durable goods, and access to services and basic works); The use of land of affected households; Potential social impacts of the project on local people.

To ensure the requirements set out by the sub-project, and due to the project area's relatively narrow, limited assessment time but still ensuring accuracy, completeness of collected information, the Consultant has applied a combination of methods and techniques for information collection and social assess with the following basic methods:

2. Assessment methodology

There are various methods and techniques used in assessment; the Consultant has applied the following methods for information collection and assessment.

(i) Review and analysis of documents:

Before conducting field investigation, the consultant collected and studied documents available to understand guidelines and policies of the government as well as the sponsor on issues related to resettlement and ethnic minorities, and updated information about the localities in the sub-project area. Necessary documents include legal framework and policies of the Government of Vietnam and WB on resettlement and ethnic minorities, aggregated the results from memoranda of project preparation organizations, feasibility report, local project proposals, documents on relevant invested projects; statistics on annual local socio-economic situation; socio-economic development report of the localities in the project area, relevant existing documents, documents available on customs, habits of local people.

The review and analysis of documents related to the project will provide background information about the project and help to explain why there are changes or why there are not. On the other hand, it also helps to identify gaps in data needed to be collected and assessed further. Sources of documents include Quang Ngai Provincial Project Management Unit (PPMU), Quang Ngai Province's Department of Agriculture and Rural Development, Lac Thuy Division of Agriculture, Quang Ngai Department of Natural Resources and Environment, Hanh Tin Tay Division of Natural Resources and Environment, Quang Ngai Statistical Office, Nghia Hanh District and Hanh Tin Tay Commune People's Committee.

(ii) Quantitative research, random sampling survey

Quantitative research, random sampling survey consists of the Provincial Project Management Unit, an important method in researches, impact assessment of the project to collect basic information on socio-economic situation at household level. Information from quantitative survey reflects the size, frequency, extent and tendency of phenomena/behaviours of objects the survey aims at. The quantitative survey was carried out by interviewing households using questionnaires.

Random sampling survey: to collect information from a large number of affected people by interviewing using questionnaires with specific questions, served for statistical analysis. The survey results will provide a basis for other researches and assessments as they allow collecting important data about implementation issues or specific indicators from a sample. This method requires a sampling strategy (shown below) to assess standards before and after the project.

(iii) Qualitative research, in-depth interviews and group discussions:

Use qualitative research with in-depth interviews, group discussions in the community consultation to find information which questionnaires (quantitative research) cannot

cover up. Information gained from qualitative research is to answer questions, causes and explain phenomena and factors affecting in the project area. Besides, qualitative information can exploit deeper thoughts, feelings, attitudes and aspirations of information providers, particularly sensitive issues. Qualitative research uses group discussions and in-depth interviews to collect information. Households selected for this method are selected with similar characteristics in educational background, living standards, etc. Group discussions will be held with at least 5% of the households in the sample, about 6 - 8 people for a group discussion.

In-depth interviews will be applied to who are members of affected households and staff involved in the project at hamlet and commune level.

In addition to qualitative information, in-depth interviews and group discussions also pay attention to community consultation, in order to learn more about views and attitudes of participants to the project development, especially women. A qualitative research is as follows:

Table B1.1-PL: Qualitative research

No.	Information collection method	Number of people interviewed	General information about participants
1	In-depth interviews	1	Provincial project officers
2	In-depth interviews	3	Governmental officers at commune level (Chairman, staff in charge of culture, union)
3	In-depth interviews	2	Staff of Farmers Union and Women Union
4	In-depth interviews	6	Members of 6 households in the beneficiary area of the project
5	In-depth interviews	4	Members of affected households have different living standards
6	Group discussions (2 discussions)	16	Participants are members of affected households
7	Total	32 people	There are 2 group discussions and 16 in-depth interviews

(iv) *Direct observation*: this method helps to obtain timely and useful information supplementing data collected, helps to better understand the context in which information and data are collected and help explain survey results.

3. Research samples

Based on the basic design, the Consultant and officers of the Provincial Project Management Unit and commune cadastral officials make a list of households affected by each project in each hamlet. In the list of affected households provided by localities, the Consultant selects 100% of affected households and 25% of unaffected households in the project area (of which 100% of households are expected to be relocated) to interview by questionnaires. Samples selected ensure gender ratio, poor households. In-depth interviews and group discussions were selected from survey samples and key information providers at provincial, district, commune levels and people. Each group discussion consists of 6-8 people.

Because the project area is located at 03 hamlets of 01 commune, it is quite favourable for the surveying. The total number of households is 346. The Consultant chose 103 out of 346 as the following hamlet structures: Tan Phu 1 with 33, Tan Phu 2 with 44 and Tan Hoa with 26. Among 44 households in Tan Phu 2, there are 23 ones losing land and 21 are in the irrigation area. Therefore, the sample ensured

Table B1.2-PL: Survey samples are allocated by region as follows

Households affected directly (production land loss) (Tan Phu 2 hamlet)		Households affected indirectly (Water loss in a construction season)		Households benefited
Households	Rate	Tan Phu 2	Tan Phu 1	Tan Hoa
23	100%	21 households	33 households	26 households

APPENDIX B2: Public health intervention plan

1. The necessity of the construction of puplic health management plan

The activities of the subproject will generate impacts on the surroundings quality: air, water and soil environment, in addition it may arise disease. All these factors will affect directly 80 workers, the entire population around the project area and households along the transport route. The consequence of these effects lead to increase occupational accidents, traffic accidents, diseases related to respiratory and intestinal system and eyes.

There are 80 workers will directly contact with sources of pollution and disease from the activities of the project, although subproject have had measures to limit pollution such as dust, emissions, wastewater and epidemics, but there are potential impacts that we do not see immediately, so need to take measures for early detection of disease and sources of disease. The plan indicates the measures to minimize and prevent those impacts.

2. Objective

To control and prevent diseases, raise awareness of the people and the workers to protect health yourself; help people access fully medical services. Organize regularly medical examination to detect early disease due to impacts of the subproject; to build treatment plans for incidents related to diseases, occupational accidents and traffic.

3. Measure and content of public health management

- To train and raise awareness, prevent impacts on health
- Organize regularly medical examination for workers and people in the subproject region
- Build plan to minimize the impact on public health
- Build plan to prevent and treat diseases

4. Role and responsibility of agencies, organizations and individuals

Department of Agriculture and Rural Development (DARD)/ Project Management Unit (PMU):

- DARD and PMU are responsible for building materials about public health safety training.

- Coordinate all levels of authorities in Hanh Tin Tay commune- Nghia Hanh district (local authorities, Fatherland Front, Women's Union, Farmers' Union, Youth Union, hamlet representative) organize propagandic activities about health safety.

Department of Health, Nghia Hanh district Preventive Medicine Center

- To train and raise awareness for all basic levels, contractors and residents about prevention measures and treatments of diseases;
- Check the medical examination process;
- To direct promptly when epidemics appear, resolving incidents related to public health.

People's Committee, Social Organizations

- To direct, guide and organize the health safety work; to coordinate closely with contractor, Department of Health and Preventive Medicine Center when epidemics appear.

Health Station: To prepare the medical examination plan and guide water pollution treatment, epidemic prevention and treatment.

5. Implementation Schedule

Public Health Management Plan implemented at 3 stages of the subproject and extended 6 months at operation stage.

Table B2-1 Implementation Schedule of "Public Health Management Plan"

No	Measure	Content	Responsible unit	Cost	Time
	To train and raise awareness, prevent impacts on health	- Identify the impact of air and water environment, food safety. - Preventable measures (using a comforter when entering the affected area, treat water pollution by alum and	- Department of Agriculture and Rural Development (DARD) - Project Management Unit (PMU) - **Nghia Hanh district** Preventive Medicine	15.000.000 millions	2 stages in the early and the mid-stage of the project

No	Measure	Content	Responsible unit	Cost	Time
		chloramine B) - Cleaning household sector, ranch house	Center - Health Station at commune/ ward - Contractor		
	- Organize regularly medical examination for workers and people in the subproject region	- Check the health of workers 3 months/ time, residents in the affected areas 6 months / time - The diseases related to respiratory system, intestinal tract, eyes - To consult the affected people during examination - Advise or handle when the detection of abnormalities related to the impact of subproject (timely notify to the authorities and functional	- Department of Agriculture and Rural Development (DARD) - Project Management Unit (PMU) - **Nghia Hanh district** Preventive Medicine Center - Health Station at commune/ ward - Contractor	Budget of **Nghia Hanh district**	3 months/ time from the start of construction to 6th month

No	Measure	Content	Responsible unit	Cost	Time
		units)			
	- Build plan to minimize the impact on public health	- Medical staffs at commune/ ward monitor regularly the implementation of the mitigation measures of construction units. - To treat timely occupational accidents and traffic - To vaccinate	- Department of Agriculture and Rural Development - Project Management Unit (PMU) - **Nghia Hanh district** Preventive Medicine Center - Health Station at	Budget of **Nghia Hanh district** and contractor	Continuously during the construction time

No	Measure	Content	Responsible unit	Cost	Time
		completely children, pregnant woman	commune/ ward - Contractor - Women's Union - Fatherland Front		
	Build plan to prevent and treat epidemic	- To spray fly and mosquito-spray in the project area with the frequency of 3 months/ time. - To guide the water sanitation; use chloramine B for pretreatment of wastewater on work site and households. - When appearing epidemic, we need localize epidemic, isolate infectious objects and spray chloramine B to disinfect.	- Department of Agriculture and Rural Development (DARD) - Project Management Unit (PMU) - **Nghia Hanh district** Preventive Medicine Center - Health Station at commune/ ward - Contractor - Women's Union - Fatherland Front	Budget of Quang Ngai province (Department of Health) and contractor	Continuously during the construction time (18 months)

APPENDIX B3: Public consultation, participation and communication strategy

1. The necessity of the construction of communication plan

The subproject "Repair and upgrade Dap Lang reservoir, **Nghia Hanh district**" cause impacts: (i) positive impacts: ensure safely for 346 households in the downstream area, ensure stability source of domestic water supply for 83 ha of rice; (ii) negative impacts: acquire land and assets on land of 23 households, affect economy and public health, impact on gender equality…

The communication and public consultation plan is done throughout from the establishment of the investment project to the project operation. This helps local communities and managers to understand and visualize the entire impacts (positive, negative) to provide mitigation measures the impact on the natural environment and society, especially vulnerable objects include children, the elderly, women and sensitive ecosystem.

Information from communication and public consultation plan help managers, local authorities, monitoring unit to give decisions quickly or change timely decisions or plans during the project implementation.

2. Objective

To publish information about sub-project and provide all materials on the action plan to government at various levels, social organizations, unions and resident in sub-project areas. To consult local communities and organizations for the plan will be made for each stage of the project. The feedback helps the investors and the management level to improve plans to meet practical needs prior to the implementation of the action plan.

3. Contents

- Information on the subproject and policies of interest will be disseminated to people by Project Management Unit (PMU);
- Environmental and Social Management Plan: (i) the PMU and consultancy units provide information of impacts and mitigation measures; (ii) To consult the local authorities and social organizations, unions, people around the project area.
- Resettlement Action Plan: Provides information about land acquisition, resettlement, compensation cost apply framework and support policies of the

subproject and the provisions of Quang Ngai Province and government at various levels, affected people

- Gender Action Plan: provides information about gender equality for the local authorities and social organizations, unions, people around the project area.
- Public Health Management Plan: provides information on the solutions, disease prevention plan, medical examination periodically.
- Social security, traffic safety, social evils: provide information about law, legal education for workers, people around the subproject area.
- Dam Safety: disseminate plans when occurring dam safety incidents in the construction process and the rainy season.
- Operate mining and flood discharge: provide information and detailed plans for the flood discharge to people around the project area and downstream area; make protection plan for the people, the buildings in downstream of the dam.

4. Forms of communication, community consultation

In order to organize the effective communication activities, need understand the basic elements of the communication process and public relations of them.

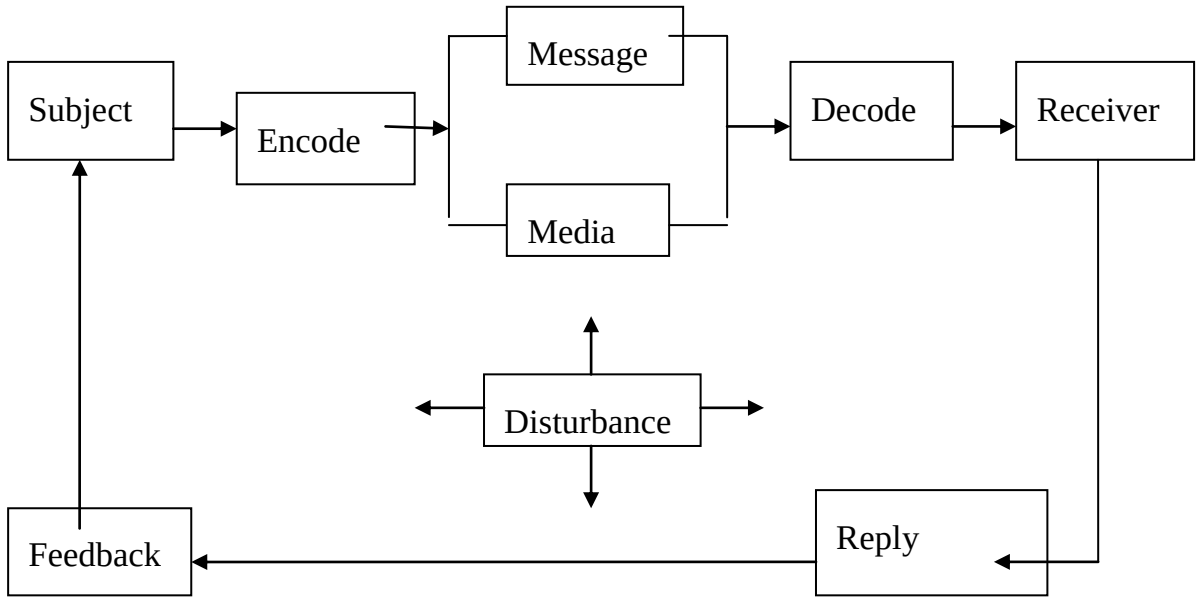

Diagram B3-1: The elements of the communication process

- Organize meetings to disseminate information for local authorities, social organizations, unions, people of the subproject region (Hanh Tin Tay commune-Nghia Hanh district);
- Through the mass media, basis loudspeakers, commune and village boards.
- Issue brochures, consultative questionnaires to local authorities, unions, people of the subproject area;

- Through the activities of organizations and clubs;
- Training;
- Other media and information forms.

5. Role and responsibility of agencies, organizations and individuals

Department of Agriculture and Rural Development represents Quang Ngai province people's committee is an investor, and Project Management Unit for investment and construction in Agriculture and Rural development of Quang Ngai province is the project implementation unit.

Department of Agriculture and Rural Development (DARD)/ Project Management Unit (PMU):

- DARD and PMU are responsible for building materials about communication plan and participatory public consultation.
- Coordinate government at various levels in Hanh Tin Tay commune- Nghia Hanh district commune (local authorities, Fatherland Front, Women's Union, Farmers' Union, Youth Union, hamlet representative) organize propaganda activities for this plan.

People's Committee, Social Organizations

- To direct, guide and organize the propaganda activities and disseminate contents of communication, participatory public consultation.
- Direct news agencies, local propaganda agencies to spend the appropriate time for disseminating plans and the impact of the subproject.

Land Clearance Committee

- Provide information about land acquisition, resettlement, compensation cost apply framework and support policies of the subproject and the provisions of Quang Ngai Province and government at various levels, the affected people.

- Health Station: disseminate information on the disease prevention plan, medical examination periodically, solutions when having epidemic.

6. Implementation Schedule

The communication plan and participatory public consultation implemented under stages of the subproject; to provide completely information for local people and government at various levels.

Table B3-1 Implementation Schedule of "Communication Plan, Consultation with Community Participation"

No	Stage	Content	Form	Responsible unit	Receptive unit	Note
1	**Preparation**	Disseminate information, consult the authorities about subproject: scale, type of investment, the main works, incidence, benefits of the subproject.	Organize meeting at government at various levels, mass organizations.	DARD and PMU	Quang Ngai Province People's Committee, Department of Planning and Investment, Department of Finance, Department of Natural Resources and Environment, Nghia Hanh district People's Committee, Government of Hanh Tin Tay commune.	

No	Stage	Content	Form	Responsible unit	Receptive unit	Note
		Disseminate information about policies, compensation plan, the draft of resettlement action plan.	Meetings, leaflets, consultation votes at all government levels, the affected households around the subproject area.	PMU coordinate with design consultancy unit, resettlement action plan consultancy unit.	Nghia Hanh district People's Committee, Hanh Tin Tay commune, Women's Union, Fatherland Front, Farmers' Union, Cadastral Division of commune/ precinct, 103 households in the project area.	Perform 2 times: to prepare and present a draft of resettlement action plan
		Disseminate information about project, present the draft of ESIA and ESMP reports, gender plan, public health, communication, etc.	Meetings, leaflets, consultation votes at all government levels, the affected households around the subproject area	PMU coordinate with design consultancy unit, ESIA consultancy unit	Nghia Hanh district People's Committee, Hanh Tin Tay commune, Women's Union, Fatherland Front, Farmers' Union, Cadastral Division of commune/ precinct,	Perform 2 times: to prepare and present a draft of resettlement action plan.

No	Stage	Content	Form	Responsible unit	Receptive unit	Note
					103 households in the project area.	
		Compensation and resettlement	Organize meetings to disseminate information about measure, counting, compensation plan, post information in noticeboard of commune/ precinct and village/ urban groups.	PMU coordinate with Compensation, Assistance and Resettlement Board	Nghia Hanh district People's Committee, Hanh Tin Tay commune, Women's Union, Fatherland Front, Farmers' Union, Cadastral Division of commune/ precinct, 103 households in the project area.	Implement according to Resettlement Action Plan report.
No	**Stage**	**Content**	**Form**	**Responsible unit**	**Receptive unit**	**Note**
2	**Construction and Operation**	Gender Action Plan		PMU and Social Supervising Consultant	Nghia Hanh district People's Committee, Hanh Tin Tay commune, Women's Union, Fatherland Front, Farmers'	Implement in 3 phases of the subproject.
		Public Health Management Plan				
		Social Management Plan				

No	Stage	Content	Form	Responsible unit	Receptive unit	Note
			Meetings, leaflets, basic broadcasting, consultation votes at government at various levels, the affected households around the subproject area		Union, Cadastral Division of commune/ precinct, 103 households in the project area.	
		Environmental Management Plan		PMU and Environmental Supervising Consultant	Nghia Hanh district People's Committee, Hanh Tin Tay commune, Women's Union, Fatherland Front, Farmers' Union, Cadastral Division of commune/ precinct, 103 households in the project area.	Implement in 3 phases of the subproject
		Public order and social evils		PMU and contractor	Nghia Hanh district People's Committee, Hanh Tin Tay commune, Women's	
		Traffic Safety and Fire Prevention and				Construction Stage.

No	Stage	Content	Form	Responsible unit	Receptive unit	Note
		Extinction			Union, Fatherland Front, Farmers' Union, Cadastral Division of commune/ precinct, 103 households in the project area.	

Monitoring Assessment: PMU make a monitoring report of communication plan and participatory public consultation to control communication content, synthesize feedback from the Supervising Consultant Unit, local government, social organizations, unions and citizens to supplement or amend policies and measures of the management plan to suit each stage of the subproject.

Implementation Cost

The implementation cost of this plan is integrated with other plans (communication content and methods will be acquired and build by other plans. Social Management Plan chairs other plans related to social issue. Cost of this phase focuses primarily for broadcasting and organizations, the expected cost is 50,000 million (fifty million VND) in 0 months.

APPENDIX B4: Public health intervention plan

1. Purposes

- Well supervise adverse impacts and dangers on public health during sub-project construction.
- Actively prevent, fight epidemics arising during sub-project construction, at the same time effectively respond to the case of epidemics occurring.
- Enhance communication, education on health for people, local government about the potential danger of epidemics during the sub-project construction.

2. Content of the public health management plan

2.1. Control of the sub-project construction site

In order to protect human health and environment, the construction site will be closely controlled to minimize in and out of people. Before starting construction activities, Contractor will apply security maintaining measures and control in and out the site. Contractor will zone the construction sites; mark with flags on trees, bushes and fixed marks in the scope of construction not allowed to have impacts; and the activities boundaries to avoid in and out. Dangers inside construction site include soil excavation and filling and movement of vehicles, machines, therefore, only the construction workers are allowed to entry the site. This information will be announced at the meetings and frequently reminded in the commune's loudspeaker.

2.2. Prevent discharging debris

Construction debris need to be gathered and moved to the dump determined before construction. The debris transportation trucks must be covered to avoid spillage affecting environment and activities of local people resulting in health problems.

2.3. Danger of outburst and spreading of epidemics

- Kinds of diseases, especially infectious diseases often appearing in the project area.
- Danger of spreading infectious diseases or danger of affecting the public health caused by workers from other places who come to temporarily stay and via versa.

2.4. Avoid personal injuries

- Workers directly participating construction must be equipped with protection cloth, mufflers, gloves, helmets, air buttons, etc. according to current regulations on labour safety. Knowledge on sanitation, labour safety must be disseminated to all workers.

- The local people must be controlled their entry and exit of the construction as per item 2.1.

2.5. Response to emergent situation

Provision of contact address: The contractor and locality must provide the local people

the address and phone numbers to contact in case of emergent situations. Map to access to the nearest medical clinic may be provided.

Accidents that are possible to happen during sub-project construction include: Truck or construction accidents, fire and explosion or environmental incidents (oil spillage due to machine breakdown, domestic water tanks are broken, etc.)

When accidents occur, the related persons at the site have to immediately contact the said address. In case of accidents, the victims need to be given first aid before moving them to a medical clinic. In case of happening fire, explosion or environmental incidents, it is required to zone the accident and contact the related agency for treatment.

In case of natural disasters, for example earthquakes, flood, storms or dangerous weather conditions, the Contractor must stop all works operations and take the workers to a safe place. Working area will be shielded to avoid preventable chemical spillage to outside and unsecured vehicles or machines affecting the community.

1. **Site:**

Public health management plan will be implemented in the hamlets in the project area and Dap Lang reservoir sub-project.

2. **Implementation period:** Before and in period of the sub-project construction (8 months).

3. **Management and supervision methods**

a. Supervision, management indices:

- Number of labour accidents due to the sub-project construction;
- Number of traffic accidents due to the sub-project construction vehicles;
- Times/number of workers suffering from sickness, especially infectious diseases;
- Availability of the medicine cabinet for workers at the tents on site;
- Number of workers instructed/trained in respect with public health;
- Instruction materials on first aid/response to epidemics, accidents must be used/ supplied to the workers by the Contractor.

b. Management method

- Contractor shall assign to the work superintendent or a worker in charge of labour safety and health of workers in order to keep tract, support related issues.
- Contractor shall coordinate with communal medical clinics and medical officers of the hamlets in order to timely update epidemic situation the area and public health issues that possibly spread.

- Contractor shall coordinate with local government, medical clinic to announce safety related issues of local people in the construction site or construction materials/debris transportation roads.
- CPC/medical clinics shall actively check the sanitation, labour safety maintenance in the construction site and tents of the workers.
- Contractor shall coordinate with CPC/medical clinics in order to have combined treatment mechanism when there are accidents or epidemics.

4. Management unit, keeping track of implementation

i) **PMU of Quang Ngai Province's Department of Agriculture and Rural Development:** PMU shall be responsible for generally supervising the all project activities, including communication plan, public health consultation. Public health related issues are one of the content reflected in the complaint mechanism of the project.

ii) **Government of Hanh Tin Tay Commune**: The communal government is generally responsible for issues arising in the communal area. The communal government may assign the public supervision board to keep tract the communication activities, this consultation in the locality.

iii) **Medical clinic of Hanh Tin Tay Commune**: Communal medical clinic has function of managing, keeping tract, give first aid, reporting the public health issues in the communal area. Thus, the public health related issues are also kept tract, supervised, supported by this unit.

iv)**Contractor:** The work superintendent will be the person on behalf of the contractor to coordinate with the local people to implement communication activities, public health related consultation and workers' man days.

5. Implementation expenditure

For the contractor: The contractor's expenditure is included the construction contract.

As for medical clinic: There is no expenditure for this activity as this is responsibility of medial units for public health management.

APPENDIX B5: Public consultation, Participation and communication strategy

1. Purpose:

- Strengthen access to information for benefit of the people in the project area;
- Inform, update project execution plans for the people to be active in production and life activities;
- Information for development: improve access to information to serve people's life, contribute to improving life quality;
- Strengthen people's participation.

2. Object of communication, consultation

- The people in the commune, especially at project areas and villages/hamlets through which construction materials means go.
- Local government, village/hamlet cadres
- On-site workers, managers
- For community, encourage participation of both men and women

3. Content of communication, consultation

- Content, main items of the sub-project, implementation capital
- Effects brought about by the sub-project;
- Local organization and implement of the sub-project: information about the Employer, construction contractors, supervisors;
- Construction plans, schedules of main works items;
- Possible impacts during construction on environment, society and the people at the project area;
- People's participation mechanism, community supervision mechanism, claims, legal proceedings handling mechanism;
- Issues detected during implementation of the project: arisen issues, conflicts, combustible materials, violation of commitments by contractors, Employer, etc.
- Local notice of unskilled workers recruitment for construction activities.

Time: Before and during construction of the sub-project. Within 1 month prior to construction, the contractor will coordinate with local government to inform construction plan as well as potential impacts related to community health.

4. Location:

At Hanh Tin Tay commune with concentration priority at the sub-project area of Tan Phu 2 villages.

5. Method of communication, consultation

Communication, consultation is done through following main forms:

- *Communication on loudspeakers of the commune.* Currently, Hanh Tin Tay commune has a system of loudspeakers at all of its villages. Almost local community communication activities are done through this form. Therefore, the loudspeakers system will be used to inform to all people at the commune about related issues during construction of the sub-project.
- *Community meeting/public consultation:* This form will be done with participation by cadres of villages in the whole commune; people at Hanh Tin Tay village, the project area and households along construction materials routes or areas with dumping grounds.
- *Communication is integrated into to activities of agencies or government:* Monthly, the government usually has meetings with cadres at the commune and agencies in the villages, therefore, content of communication may be integrated into these activities.

6. Implementation:

a. Prior to implementation:

The safety policy consultant will be the unit to implement communication, public consultation for general safety policy related issues.

b. During implementation of the project:

Project management board, the Contractor will co-ordinate with local government and social organizations, villages/hamlets to develop and implement communication activities according to the above methods.

7. Monitoring, supervision of implementation

Community communication and consultation plan is related to participation, supervision of the following units:

- **Quang Ngai province Project management unit** Project management unit will be responsible for general supervision of all project activities including community based communication, consultation plan. Issues directly related to the people in environment, society and compensation for affected property are one of the contents to be reflected in the complaint mechanism of the project.
- **Hanh Tin Tay commune authority**: The commune authority is generally responsible for all issues arisen at the commune. The commune authority may entrust Community supervision board to monitor communication, consultation activities at the locality.

- **Contractor**: The work superintendent will coordinate with local government on behalf of the contractor to implement community and on-site worker participation based communication, consultation activities.

8. Implementation cost

Implementation cost is mainly spent on construction phase and preparation phase. Expected expenditure is as follows:

Table B3.1-PL: Cost estimate for information disclosure
Estimated construction period: 12 months

Activity	Frequency	Quantity	Unit price	Cost estimate (VND)	Expenditure
Broadcast news on loudspeakers about construction activities	Once a week during construction process	1 time x 50 weeks = 50 times	VND 30,000 /1 news	VND 1,500,000	These costs are included in the contract between the Employer with relevant parties
Organize large-scale consultation meeting with commune, district government and households related to construction of the works	Once every three months during construction process	4 times within 12 months	VND 500,000 /1 meeting	VND 2,000,000	These costs are included in the contract between the Employer with relevant parties
Stick on the bulletin board to announce information to the commune People's Committee and the people	Once in every 2 weeks/during construction process	25 times during construction process	VND 50,000 /1 bulletin board	VND 1,250,000	These costs are included in the contract between the employer with relevant parties
Total				VND 4,750,000	

Public consultants

Consultation meetings with leaders of Hanh Tin Tay commune

Consultation meeting in Tan Phu 1 village

Consultation meeting in Tan Phu 2 village

Consultation meetings in Tan Hoa village

APPENDIX B6: Gender action plan

(This part represents the summary contents in an independent report on gender action plan)

From the above-mentioned gender analyses, a gender action plan is necessary to create conditions for women's maximum participation during the project construction, provide women with new opportunities to increase income but not to increase their life burden and contribute to increasing women's role and position at the project site. The objectives of this plan are described as follows:

(i) Local bidders shall use at least 30% of female labourers in maintenance, construction and repair;

(ii) For a job of the same nature, female labourers shall be paid like male labourers;

(iii) Safety conditions shall be equal for both men and women;

(iv) Local bidders shall not use child labourers;

(v) Encouraging to use local labours and avoid building huts;

(vi) Group of women and women's union shall be consulted in design of the sub-project;

(vii) Providing training on gender mainstreaming to the national, provincial and local agencies (i.e., PMUs and other stakeholders).

(viii) Training and building capacity for women to participate in the decision-making process of the community and sub-projects in the most meaningful manner (i.e., providing training on participation and negotiation, marketing skills and on mathematics and scripts);

(ix) Ensuring women's participation in project study tours.

(x) Women-targeted agricultural encouragement services shall be designed and transferred to women.

(xi) The campaign on increasing acknowledge on HIV/AIDS shall be launched before commencing the civil work. PMU shall be responsible for monitoring and reporting the performance indicators of the gender action plan, including women's participation, objective jobs and training and campaigns to prevent HIV epidemics.

(xii) At least one woman shall be the commune's representative in the commune supervision board (making up about 1/3 of the members).

Sets of solutions for meeting the objectives

- **Capacity building for women**
  - Identify and build capacity of relevant agencies/partners in relation to the

project areas and female labours so that they can help build capacity for women in the project areas.

- Assess the women training needs
- Deliver women-targeted trainings (a required female proportion for each training content)

➢ **Improved ability in accessing and using information for women**

- Assess the information needs and channels suitable for women and workers in the project areas to inform the development of the related information system.
- Assist women in application of information

➢ **Policy and supports to women**

- Hold dialogues with the project investors to figure out suitable policies for women in the project areas (priorities given to women in terms of land usage, access to funds, trainings, etc.)

Implementation arrangements

➢ **Gender-based priority activities:**

(i) Priority activities:

- Hire gender staff (propagate and advocate households to move out of the project areas in order to speed up the implementation and mitigate health and safety risks to local people).
- Deliver training on gender issues to Project Management Unit (PMU) and project staff within the project area so that they are aware and capable of integrating gender issues during planning process.
- Deliver training on gender issues to communal officers within the project areas.
- Deliver training on gender analysis to PMU, project staff and gender analysis team.
- Perform gender analysis for the project to identify advantages and challenges faced by women to inform the gender integration activities development.

➢ **Monitoring the implementation of the plan**

- Coordinators of each component, gender staff and PMU give due attention to gender integration during the implementation of the plan (based on indexes and targets).
- M&E staff monitors the implementation of the gender integration plan (incollaboration with gender staff and coordinators), report, monitor and evaluate gender targets.
- Periodical reports include reporting on gender integration results.

- Action Plan is reviewed and revised annually, if any.
- Gender-based activities in the next years will be identified and scheduled based on the results of gender analysis and the annual implementation review.

Table B6.1-PL: TDA's gender action plan

Project's output	Work and indicator	Responsibility	Time
Output 1: **Improving dam safety, rehabilitating irrigation conditions**	The bidders shall give priority to using unskilled labours (through sub-contracts); at least 30% of the total labours shall be local unskilled labours; Of 30% of the local labours, priority should be given to unskilled women; male and female labours shall receive the equal wage for the same job category; The bidders shall not be permitted to use child labours; Residents who desire to work for the project shall write their name into the hamlet/village's list. Hamlet's head and communal officer shall provide this list to the bidder and the bidder shall select from this list on the basis of prioritizing poor and vulnerable households.	PMU/Project coordination consultant shall be responsible for ensuring that these provisions shall be noted in the contract; the communal officer shall submit to the bidder the list of residents who desire to work for the project; The communal officer shall be responsible for ensuring that the given objective shall be achieved. The communal women's union shall be also responsible for ensuring that the commune's women shall be hired to work in the project.	During the construction
Output 2: Increasing capacity for the residents to explore the sub-project's advantages	At least 30% women shall participate in agricultural encouragement classes	Officers of the provincial project management unit, District's officers Commune's officers	During the construction
Output 3: **Increasing acknowledge about**	Program on HIV/AIDS and human trafficking prevention and fighting. Community-based risk	The province and commune's women's union shall be responsible for	Monthly, before and during the project

Project's output	Work and indicator	Responsibility	Time
potential social evils for the vulnerable objects, especially, women	mitigation program Information on risk mitigation shall be publicized to BAH communes and hamlets because the project uses the approach with the crucial participation of poor and vulnerable households (for example, households with holders as women, households with elder people and disable people) Documents and information shall be suitable in terms of language, culture and gender, especially, they shall be translated into ethnic language of each specific region; The women's union, representative of HIV/AIDS prevention and fighting centre and commune shall train propagandists for each commune/hamlet in the project site. Programs shall be performed in communes and hamlets by two propagandists (hamlet's head and 01 member of the women's union). Programs shall be performed in hamlets and on market days through distributing project and program documents and using loudspeaker.	organizing and performing the program (training and preparing materials) and coordinating with the commune and district's health centre. The hamlet and mountainous village's women's union shall be responsible for propagandizing and publicizing information. The commune and district's health centre shall provide support to the commune's women's union. The project coordination consultancy shall provide domestic and international gender specialists Gender specialists shall check-up the available documents and supplement documents if they are necessary for the program	construction
	Risk mitigation program during the construction: PMU and bidder shall coordinate closely with the health services in the communes and districts to launch the programs on increasing	PMU Bidder Local health centre Communal officer The women's union shall perform overall	During the construction

Project's output	Work and indicator	Responsibility	Time
	awareness, training, preventing, diagnosing and treating diseases for labours. All programs and documents shall be developed and mainstreamed with gender issues, including vulnerability and men and women's demands. Bidder shall: Launch the programs on increasing awareness for labours and community including publicizing, educating, propagandizing and mentioning HIV transmission issue and guiding preventive measures. Provide free-or-charge consultancy service and encourage labours to participate in HIV test to ensure that all of them acknowledge their health status. Support access to health services and encourage HIV infected people to admit that they have been HIV infected; Provide medical equipment (delivering condom free of charge) to workers who live in hut;	coordination to generate more powerful collective strength in terms of HIV prevention and fighting	
Project management	- Instructions on gender, development and training shall be provided to PMU's employees, local organizations and bidders. - All capacity development activities shall include the objects for the participating women and EM. Project performance consultant PPMU in design and initial	- Project performance consultant - PPMU	During the design and initial performance

Project's output	Work and indicator	Responsibility	Time
	performance		

Table B6.2-PL: Trainings with support on gender integration during the implementation of the Dap Lang Reservoir/Dam Rehabilitation and Improvement Sub-Project

No.	Training contents	Required proportions of women	Estimated budget
1	Capacity building on social and environmental management of the sub-project, with community involvement	At least 50%	5 mil/1 course x 2 courses
2	Awareness raising on dam safety	At least 40%	5 mil/1 course x 2 courses
3	Technical training on ICM (Agricultural promotion course)	At least 50%	20 mil/1 course x 2 courses
4	Awareness raising on infectious disease prevention and control	At least 50%	5 mil/1 course
5	Awareness raising on maternal and child health	100%	5 mil/1 course
6	Training and raising awareness of women about integrating gender action plan in sub-project.	50%	5 mil/1 course
Total			55 mil

(ii) Budget: The budget for this is considered a part of project management budget.

APPENDIX B7: Grievance redress mechanism

Any complaint related to any aspect of the project will be handled through negotiation to obtain a consensus. A complaint will undergo 3 phases prior to being put to a legal court as the last resort. CPO will incur all administrative and legal expenses arisen by complaints handling and complaints.

Settling the project's complaints shall comply with Article 138, Land Law in 2003; Article 28 of the Law on Complaints; Article 63 and 64 of Decree No.84/2007/ND - CP of the Government; Clause 2 Article 40 of the Decree No.69/2009 and regulations on complaint specified in the Decree No.75/2012/ND - CP promulgated on 20 November 2012. As per Clause 2, Article 138, Land Law in 2003:

(i) Where complaints about administrative decisions or administrative acts regarding land management are settled for the first time by the presidents of the People's Committees of rural districts, urban districts, provincial capitals or provincial towns, but the complainants disagree with the settlement decisions, they are entitled to initiate lawsuits at people's courts or continue to complain with presidents of the provincial/municipal People's Committees. In case of complaining with provincial/municipal People's Committee presidents, the decisions of the provincial/municipal People's Committee presidents shall be the final ones;

(ii) Where complaints about administrative decisions or administrative acts regarding land management are settled for the first time by provincial/municipal People's Committee presidents but the complainants disagree with the settlement decisions, they are entitled to initiate lawsuits at people's courts;

(iii) The statute of limitation for complaining about administrative decisions or administrative acts regarding land management shall be thirty days as from the date of receiving such administrative decisions or knowing about such administrative acts. Within forty five days as from the date of receiving the first-time complaint settlement decisions, the complainants, if disagreeing therewith, shall be entitled to complain to competent State agencies or initiate lawsuits at people's courts.

In settling the letter of complaint: Law on Complaints Article 14: Rights and obligations of the first time complain settler:

(i) The first time complain settler shall:

a) Request the complainant, related agency, organization and individual to provide information, materials and documents within 07 working days since the requested date as the basis for settling complaint;

b) Decide to apply, cancel the emergency measure as specified in Article 15 of this Law;

(ii) The first time complain settler shall have the following obligations:

a) Receive the complaint and notify in writing to the complainant, agency, organization or individual that is entitled to complain and state inspection agencies at the same level of agreeing to settle the complaints on administrative decisions or administrative acts;

b) Settle the complaints on administrative decisions or administrative acts when the complainant requests;

c) Hold a dialogue with the complainant, complained and related agencies, organizations and individuals;

d) Decide to settle the complaints for the complainant and take responsibility before the law for complaint settlement. In case of making complaints on the competent agency, organization or individual, it is required to notify the settlement result to such agency, organization or individual in accordance with legal regulations;

e) Provide information, materials and evidences that relate to complaints when the complainant requests; provide the complaint settlement documents when settling the complaints for the second time or requesting the court to settle the complaints.

(iii) Compensate for the first time complaint settlement and damages due to the administrative decisions or administrative acts in accordance with the legal provisions on State's responsibilities.

(iv) The first time complain settler shall perform rights and obligations in accordance with legal provisions.

Declare the decision on complaint settlement: Article 12 of the Decree No.75/2012/ND-CP dated 03 October 2012 of the Government detailing a number of articles of the Law on Complaints.

(i) Within 15 days from the decision to settle the complaint, those who are competent to settle the second complaint are responsible for publication of

decision on complaint settlement in one of the forms prescribed in Clause 2 of Article 41 of the Law on Complaints.

(ii) In case of publication at the meeting, the meeting attending composition must include: The person who makes decision to resolve the complaint, the complainant or the representatives, person who is complained and concerned agencies, organizations and individuals.

Before conducting the public meetings/person that is competent to settle complaints must send notice to the concerned agencies, organizations and individuals. Notice period should be three days in advance.

(iii) The notice of the decision on settlement of complaints on the mass media is performed on radio, television, print press, electronic press. Persons who are competent to settle complaints are responsible for choosing one of the mass media to make the announcement. In case the agency of person who is competent to settle complaints has e-portal or electronic information page, it must be publicized on e-portal or electronic information page.

The number of times publicized on the radio: at least 02 times; television: at least 02 times; print press: at least 02 times; time to publish in the e-press, on the electronic portal or on electronic information page is at least 15 days from the date of notification.

(iv) In case of posting in offices or places where receive citizens of the agencies, organizations that have resolved the complaints, time to post complaint settlement decisions is at least 15 days from the date of post.

Complaint settlement procedures of the Project shall consist of 04 steps:

Complaint that relate to any aspect of the project shall be settled through negotiation to reach the consensus. Complaint shall undergo three phases before being submitted to the legal court as the final option. CPO shall incur all arising administrative and legal costs in settling complaints and claiming.

1. Initial phase, the Commune People's Committee

An affected household who is dissatisfied will present their complaint to any member of the commune People's Committee through the village head or directly to the CPC, written or verbal. The above member of the CPC or the village head shall inform the CPC about the complaint. The CPC will work individually with the affected household who has a complaint and will have 30-45 days to handle after receiving the complaint. The secretariat of the CPC is responsible for documenting and archiving all the

complaints that it handles.

When the CPC promulgates a decision, the household may appeal within 30 days. If the household is still not satisfied with the secondly issued decision, they may appeal to the DPC.

2. Second phase, the District People's Committee

When receiving a complaint from a household, the DPC will have 30-45 days to handle as of receiving such complaint. CARB is responsible for documenting and archiving all the complaints it handles.

When the DPC issues a decision, the household may appeal within 30 days. If the household is still not satisfied with the secondly issued decision, they may appeal to the Province People's Committee.

3. Third phase, the People People's Committee

When receiving a complaint from a household, the PPC will have 30-45 days to handle as of receiving such complaint. The PPC is responsible for documenting and archiving all the complaints it handles.

When the DPC issues a decision, the household may appeal within 30 days. If the household is still not satisfied with the secondly issued decision, they may appeal to a court within 45 days. The PPC has to pay compensation into an escrow account.

4. Final phase, the Civil Court

If a complainant files their case to a court and the court decides to side with the complainant, then the province's government must satisfy compensation to a level decided by the court. In case the court takes side with the PPC, the complainant will take back payment paid to the court.

To ensure the above complaint handling mechanism is practical and acceptable to PAPs, consultation with local government and community has taken into account distinctive cultural characteristics as well as traditional cultural mechanisms in raising and handling complaints and conflicts. Objects and efforts of ethnic minorities have also been defined and culturally acceptable methods have been determined to find an acceptable solution.

Complaint handling process for an affected person has been described in Information about the sub-project for "Repairing and upgrading safety Dai Thang reservoir's dam" and has been issued to the affected person. To avoid the case that an affected person do not who to meet at the communal, district or provincial level to handle their complaint, the document has provided name, address and telephone number of the

persons in charge of handling complaints in order to help the affected person to effectively complain.

The affected persons will be expectted from all expenses related to administrative and legal procedures. Complaints submitted to a court are also expected from filing expenses. All the complaint profiles and handling methods will be kept at the People's Committee of communes, communal level public consultation board and investors in works of the sub-project for "Repair and Upgrade of Dap Lang Reservoir- Hanh Tin Tay commune- Nghia Hanh district- Quang Ngai province".

APPENDIX B8: Information disclosure, accountability and monitoring

1. Consultancy and information disclosure

The main objectives of information disclosure and community consultancy are to ensure the participation of the affected community, households, local governments and related organization in sharing project information; to consult selection of technical scheme; to predict impacts on land, income and land-on assets, etc. The information declaration shall be an important contribution for speeding up the project progress during the performance, preparation and when the project comes into operation with the consensus of the community, local govern and project management unit. This shall mitigate arising conflicts and other risks, increase the investment effectiveness and social meaning of the project.

The program on information disclosure and community consultancy shall ensure that:

The competent officials of the locality as well as affected residents' representatives shall participate in preparing the project and decision making process. The project management unit shall coordinate closely with the communes/districts during the project performance. The participation of the affected residents during the performance shall be continued by requesting the communes/districts to invite the affected residents' representatives to participate as members in the compensation, land clearance and resettlement board and participate in the settlement activities partially.

All information about the items and activities in accordance with the project's plan shall be shared to the affected residents.

Information about the demands and priorities of the affected residents as well as their responses to the proposed policy and activities shall be gathered.

The affected residents may be notified fully the decisions that affect directly to their income and lives and they shall have opportunities to participate in the activities and make decisions on the issues that affect them directly.

Transparency in all activities that relate to land withdrawal, compensation, settlement and recovery shall be ensured.

For the WB, the residents who are affected by the project shall be notified fully and consulted technically in terms of resettlement and compensation schemes. Consultancy shall be the starting point for all settlement-related activities. The residents who are affected by settlement may be worried that their livelihood and community relationship may be affected or that their benefits are not ensured. Right to participate

in making the plan and managing the resettlement activities shall help them relieve worries and bring the affected residents with the opportunity to participate in deciding what shall affect their lives. Performing the resettlement activities without consulting may lead to an unsuitable and useless strategy, consequently. Without consultancy, the affected residents may show their negative responses to the project, which causes difficulties in term of social aspect, slows down significantly the objective fulfilment, even, the objectives may be ignored and costs shall increase. Therefore, with consultancy, the initial disagreement to the project may be turned into participation with constructive spirit.

For Vietnam, the furthermore important step in promoting democracy at the grassroots level is the Directive No.30-CT/TW of the Central Committee of the Communist Party of Vietnam on "preparation and implementation of democratic regulations at the grassroots level" and the Decree No.79/2003/ND-CP concerning this issue. The key feature of this legal document is the famous slogan "the people know, the people discuss, the people do, and the people check"; the Ordinance No. 34/2007/PL-UBTVQH11 indicates the issues that the local govern and community participate in giving opinion before the competent authority makes the decision; in which, including preparing the scheme on compensation, support and resettlement relating to the project and works in the ward/commune; Article 39, Clause 2, the Land Law in 2003 requests to publicize resettlement-related issues such as reasons, land withdrawal plan, removal plan, general compensation plan, land clearance for the affected residents.

Thus, consultancy and participation are a reform in project performance in Vietnam. This policy shall overcome weaknesses during the project launch and performance because both the local residents and project implementers lack experience in this field.

The following points should be concerned to encourage the stakeholders to participate in the consultancy process in the project:

- Determine and attract all stakeholders, especially, the residents who live at the project site, affected residents (men, women, ethnic residents, etc.) into the consultancy and participation process;
- Build the strategy on collective participation for making the plan, performing, monitoring and evaluating the project.
- Develop the contents and topics that are necessary for the campaigns on broadcasting and information disclosure and develop the procedures so as for the affected residents to make negotiation on their benefits.

- Attract the stakeholders to participate in deciding again all project performance phases (such as design options, compensation methods, referring the affected residents' opinions about compensation method, performance schedule, etc.).
- Establish a schedule to complete the activities, for example, information provision campaign, compensation levels and methods, benefits, removal place and plan.
- Develop the complaint settlement procedures.

Regular community consultancy shall be also performed with the units that prepare and designs in details the project's items. This shall ensure that the proposed designs have the community's participation and restrict adverse impacts on the community. This shall also help to make the works friendlier to the community and users.

Consultancy shall be also performed with the stakeholders, in which, the units that shall be responsible for managing and operating the work; it should be ensured that the stakeholders are asked and contributed their opinions to the design.

During the construction, the project employer should broadcast on the mass media about the construction activities, expected schedule, measures on supporting the affected residents and procedures of receiving and sending reply from the community. The affected residents shall be notified the project's policies and procedures to ensure that their lives shall not be changed much later. The affected residents shall be also notified if they have any question about the project and the project management unit shall answer such question for them.

Table B6.1-PL: Consultancy content/information declaration and form of consultancy/information declaration

Information to be declared	**Form of consultancy/declaration**	**Time**	**Implementer**
1. Information about the design and technical drawings; alignment schemes	Discuss with the ward/commune govern and related union divisions, branches; representatives of the affect households.	Project survey and design process	Consulting and PMU
2. Information about withdrawal, land clearance and compensation.	Ward/commune's officers shall coordinate with PMU to consult the affected households to make initial assessment. Develop and agree the scheme on withdrawal and compensation with APs before submitting it to the competent authority for making decision.	Before launching	Communal people's committee Project management unit

	Publicize the policy and answer questions through meetings with APs.		
3. Information about the performance schedule, supervision mechanism and accountability.	Meetings of the street groups, notices and posters that are placed in the public places.	When commencing and maintaining during the performance.	PMU, communal people's committee
4. Information about using and paying wage to local labours.	Hold three-party meeting between the constructing unit, govern/ward/commune's supervision board and residents.	Before execution	constructing unit, community supervision board
5. Information about potential adverse impacts and mitigation measures.	Combine activity 2 and 3 above	Before and during the performance.	PMU, constructing unit, communal people's committee

2. Social accountability

The objective of declaring information about the project's proposed schemes to the affected residents and stakeholders during the community consultancy and site survey process of the social assessment consultants is to offer a sample frame for publicizing information continuously in the project performance process. Moreover, as requested at all community meetings, the affected residents want to be held the meetings to exchange information regularly with the project management unit at the headquarters of the people's committee of the commune that has the affected community during the project performance. Thus, the reports on the resettlement plan as well as the plan on environmental management shall represent the responsibilities of the project management unit in ensuring that the people get the project information regularly.

Apart from the regular meetings between the project management unit and affected community at the headquarters of the communal people's committee, the community meetings at all communes that have performed community consultancy should determine the necessity of establishing the close connection to create conditions for maintaining easy and quick contacts with the project management unit. The best way to make close connection is to provide telephone number and address of the responsible project management unit at all places of executing the project's items and headquarters of all communes of the project's entire component.

3. Supervision with participation

To ensure the effectiveness of the project's components, it is necessary to prepare a supervision plan with the participation of the stakeholders such as Department of Natural Resources and Environment, Department of Construction, Department of Planning and Investment, Department of Transport, etc. The agencies/units that manage and operate directly the Project's items after completion shall participate in supervision during the engineering design and execution.

In addition to the project's independent supervision division, it is necessary to have a supervision division at the community level to supervise the project's activities, especially, the activities that relate to resettlement, environmental sanitation and execution of various items. The supervision division shall include the local leaders' representatives, representative of the unions such as Women's Union, Fatherland Front, Veterans' Association, Farmers' Association, residents' representatives, etc. This community-level supervision division shall coordinate with the project's independent supervisor to supervise the project's activities as per the indicators on social safety. The indicators on life, production recovery, environmental sanitation and transport shall be developed for the project's supervision plan. Through the survey, the community-level supervision division may reflect in time information that relates to the project schedule, arising issues during the project performance to notify them to the PMU for settlement in time. This division's responsibility is to gather and submit the residents' response to the competent authority levels and project management unit. Simultaneously, the residents shall also participate in the execution supervision process, safety and environmental sanitation assurance during the execution.

The community-level supervision division should prepare a plan on training, increasing the capacity of supervising and assessing the project's activities. Supervision skills shall be trained directly for this division and considered as an integral part in the project's supervision plan with participation.

It is necessary to apply the Resolution 80/CP on community supervision for the construction works in the locality.