ENVIRONMENTAL MANAGEMENT PLAN (EMP)

IRRIGATED AGRICULTURE IMPROVEMENT SUBPROJECT IN QUANG NAM PROVINCE

VIETNAM IRRIGATED AGRICULTURE IMPROVEMENT PROJECT (VIAIP/WB7)

(FINAL VERSION)

Quang Nam, September 2013
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<th>Description</th>
</tr>
</thead>
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<tr>
<td>CMC</td>
<td>Construction management consultant</td>
</tr>
<tr>
<td>CPC</td>
<td>Communal People’s Committee</td>
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<td>CPO</td>
<td>Central Project Office</td>
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<tr>
<td>CSEP</td>
<td>Contractual specific environmental plan</td>
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<tr>
<td>DOCST</td>
<td>Department of Culture, Sport and Tourism</td>
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<tr>
<td>ECOP</td>
<td>Environmental code of practice</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental impact assessment</td>
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<tr>
<td>EMP</td>
<td>Environmental management plan</td>
</tr>
<tr>
<td>MONRE</td>
<td>Ministry of natural resources and environment</td>
</tr>
<tr>
<td>PDNRE</td>
<td>Provincial Department of Natural Resources and Environment</td>
</tr>
<tr>
<td>PMU</td>
<td>Project management unit</td>
</tr>
<tr>
<td>PPC</td>
<td>Provincial People’s Committee</td>
</tr>
<tr>
<td>PPMU</td>
<td>Provincial project management unit</td>
</tr>
<tr>
<td>SMU</td>
<td>Subproject management unit</td>
</tr>
<tr>
<td>WB</td>
<td>World Bank</td>
</tr>
</tbody>
</table>
CHAPTER 1 - INTRODUCTION

1.1 Brief introduction to the Project

The Vietnam Irrigated Agriculture Improvement Project (VIAIP/WB7) will be implemented based on the proposal of Ministry of Agriculture and Rural Development to request the World Bank to support some Central and Northern mountainous provinces in Vietnam to improve the irrigated agricultural schemes to sustainable development, suitable with climate change, environmental improvement, increase quality of life and improve living standards for the people's in Quang Nam province. The project is proposed with total investment of USD 210 million (including an ODA loan of USD 180 million from World Bank and a counterpart loan of USD 30 million from Vietnamese Government). The implementation period of the project is 6 years (2014-2020). The project areas covers 07 provinces, including 03 Northern mountainous ones, namely Ha Giang, Hoa Binh, Phu Tho, and 04 Central coastal ones, namely Thanh Hoa, Ha Tinh, Quang Tri and Quang Nam.

1.2 Introduction on the Subproject

Quang Nam Irrigated Agriculture Improvement Subproject was proposed in Vietnam Irrigated Agriculture Improvement Project (WB7) as a connection to the past Bank-financed Vietnam Water Resources Assistance Project (VWRAP) – WB3 that was completed in 2011 for Phu Ninh reservoir irrigation scheme and expansion of Khe Tan reservoir irrigation scheme. While for Phu Ninh reservoir irrigation scheme, part of the canal system has been rehabilitated, Khe Tan irrigation scheme was completed in 1989 but until todate it has not been repaired or upgraded. Hence, the canal system has experienced erosion, siltation and canal regulating structures have been operating inefficiently. The irrigation scheme can only provide water for about 66% of the intended irrigated area in the original design.

As part of Phu Ninh irrigation scheme has not been rehabilitated, the end of the primary, secondary and tertiary canals encountered serious erosion, water flow of the canals is not assured causing serious shortage of irrigation water for the cultivation area of the farmers. Improvement of this irrigation scheme including works such as installing concrete canal embankments to maintain designed canal cross-sections combined with construction of rural road.

1.3 Objectives and structure of this report

1.3.1 Objectives of the report

Environmental management plan (EMP) for Quang Nam Irrigated Agriculture Improvement subproject describes the principles, procedures and methods which will be used to control and minimize potential negative socio-environmental impacts associated with the implementation and operation of the sub-project. EMP also aims to support the project additional environmental and social impact assessment process, and to ensure that the commitments of the Subproject Management Unit (SMU) to minimize the potential negative socio-environmental impacts will be implemented through all stages of the subproject.

In order to achieve highest social and environmental efficiency, the subproject will ensure the followings:

- Meeting all social and environmental requirements regarding the project approval;
- Development. Stimulation and increase of sense of common responsibility in the project environmental and social activities.
• Increase of construction workers and contractors’ awareness and knowledge of environment via training;
• clear determination of roles and responsibilities for social and environmental management, combine the project outcomes with positive impacts on the environmental.
• Raise awareness on sensitive aspects for local community’s such as local culture values and lifestyle for monitoring compliance of the contractors.
• Monitoring the effectiveness of the measures to mitigate negative social and environmental impacts during the implementation of the sub-project and enhance the positive impacts;
• Facilitate the participation of local communities and the project affected stakeholders to make sure they are benefited from the sub-project; and
• Meet the requirements on information disclosure and consultation with local stakeholders during all of the project stages.

1.3.2. Structure of the report

EMP was designed as an important material for environmental management in the sub-project. It directly link to Environmental and social impact assessment report prepared for the subproject.
EMP includes principles and procedures for mitigating the impacts and risks, plans for environment communication campaigns, reporting requirements, training needs, monitoring and auditing checking plan for application by the officials of SMU, the contractors and subcontractors before, during and after the subproject implementation period.

There are 7 chapters in EMP, namely

  Chapter 1: Introduction
  Chapter 2: Policies, provision and institutional framework
  Chapter 3: Project description
  Chapter 4: The subproject’s environmental background
  Chapter 5: Potential impacts and mitigation measures
  Chapter 6: Implementation organization
  Chapter 7: Consultation and information disclosure
CHAPTER 2

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1. Applicable Bank Safeguards policies

In addition to strict compliance with the environmental laws and regulations of the Government of Vietnam, Quang Nam Province Irrigated Agriculture Improvement Subproject is established and carried out in compliance with the World Bank’s environmental and social safeguard policies. The subproject is classified as Category B according to the World Bank classification on safeguards. Environmental assessment aims towards identifying potential positive and negative socio-environmental impacts, based on which, necessary measures are developed to avoid, prevent, mitigate and minimize or compensate the adverse impacts and improve environmental outcomes.

The Quang Nam Irrigated Agriculture Improvement Subproject has some potential negative impacts on the environment but most of them are localised and temporary during construction phase, the subproject also bring about long term significant socio-environmental benefits. As a result, on the basis of making consideration for the project area and project activity proposal, with reference to the whole project’s Environmental and Social Management Framework (ESMF), the following environmental and social safeguard policies are triggered during the environmental impact assessment process of Quang Nam subproject:

- **Operational Policy 4.01 - Environmental assessment.** This policy is triggered when the proposed sub-project has some potential negative socio-environmental impacts. OP 4.01 requires that environmental assessment is carried out to predict the potential socio-environmental impacts so appropriate safeguard plans can be prepared to avoid, mitigate the adverse impacts during construction and operation phases. Therefore, EA has been prepared for GOV approval and this EMP is prepared and submitted for the Bank to review.

- **Operational Policy 4.09 – Pest Management.** As the subproject irrigate additional cultivation land where likely pesticide are used, OP 4.09 is triggered. An Integrated Pest Management Plan has been prepared under the ESMF and cover Quang Nam sub-project in order to mitigate the negative impacts associated with the transportation, handling, storage, usage and disposal of pesticides.

- **Operational Policy OP4.11 - Physical Cultural Resources (PCR).** This policy is triggered when a subproject has potential impacts on physical cultural resources including archeological sites and objects, cultural/religious structures, graves etc. Although the Quang Nam subproject will not affect any known PCR, it included some excavation works thus OP 4.09 is trigged. To meet the requirements of OP 4.09, the Chance Find Procedures introduced in the ESMF is included in this EMP.

- **Operational Policy 4.37 – Dam Safety.** As the irrigation schemes invested under the Quang Nam sub-project depends on the safety of the two dams - the Khe Tan and the Phu Ninh, OP 4.37 is triggered. With the investments on dam safety under the previous Bank-financed VWRAP, the Phu Ninh dam already met the requirements of OP 4.37\(^1\) - Report on dam safety which is made separately following ESMF.

- **Operational Policy 4.12 – Involuntary resettlement**

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\(^1\) According to the newest reports on Khe Tan and Phu Ninh Dam supplied by PMU and IMC Phu Ninh, these dams are tested their safety regularly, operated normally and there is no incidents.
2.2. National laws

- Law No. 52/2005/QH11 on environmental protection dated November 29, 2005 of the National Assembly of the Socialist Republic of Vietnam, Congress XI, 8th session, effective since July 01, 2006;
- Land Law No. 13/2003/QH11 approved by the National Assembly of the Socialist Republic of Vietnam on November 26, 2003;
- Law on water resources by the National Assembly of the Socialist Republic of Vietnam approved on June 21, 2012;
- Law No. 29/2004/QH11 on forest protection and development approved by the National Assembly of the Socialist Republic of Vietnam on December 03, 2004;
- Decree No. 197/2004/ND-CP dated December 03, 2004 by the Government on compensation, assistance and resettlement when land is recovered by the state;
- Decree No. 23/2006/ND-CP dated March 03, 2006 by the Government on the implementation of the law on forest protection and development;
- Decree No. 72/2007/ND-CP dated May 07, 2007 by the Government on management of dam safety;
- Decree No. 112/2008/ND-CP dated October 20, 2008 by 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 December 01, 2008 by the Government on river basin management;
- Decree No. 88/2009/ND-CP dated October 19, 2009 by the Government on the grant of land use right and house and land-attached asset ownership.
- Decree No. 29/2011/ND-CP signed on April 18, 2011 by the Government on providing strategic environmental assessment, environmental impact assessment and environmental protection commitment;
- Circular No. 16/2009/TT-BTNMT dated October 07, 2009 by the Ministry of Natural Resources and Environment defining national technical regulations on the environment, quality of air and some hazardous substance in the surrounding air environment;

Besides these, Vietnam National Standard and Vietnam Technical Regulations relating to environmental protection, which are applied to the subproject are listed in annex 4 of this plan.
CHAPTER 3 - SUBPROJECT DESCRIPTION

3.1 Subproject objectives and scope of works

3.1.1 Subproject objectives

a. General Objective

- To ensure that the irrigation schemes are safe, reliable and they can provide with integrated benefits.
- Operational management is low-cost and the schemes are easy to operate, flexible in maintenance.
- To satisfy the requirements for suitability of water for agriculture, domestic activities, industrial activities and for improvement of ecological environment and tourism.
- To exploit potential human resources; to reduce poverty; economic development in the project area and relevant area; to increase productivity, cultivation efficiency through changing the structures of plantation, creating a high-yield production area of high economic value to contribute to the construction of infrastructures for new rural programs.
- To improve livelihood and increase living standards and to reduce poverty for households through increasing agricultural yield, improving agricultural products and minimizing loses caused by external factors such as flood, draught.
- In addition, the project helps improve traffic conditions of the people in the area through the use of the embankments to build traffic roads of the villages, communes and other center areas.
- The structures are helpful in development of the ecology and climate control.

b. Specific objectives

b.1. For Phu Ninh reservoir irrigation scheme

- Complete the irrigation scheme for Phu Ninh work towards the modernization mentioned in WB3.
- Replacement of pump stations which are not suitable any more for supplying water to 1,800ha of Ba Ren irrigation area since water sources of Thu Bon and Truong Giang rivers are saline.
- Increase water pumping efficiency: the amount of time for pumping water to primary canals decreased significantly.
- Supply of domestic water capacity $Q= 22,500 \text{ m}^3/\text{day.night}$
- Supply of industrial water capacity $Q= 3,44 \text{ m}^3/s$
- Percentage increase for agricultural productivity 12%.
- Ensure watering for Phu Ninh irrigation area and that at the left of Ba Ren river with total area is 19,427ha.
- The area of high-yielding value crops increases by 2447 ha.
- Associations of water users that actively operate and carry out maintenance of irrigation schemes increase from 20 cooperatives to 32 cooperatives (the scale of each
cooperative is from 500 ha to 700 ha). Experience from the practice of these cooperatives might be useful when there are opportunities for expansion to other irrigation area.

b.2. For Khe Tan reservoir irrigation scheme

- The area that is ensured for irrigation water increased by 32%.
- Increase in water pumping efficiency: the duration of water pumping to the end of the canal and primary canals reduced significantly;
- Water supply for fish farming: From 5.38 ha in 2012, 2020 increased to 50ha
- Water supply for domestic activities: 1,296 m³/day.night
- Percentage rate of increase in agriculture productivity 12%.
- The area of high-yielding value crops increases by 1,000 ha.
- Associations of water users that actively operate and carry out maintenance of irrigation schemes increase from 0 to 6 cooperatives (the scale of each cooperative is from 500 ha to 700 ha). Experience from the practice of these cooperatives might be useful when there are opportunities for expansion to other irrigation area.

3.1.2 The subproject scope of Works

The components of the Subproject are: Phu Ninh reservoir Irrigation Scheme and Khe Tan reservoir Irrigation Scheme.

Phu Ninh reservoir irrigation scheme is located in the area of the Phu Ninh, Nui Thanh, Thang Binh, Que Son, Duy Xuyen districts and Tam Ky city. The area’s total land area is 652.85km² with 325,536 people residing. Their main source of income is from agriculture production activities. The main North canal of Phu Ninh is 47 km in length and 25.5km/47km was upgraded and modernized as part of VWRAP (WB3) project; for the proposal of this VIAIP (WB7) project, the remaining 16km should be upgraded and modernized to ensure safe and effective operation of the entire project.
Khe Tan Reservoir Irrigation Scheme is located in the area of Dai Chanh, Dai Thanh, Dai Thang, Dai Tan, Dai Phong, Dai Minh, Dai Cuong communes of Dai Loc district. The total natural area is 155.71 ha, which composes mainly of agricultural land. Total population is 43,412 people and their main occupation is agriculture production.

- Khe Tan reservoir is the second biggest irrigation scheme of Quang Nam province (the first being Phu Ninh reservoir); its construction commenced in 1985 and it was completed in 1989. According to the initial design, the work aimed towards providing irrigation water for 3,500ha of agricultural land in Dai Chanh, Dai Thanh, Dai Thang, Dai Tan, Dai Phong, Dai Minh and Dai Cuong communes but in actuality, this reservoir can only ensure irrigation for 2,100ha/season. The shortage of water caused instability for plantation and animal farming.

- Canals and structures on canals: Khe Tan main canal is 14,595 in length; it is earth canal, trapezoidal cross-sections and the side slope coefficient is m=1.5, bed slope \(i=1\times10^{-4}\); with 436 structures on canals including: inlet gate for water in the primary canal, drainage for excess water and other structures .... and 04 large aqueducts;

- Along the whole length of the canal, erosion frequently occurs causing decrease in the level of water discharge; it only reached a level of 80-90% compared to the initial design; for some area, the level is only 50-60% compared with initial design.

- Structures on canals have been degraded, especially when these structures are stone masonry; mortar has disintegrated; additionally, erosion caused big losses during operation of the irrigation scheme and it also caused instability that hindered flood drainage.
3.2. Component and specifications of the subproject

Table 1. Project Components

<table>
<thead>
<tr>
<th>Subproject</th>
<th>Investment field (Items/scale/parameter/specific amount)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component B</td>
<td>• Upgradation and fixing of Phu Ninh and Khe Tan irrigational scheme</td>
</tr>
<tr>
<td>a. Phu Ninh scheme</td>
<td>• Ensure irrigation for 19,427 ha, supply domestic, industrial and aquacultural water</td>
</tr>
<tr>
<td>1.1. Focal item</td>
<td>• Non upgradation</td>
</tr>
<tr>
<td>1.2. Canal scheme</td>
<td></td>
</tr>
<tr>
<td>1.2.1. Main North canal</td>
<td>• Upgradation of 16km of the main North canal:</td>
</tr>
<tr>
<td></td>
<td>• Regarding embankment canals or ones with half of digging and half of embankment, which are eroded, have sedimentation at the bottom and absorb deeply, the solution is to reinforce completely cross section of the canal by concreting reinforced concrete M200 with the thickness of 10cm at the site.</td>
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<td></td>
<td>• Solution for dug canal traversing kaolin area is reinforcing by rectangular reinforced concrete.</td>
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<td>• In terms of canal of which the inside cover is seriously eroded, traversing and absorbing hillsides, the solution is to reinforce by</td>
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<tr>
<td>1.2.2. Main South canal</td>
<td>• No need to upgrade</td>
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</tbody>
</table>
| 1.2.3. Canal level 1   | • Dredge and embankment to meet the design cross section.  
|                        | • Supplement missing canals.  
|                        | • Proposed technical solution to solidification is canal with trapezoidal cross section, reinforced by concreting reinforced concrete at the site with the thickness is 8-10cm and mortar lining beneath. |
| 1.2.4. Canal level 2 and 3 | • Canal level 2 and 3 are improved and/or built  
|                        | • Dredge and embankment to meet the design cross section.  
|                        | • Supplement missing canals.  
|                        | • Reinforcing solution is reform canal with trapezoidal or rectangular cross section, reinforced by concreting reinforced concrete at the site and/or canal with rectangular cross section to canal built by Blo cement brick or building brick and reinforced concrete M200 at the bottom. |
| 1.3. Structures on the canal | • For overhaul or fixing works, restore their original design status, improve if necessary.  
|                        | • For works which need to be removed and rebuilt, restore original design status.  
|                        | • Water control work which can ensure facilitating controlling water can be kept or implemented minor repair. Water control work which is not good anymore will be replaced by gated long top spillway. |
| 1.4. Management road on the main canal | • Invest for completing remaining 10km of the main North canal: roadbed is 4.5m wide; road surface is 3.50m wide, built by M250 concrete with the thickness is 20cm |
| 1.5. SCADA system      | • Continue to supplementarily implement measure station at water controlling and water supply drain on the main canal: 6 locations (N2, N6, N10A, N20, N24 and canal bridge No.7 on the main North canal).  
|                        | • Monitor activities at the measure station using camera.  
|                        | • Put in operation the measure station at all duck bill spillway (9 locations) so that amount of water use on each part of the main canal can be controlled.  
|                        | • Put in operation the measure station at 03 controlling points on the branch canal N16 to control irrigation amount there.  
|                        | • Put into use 05 the measure station of environmental parameter (temperature, air, air humidity, rainfall, wind direction and speed, etc.) at the irrigation areas to build database for estimation of the water use there.  
<p>|                        | • Build digital map system regarding water demand and supply of Phu Ninh irrigation scheme. |
| 2. Khe Tan subproject  | • Ensure irrigation for 3,500 ha, provide 50ha of domestic and |</p>
<table>
<thead>
<tr>
<th>2.1. Focal item</th>
<th>• Non upgradation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2. Canal scheme</td>
<td></td>
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</tbody>
</table>
| 2.2.1. Main canal | • Upgrade 10km  
• Regarding canal of which ground is stable, the outside cover is absorbed, embankment of its inside cover, create trapezoidal cross section with cover index $m=1.5$; reinforce its bottom by concreting reinforced concrete at the side with the thickness 8-10cm over the M.75 3cm thick mortar lining, connecting by asphalt sacks.  
• Regarding canal of which ground is weak, geology is unstable, reinforce the ground and build solid (retangular cross section) canal by reinforced concrete.  
• In terms of canal of which inside cover eroded seriously, traversing and absorbing hillsides, reinforce by reinforced concrete beams with the inside is stone beams.  
• In terms of canal of which 1 side is absorbed inside, the other side is absorbed outside, inside cover eroded due to absorb inside, reinforce, create trapezoidal cross section with cover index $m=1.5$; reinforce 2 covers, not its bottom. |
| 2.2.2. Canal level 1 | • Dredge and embankement to meet the design cross section.  
• Supplement missing canals.  
• Proposed technical solution to solidification is canal with trapezoidal cross section, reinforced by concreting reinforced concrete at the site with the thickness is 8-10cm and mortar lining beneath. |
| 2.2.3. Canal level 2 and 3 | • Canal level 2 and 3 are improved and/or built  
• Dredge and embankement to meet the design cross section.  
• Supplement missing canals.  
• Reinforcing solution is reform canal with trapezoidal or retangular cross section, reinforced by concreting reinforced concrete at the site and/or canal with retangular cross section to canal built by Bio cement brick or building brick and reinforced concrete M200 at the bottom. |
| 2.3. Structures on the canal | • For overhaul or fixing works, restore their original design status, improve if necessary.  
• For works which need to be removed and rebuilt, restore original design status.  
• Water control work which can ensure facilitating controlling water can be kept or implemented minor repair. Water control work which is not good anymore will be replaced by gated long top spillway. |
| 2.4. Management road on the main canal | • Upgrade the road along the main canal to be management road with the lenght of 10km, road surface is 2.5-3.5m wide, |
2.5. SCADA system
- Establish coordinating center at Dai Loc Irrigation branch
- Implement installation of 08 measure and controlling stations at aqueduct and controlling sewer on the main canal.
- Put into use 03 the measure station of environmental parameter (temperature, air, air humidity, rainfall, wind direction and speed, etc.) at the irrigation areas to build database for estimation of the water use there.

2.6. Drainage system
- Improve and upgrade existing drainage of the communes, namely Dai Tan, Dai Thang, Dai Minh, Dai Phong and Dai Cuong

Material resources
Serve for the upgradation of the canal system and related items such as management road and structures on the canal
- Major construction materials include riprap, crushed stone, sand, iron and steel, concrete, etc which can be bought in district center of the project areas.
- Land for filling can be exploited at material yards surveyed in WB3 and WB5 projects. If the amount is not guaranteed, the material yard proposed in technical design period can be zoned too.

Source: FS report of WB7 Subproject in Quang Nam province, 2013.

3.3. The subproject main activities

<table>
<thead>
<tr>
<th>No.</th>
<th>Main activities</th>
<th>Objectives</th>
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<tbody>
<tr>
<td></td>
<td><strong>Preparation period</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Site clearance</td>
<td>Prepare and hand over implementation site of the construction to facilitate the most for the implementation</td>
</tr>
<tr>
<td>2</td>
<td>Compensation for land occupy</td>
<td>Ensure rights and benefits of owners and community</td>
</tr>
<tr>
<td>3</td>
<td>Mine clearance</td>
<td>Ensure safety/ avoid potential risks for the implementation activities and the community</td>
</tr>
<tr>
<td></td>
<td><strong>Implementation period</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Dredge/rebuild/upgrade the main canal systems, canals level 1,2,3 and the structures on the canals</td>
<td>Make sure the load compliant with design flow, prevent erosion of the canal cover and bottom as well as sedimentation and ensure the canal system safety in annual flood season.</td>
</tr>
<tr>
<td>2</td>
<td>Upgrade sides of the main canal and canals level 1,2 to the management road</td>
<td>Ensure the transport connection between the communes and districts; after upgradation, the sides of the canal will be the management road, which prevents flood and serves for rescue as well as relief for people in the subproject area, simultaneously, contributes to develop rural transportation system.</td>
</tr>
<tr>
<td>No.</td>
<td>Activity Description</td>
<td>Description</td>
</tr>
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</tr>
<tr>
<td>3</td>
<td>Establish operation center, measure and control station</td>
<td>Monitor all of the automatic constructions in order to check the compliance of all functions, especially monitoring ones. Display of alarm signs and abnormal measurement value will enable immediate finding of emergent situation and having suitable decisions. Transfering measurement value is almost implemented during real time and monitoring operation to check the compliance of water supply with projected program. If there is any deviation, adjustment can be made quickly and then be implemented. Record measurement value to do statistical analysis and research to improve properly the operation task.</td>
</tr>
</tbody>
</table>

**Operation period**

| Periodical observation | Follow the system operation, control technical safety and the project environment. |
CHAPTER 4 - THE SUBPROJECT ENVIRONMENTAL BACKGROUND

The benefited areas identified as:

- Phu Ninh reservoir basin area (about 235 km²) – of Phu Ninh district
- Khe Tan reservoir basin area – of Dai Loc district
- Irrigational schemes with a total area of over 23,000 ha in the area of Nui Thanh, Phu Ninh, Duy Xuyen, Thang Binh, Que Son, Tam Ky City and Dai Loc district.

These areas belong to 6 districts and Tam Ky city with 60 communes and wards. The natural conditions of this area share many similarities in characteristics to those of Quang Nam province.

4.1. Natural environment

4.1.1. Geographical and geological conditions

Quang Nam is a Central coastal province which has geographical coordinates from 14°54’ to 16°10’ North Latitude, 107°13’ to 108°44’ East Longitude. The city belongs to Key Economic Region of Central Vietnam, bordered by Da Nang city – center of the Key Economic Region of Central Vietnam to the North, Quang Ngai province to the south, South China Sea to the South, Kon Tum province and Laos to the West and next to Dung Quat industrial area.

The subproject area belongs to midlands with average height from 50 to 200m, a bowl-shaped hill topography, alternating with small and narrow plains, and rich in mineral resources, etc. Geological strata of the subproject area are complicated, shaped from metamorphic rocks such as Protozoic, Paleozoic, Mesozoic and Cenozoic. Main geological structure of the area is Protozoic metamorphic rocks which has basic chemical components of SiO₂ 49-56%, Al₂O₃ 12 – 27%, Na₂O 1%, K₂O 5%, Co, Ni, Cr and Ba.

4.1.2. Meteorological conditions

The subproject area is in tropical monsoon climate region and divided into two clear seasons (dry and rainy one). Annual rainfall varies from 3,200mm – 4,000mm. The area temperature does not vary much during the year. Average relative humidity in the subproject area is high. Strong evaporation occurs in May, June, July and August.

The subproject area is in tropical monsoon climate region and divided into two clear seasons (dry and rainy one). The rainy season is from September to January of the following year; flood and heavy rain often occur from September to December annually; average temperature in this season is about 20°C, with the highest one is 24°C and lowest one is 14°C. The dry season is from end of January to August, the weather is quite hot and dry; the highest temperature can reach to 40°C, average temperature varies from 29°C to 30°C; humidity is under 55%. The average humidity of the year is high, from 85% - 90%.

Total average sunny hours in the year are about 1980 hours, corresponding to nearly 5.2 hour/day.

4.1.3. Hydrological conditions
In Quang Nam province, major surface water resources come from 03 systems: (i) Vu Gia-Thu Bon river system; (ii) Tam Ky river system and (iii) Reservoir system. The subproject area has Phu Ninh reservoir as its main sources of surface water hydrology. Phu Ninh reservoir is located on Tam Ky river, Phu Ninh downstream has large rainfall, flood season is from September to December or January. The largest rainfall occurs in October, November and December, with heavy flood often occurs from middle of November to middle of December.

4.2. BioPhysical environment

4.2.1. Water resource

For the subproject region, Phu Ninh reservoir is the main source of surface water. The reservoir is located in Tam Ky lake, the basin of Phu Ninh is in the area with high rainfall level; flood season is from September to December or January. The highest level of rainfalls can be observed in October, November, and December.

The average water level in the reservoir is at the altitude of +32m, dead water level is at +20.44m. Total storage in a year is from 344 million m³ to 273.7 million m³, equivalent to water height level of +32m and +20.44m. Total area of the reservoir surface is about 22.1km², equivalent to water height level of +32m and 18.9 km², equivalent to surface water level at +20.44m

![Figure 3. Water level of Phu Ninh reservoir through each month from 2008 to 12/2011](attachment:image)

Source: report by Phu Ninh IMC 2012

The water quality of the subproject area is generally assessed as follows: **Surface water**

Results of observation and environmental monitoring come from Vietnam Water Resource Assistance project from 2008 to 2012 demonstrated that the quality of surface water of the irrigational canals and Phu Ninh reservoir is relatively good after the 12 monitoring batch.

Water samples from locations in Khe Tan reservoir and the main canals connecting with primary and secondary canals, which expect to be upgraded, indicated good quality of surface water in terms of chemistry and micro-organism. In some locations, there was a high
level of phosphate as compared to Vietnam Standards, but however the difference is not significant. (See details in Annex 2. Result of environmental sample analysis).

**Underground water**

Total area is 488 km$^2$. Natural reserve of the whole area except saline areas is 815.894 km$^2$. Potential exploiting reserve is approximately 1,329,368.7 m$^3$/day.

Its quality meets national standard of groundwater, except the standard of bacterial contamination. Newest results of water monitoring conducted by EIA team in 2013 along with monitoring data from 2008 to 2012 show that groundwater quality in and at the end of sample area often contaminated with iron, manganese and ammonium. In some places, amount of bicarbonate in water is high, there are many residues in water after being boiled and deposited. (See details in Annex 2. Result of environmental sample analysis).

Regarding microorganisms representing sanitation index, most of them are over Vietnam technical regulations many times.

Shallow and deep underground water is both contaminated with micro-organism by 32 to 80 times compared to the allowed level regulated by Vietnam.

**4.2.2. Land resource**

Land fund in the area of Phu Ninh reservoir irrigation scheme is 81,465 ha, including 29,329 ha (accounting for 36%) of non-using land; this proves that there are much potential for exploitation of land resources. According to the province’s plan of using land until 2020, there are still 14,100 ha of non-using land in the fund of non-using land.

<table>
<thead>
<tr>
<th>Land Type</th>
<th>District/city</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tam Ky</td>
<td>Nui Thanh</td>
<td>Phu Ninh</td>
</tr>
<tr>
<td>Natural area</td>
<td>9.281,90</td>
<td>53.396,07</td>
</tr>
<tr>
<td>Agricultural land</td>
<td>4.074</td>
<td>10.652,00</td>
</tr>
<tr>
<td>Forest land</td>
<td>862,60</td>
<td>26.917,98</td>
</tr>
<tr>
<td>Unusing land</td>
<td>1.170,6</td>
<td>4.221,83</td>
</tr>
</tbody>
</table>

*Source: Investment report and Local Statistical Yearbook*

**4.2.3. Mineral resources**

Some mineral found in the project area are as follows:
White sand

It is distributed widely in the area, especially the West of Truong Giang river. White sand could be found from Binh Phuc, Thang Binh all the way to Tam Thanh, Tam Ky and Tam Hiep, Chu Lai of Nui Thanh, making up the hilly terrain at the height of 5m compared to sea level. The height of sand layer for exploitation ranges from 3-5m, in some area, it could be as high as 10m. The deposit is expected to reach 300 million tons.

Titan - Inmenit

It is distributed on the water surface of the sea all the way from Dien Duong (Dien Ban) to Cua Lu, Tam Hai commune (Nui Thanh); in some area, the ore zone reaches 2-5km and is mixed within layers of white sands.

Peat

It is concentrated in some area such as Binh Phuc (Thang Binh), Tam Phu (Tam Ky) and Cam Ha (Hoi An). The deposits amount to about 130,000 m3. Outputs are mainly sold domestically.

In addition, according to a report on actual state of the environment, the project area also has some of the following minerals:

- Feldspat: there are three mines in Dai Loc, Dai An and Loc Quang with total deposits of about 1.84 million tons;
- Construction rocks such as granite in Nui Kiem, Da Ham (Que Son), granitogneis (Nui Thành). Total deposits amount to be about 100 million tons.

4.2.4 Air quality

In the irrigational area and neighboring area where the subproject for upgrade of irrigational scheme is to be carried out, the density of vehicles on roads as well as population density is low/sparse; hence quality of air is good.

4.3. Ecosystem and biological resources

4.3.1. Agricultural ecosystem

The agricultural ecosystem in the subproject area is the agricultural cultivation system including food plants interpersed with gardens that have low biological value.

Flora are divided into the following main groups:

- Grain crops: Rice, corn, etc. account for the largest area (about 64% of total).
- Root crops: Cassava, sweet potato and other root crop.
- Food crops: Vegetable, bean, spices of all kinds.

Fauna in the agricultural ecosystem consists mainly of reared animals and poultry such as buffalo, cow, pig, chicken etc., which are raised with small scale at the households.

4.3.2. Biological diversity

The project area has adequately typical features of terrain, climate and landscape of Quang Nam province and its biological resources are pretty abundant.

a. Forest resources
Table 3. Types of forest classified by district agencies

<table>
<thead>
<tr>
<th>No.</th>
<th>District/City</th>
<th>Natural area</th>
<th>Land with forest (including in and out of forestry planning)</th>
<th>Land with no planning for forestry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>Coverage</td>
</tr>
<tr>
<td>1</td>
<td>Dai Loc</td>
<td>58,704.11</td>
<td>31,705.69</td>
<td>54</td>
</tr>
<tr>
<td>2</td>
<td>Que Son</td>
<td>25,117.15</td>
<td>7,836.87</td>
<td>31</td>
</tr>
<tr>
<td>3</td>
<td>Nui Thanh</td>
<td>53,396.07</td>
<td>24,563.78</td>
<td>46</td>
</tr>
<tr>
<td>4</td>
<td>Duy Xuyen</td>
<td>29,909.48</td>
<td>6,573.85</td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>Thang Binh</td>
<td>38,560.24</td>
<td>6,340.94</td>
<td>16</td>
</tr>
<tr>
<td>6</td>
<td>Phu Ninh</td>
<td>6,530.74</td>
<td>6,530.74</td>
<td>26</td>
</tr>
<tr>
<td>7</td>
<td>Tam Ky</td>
<td>9,281.93</td>
<td>662.97</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: Report on Biodiversity in Quang Nam province, 2011

The data shows that the project area includes districts in midland and low mountain area. Total forest area of the 5 districts is 212,217.79 ha, mostly consisting of artificial forest, natural forest accounts for a small portion. The coverage level of this forest is approximately 33%. Forest ecosystem is pretty poor and is degraded greatly due to human impacts, there are no known rare species listed for conservation. Natural forests of the subproject is mostly in districts namely Nui Thanh and Phu Ninh; majority of them are protective ones at the watershed.

b. Inland inundated land resources

Natural and artificial reservoirs in the subproject area including Phu Ninh (3,620ha), Vinh Trinh (270 ha), Thach Ban (275ha), etc.; natural rivers, aquatic lakes, ponds; area of rice growing, etc.; among them, typical one is Phu Ninh reservoir with diversified ecosystem.

- 71 species of fish (49 genera, 19 families, 9 groups), of which 10 economical and 5 rare ones.
- 59 amphibians and reptiles; in which 7 species are named in the Red Book of Vietnam: 02 species are considered critically endangered (CR), 07 species are considered endangered (EN) and 08 species are considered vulnerable (VU); 29 species are listed in the World Red List; there are 10 species listed in Decree No. 32/2006/ND-CP by the Government, in which 01 species is in the group that no exploitation and use is allowed (IB), 09 species is in group IIB that includes wild animals whose exploitation and use are limited (IIB); 13 species are recorded in CITES.
- 420 species of vascular plants; including 12 plants recorded in Vietnam Red Book with 06 species classified as endangered (EN), 05 species classified as vulnerable (VU), 01 species is classified as data deficient (DD); at the same time 5 species in IIA category are identified as plants limited for use and exploitation for commercial purposed.

c. Coastal wetland ecosystem

An Hoa and the coastal area of Ban Than (Nui Thanh) of the project area is one of the most
important coastal wetland of Quang Nam with typical wetlands, they are: Intertidal wetland with no vegetation; intertidal wetland covered with vegetation (sea grasses, tidal marshes); fishery farming land; land accretion; land for salt production; coral reef.

Species composition is relatively diverse; it was recorded that there are 128 species belonging to 91 genera, 54 families, 15 orders, mostly are fish, of which there are 5 economic fish family and 14 species of molluscs, 06 crustacean species with high economic value.

4.4. Social environment

4.4.1. Population

<table>
<thead>
<tr>
<th>No.</th>
<th>District</th>
<th>Natural land area (km²)</th>
<th>Population</th>
<th>Density (people/km²)</th>
<th>Total HHs</th>
<th>Family member</th>
<th>Family scale of the project area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tam Ky</td>
<td>92.82</td>
<td>108.323</td>
<td>1.167</td>
<td>31.601</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Nui Thanh</td>
<td>533.96</td>
<td>138.539</td>
<td>259</td>
<td>39.850</td>
<td>3.48</td>
<td>3.8</td>
</tr>
<tr>
<td>3</td>
<td>Phu Ninh</td>
<td>251.52</td>
<td>77.597</td>
<td>309</td>
<td>20.740</td>
<td>3.74</td>
<td>4.1</td>
</tr>
<tr>
<td>4</td>
<td>Thang Binh</td>
<td>385.60</td>
<td>178.970</td>
<td>464</td>
<td>47.972</td>
<td>3.73</td>
<td>3.8</td>
</tr>
<tr>
<td>5</td>
<td>Que Son</td>
<td>251.17</td>
<td>83.811</td>
<td>334</td>
<td>20.825</td>
<td>4.02</td>
<td>3.6</td>
</tr>
<tr>
<td>6</td>
<td>Duy Xuyen</td>
<td>299.09</td>
<td>121.244</td>
<td>405</td>
<td>33.399</td>
<td>3.63</td>
<td>4.0</td>
</tr>
<tr>
<td>7</td>
<td>Dai Loc</td>
<td>587.04</td>
<td>148.546</td>
<td>253</td>
<td>38.889</td>
<td>3.82</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2,308.38</td>
<td>748.707</td>
<td>324</td>
<td>201,675</td>
<td>3.82</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Source: Statistical yearbook of the districts and city 2010-2011 and data provided by CPCs.

Total population of 6 districts in the 2 subprojects is 385,165 people living in the total natural area of 2,308.38ha. The households scale of the whole districts (there’s data on 4 districts) stay under 4 people/households with the exception of Que Son district, where the household scale is about 4.02 people. For Dai Loc district of Khe Tan irrigational scheme, the average number of people per household is 4.16 people.

In the project area, the majority of the people live in the area that passes through traffic area and along the embankment, creating small villages spreading around the irrigational area. Population quality in recent years demonstrated a positive improvement; the population is quite young and the average life expectancy in the whole province is 73 years old.

In the project area, most rural people live in area sat the intersection of rural roads and along the canals, forming small villages located in the irrigated areas. However there is no house built within the safety corridor of the canals.

4.4.2. Ethnicity

100% of the households living in the area of Phu Ninh and Khe Tan irrigational schemes are of Kinh ethnic. There is only a small number of ethnic minority people living above Phu Ninh and Khe Tan dams on the mountain, which is not within the irrigational area.

Source: Statistical data provided by CPCs in the project area.
4.4.3. Culture, religion, belief

There are two historical relics recognized by UNESCO world cultural heritage, three national relics here, seven provincial heritage, monument of the first battle with American in Nui Thanh. These heritage are also far from the irrigational area.

Construction of the project does not exert an impact in any culturally sensitive such as Pagoda, temple, shrine or tomb or monuments or cultural, historical relics that need to be protected.

Regarding religion, the majority of the people in the irrigational areas follow Buddhism and they worship their ancestors at home, about 10% of the people are Christian⁴. Religious people live in harmony with each other in the village and commune and are free to follow their religion, go to temples or churches.

4.4.4. Education

In all the commune, children have access to education. In the Project comunes, there are kindergarten, elementary and high schools. High schools are distributed in groups of communes. Students generally enroll school at their right age and absenteeism is rarely seen.

In general, education in the area received positive results and the educational level of the people in the area is relatively good.

4.4.5. Living quality and public health

100% of the comunes in the area has electricity for domestic, entertainment and productive activities. In addition, 100% of the comunes have loud speakers system to each Hamlet and village.

People’s main water resources for domestic use are tap water, drilled and drug well water; in addition, there is water from the rain and stream, spring and lakes.

Currently, the districts are active in carrying out National Objective Program about new rural and provision of clean water for the people is one of the objectives of this program.

Regarding public health care, 42/47 communes has reinforced health care facilities. However, there is doctor in only 8 communes. Medical staffs at the stations are nurses (57), aid (42) and pharmacists (24).

In 2012, a total of 384,763 people went in for examination and treatment. Frequently encountered diseases are flu, diseases related to respiratory tract; diseases spread through water are also found such as digestive disorder, dengue fever, diarrhea etc. 31 people using heroin were found in the comunes, including 26 people HIV infected.

4.4.6. Labor and job

Labour

The total number of households living in the project is 127,326 households with 374,414 people. Rate of the gender is relatively equal.

The percentage of people in working age is from 41% to 88% depending on the communes (Dai Thanh commune has the lowest rate which is 41.77% and Tam Vinh commune has the highest one, which is 88%). The percentage of male and female worker are pretty similar.

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⁴ Source: socio-economic survey data in 2013 provided by CPCs
Occasion

Among 127,326 people living in the project area, there is over 80% of the households participating in agricultural activities. The ratio of male over female working in agricultural production is quite similar, specifically 51% of male and 53% of female. Workers working for the state accounts for 4% for male and 3% for female.

The development of the households in industry, commercial and services is not high yet.

4.4.7. Economy and economic components

Income source

The main source of income of the people living in the project communes is agriculture, mostly are growing rice, crops, short-day industrial crop cultivation and husbandry. Small-scaled handicraft, commerce and service activities also contribute to the households’ income; however, it accounts for a small proportion.

Average income

The average income level as well as living standards of the household have a relatively wide range among the project communes. Except for Tam Ky city, the highest average income per capital in the project area is in Duy Xuyen district with VND 1.7 million/person/month and the lowest one is in districts namely Que Son and Nui Thanh with over VND 804 thousand/person/month.

Living standards of the households

Living standards of the households in the project area are of medium level compared to the whole provinces and of average level depending on the district.

Nui Thanh district has the average number of poor households equivalent to the average ratio of poor households in the whole province with 17.34% of all the households in 5 project communes. Except for Phu Ninh, where the average percentage is significantly lower at 10.08% (6 communes).

Economic component

Rate of the households participating in agriculture accounts for a major proportion in occupation structure of the communes and districts, from 49.72% to 66.35% of total households in the communes. In the communes of Nui Thanh district, over 11% of total households developing aquaculture.

The households' development in commerce and service has yet been high. In both these fields, participating rate of the households in the communes of the project area only fluctuates in a low rate from nearly 4% to 12.13% of total households (Phu Ninh district).

Duy Xuyen district has the highest percentage of households participating in construction industry.

4.4.8 Road infrastructure

The quality of the main roads through the project area is considered good. All communes and villages have roads. Many roads are not flat, mostly bumpy, difficult to access especially during the rainy season, along themainchannelandchannellevel1hasbeensignificantly improved as a result of theWB3project.
The WB7 project will also upgrade the remaining roads on level 1 canals as access roads. This creates a uniform management system of canal roads, both facilitating canal management and developing local rural roads.
5.1. The subproject’s activities and potential socio-environmental impacts and risks

Table. Summary of construction components of Phu Ninh reservoir scheme

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of canal/ part of canal</th>
<th>Planned activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Improve North Phu Ninh Main Canal</td>
<td>Reinforce roof, bottom: Make a filtration system to avoid collapsing the roof</td>
</tr>
<tr>
<td>1.1</td>
<td>Reinforce, rebuild works on the main canal</td>
<td>Rebuild irrigation drains and box culvert</td>
</tr>
<tr>
<td>1.2</td>
<td>Improve, rebuild Canal level 1</td>
<td>Reinforce roof, bottom: solidify bottom, roof</td>
</tr>
<tr>
<td>1.3</td>
<td>Rebuild works on the canal</td>
<td>Rebuild: irrigation drain, culvert, canal bridge, water step, deep discharge spillway, influx spillway, long-top spillway, etc.</td>
</tr>
<tr>
<td>1.4</td>
<td>Upgrade management road</td>
<td>Concrete</td>
</tr>
<tr>
<td>2</td>
<td>Improve Canal level 1 of South Phu Ninh Main Canal</td>
<td>Reinforce roof, bottom: solidify bottom, roof</td>
</tr>
<tr>
<td>2.1</td>
<td>Rebuild and fix works on the canal</td>
<td>Rebuild: irrigation drain, culvert, canal bridge, water step, deep discharge spillway, influx spillway, long-top spillway, etc.</td>
</tr>
<tr>
<td>2.2</td>
<td>Build management road</td>
<td>Concrete road on the canal</td>
</tr>
<tr>
<td>3</td>
<td>Fix Canals level 2 and 3</td>
<td>Reinforce roof, bottom: solidify bottom, roof</td>
</tr>
<tr>
<td>3.1</td>
<td>Rebuild/ fix, upgrade works on the canal</td>
<td>Rebuild: irrigation drain, culvert, canal bridge, water step, deep discharge spillway, influx spillway, long-top spillway, etc.</td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) – Quang Nam Irrigated agriculture improvement subproject

### Table. Summary of components of Khe Tan reservoir irrigation scheme

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of canal/ part of canal</th>
<th>Planned activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Pumping station and TB Canal</td>
<td>Rebuild, change pumping station, solidify canal roof and bottom</td>
</tr>
</tbody>
</table>

1. Improve Khe Tan Main Canal

1.1 Reinforce, rebuild works on the main canal

1.2 Improve, rebuild Canal level 1

1.3 Rebuild works on the canal

1.4 Upgrade management road

2. Improve Khe Tan Canal level 1

2.1 Reinforce, rebuild works on the main canal

3. Fix Canals level 2 and 3

3.1 Rebuild/ fix, upgrade works on the canal

In Phu Ninh Reservoir scheme, 15 canals level 1 at Main North Canal and 9 canals level 1 at Main South Canal will be improved; there will be total 24 canals level 1 upgraded. Total length of improved canals of Phu Ninh and Khe Tan Reservoir schemes are 241km and 75km, respectively. Structures on the canals such as controlling and drainage sewer will be also upgraded to meet increasing requirement of drainage.
5.1.1 Impacts during preparation phase

5.1.1.1. Impacts associated with site clearance

Table. Impact sources

<table>
<thead>
<tr>
<th>No.</th>
<th>Impact sources</th>
<th>Objects of impacts</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sources relating to wastes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chop down trees, site clearance</td>
<td>Community</td>
<td>Medium</td>
</tr>
<tr>
<td>2</td>
<td>Sources non relating to wastes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Design: Choose design parameters</td>
<td>Community</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Search and destroy bombs, mines</td>
<td>People</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td>Disturbance in people’s activities</td>
<td>Community</td>
<td>Medium</td>
</tr>
</tbody>
</table>

- Wastes from the clearance: are from vegetation clearance and dredging to prepare construction site. These activities happen in a short period of time and dredged materials are often used by local farmers for fertilizing crops. Therefore their impacts are not significant.

- Safety risks to community, including Impacts of Unexploded objects (UXO/bombs and mines): There are risks in terms of unexploding materials left from the war in the subproject area. Despite the fact that cultivation has happened been practiced in the area for many years so that risks of exposure to unexploded materials is low, the Project will address this risk by hiring aspecialized agencies to clear bombs and mines before construction is started\(^4\).

- Disturbance in the community activities: There are potential impacts on community in terms of activities relating to cultivation along canal system as well as travel on main canals which are used as public roads. These impacts are low and short-term.

5.1.1.2. Compensation, relocation and resettlement

Although there are no requirements of resettlement on both Phu Ninh and Khe Tan reservoir irrigation scheme, there is land acquisition and it is necessary to apply OP 4.12 of WB on Involuntary resettlement.

Regarding land occupancy leading to compensation, considerable works is Canal N30 on Phu Ninh scheme, which is planned to rebuild, from K44+315 North main canal, traversing Ba Ren River, connecting directly to the canal of Chau Hiep pumping station.

\(^4\) Searching and clearing bombs and mines will be conducted by Quang Nam PPMU via hiring contract with a specialized agency according to QCVN 01:2012/BQP National Technical Regulation on searching and clearing bombs, mines and unexploded materials which effects since 1/1/2013.
There are 36 households whose land will be permanently acquired in an area of 2.948m² in 02 communes in Duy Xuyen district, including Nam Phuoc township will be affected 1,031m² and Duy Trung commune will be affected 1,467m².  

Residential land: 381m² of the residential land will be impacted by the canal scheme upgradation in Nam Phuoc township and 10 affected households with average area is 38.1m²/household.  

Land for planting annual trees: 2,117m² of land for planting annual trees is affected, of which 650m² of Nam Phuoc township and 1,467m² of Duy Trung commune.  

Of which 22 households will be affected with agricultural land; 4 households affected with other structures and 10 households affected with trees and crops. No households will be displaced or severely affected (more than 20% of their crop land area acquired).  

Mitigation measures have been proposed in a Resettlement Action Plan prepared by Quang Nam IAIP.  

Regarding Khe Tan irrigation scheme, there is no proposal on land acquisition.  

5.1.2. Construction phase  

5.1.2.1. Impacts relating to wastes and wastewater  

Source of wastes includes municipal wastes from workers’s residential facilities and construction wastes from construction area. Construction wastes include excavated soil, dredging materials from canals, packaging materials, form works, failed concrete, residual sand and gravel. Besides that, there may be wasted oil from machines and equipments, such as excavators, bulldozers, concrete mixers, etc. or unintentionally spill oil to the environment;  

The above wastes are resulted from: (i) construction workers; (ii) Traffic participants on the management and canal roads in the project area;  

Camps which are set up on vacant land or are hired from local people usually generate municipal wastes and wastewater such as organic wastes, human wastes (faeces, urine).  

Wastewater is generated from camps and construction activities such as concrete mixing, water pumped out for drying canals etc.  

a. Air, noise and vibration  

According to calculation results, dust and gases such as SO₂, NO₂, CO, VOC from exhaust fumes of vehicles, implementation machines and transporting vehicles are insignificant; most of construction sites are on existing canal system, far away from residential, have wide space and many trees.  

Impacts on the air are mainly emissions (CO, SO₂, NO₂, VOC) from bulldozing, excavating and backfilling with earth, transporting materials and mixing concrete. In order to assess these impacts, EIA team estimates amount of exhaust fumes from vehicles participating in constructing and transporting materials, based on NATZ’ emission coefficient (0.37kg of oil/m³) and WHO’s coefficient of pollution emission from levelling and backfilling activities.

<table>
<thead>
<tr>
<th>No.</th>
<th>Causes of pollution</th>
<th>Estimated emission coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dusts from excavating, levelling and blowing up</td>
<td>1-100 g/m³</td>
</tr>
<tr>
<td>2</td>
<td>Dusts from handling construction materials (concrete,</td>
<td>0,1 – 1 g/m³</td>
</tr>
</tbody>
</table>
soil, sand, gravel, etc.), machines and facilities

| 3 | Exhaust fumes from transporting and constructing vehicles consisting of dusts, CO, hydrocarbon, SO2, NOx... (truck 3.5-16 tons, using oil DO with S=0.5%) | Dust: 4.3kg/ton DO; SO2: 0.1kg/ton DO; NOx: 55kg/ton DO; CO: 28kg/ton DO; VOC: 12 kg/ton DO |
| 4 | Vehicles transporting sand and soil leave materials on the roads, causing dusts | 0.1 – 1 g/m³ |


Amount of exhausts and dusts will be calculated based on detailed number of machines used in construction.

Areas for gathering materials, making precast concrete slabs or mixing concrete on the canal can cause dusts, noise and vibration, influencing households next to the canal;

In process of dredging the canal, if excavators are used, then noise will be mostly from the excavators. If operation machines cause loud noise, the contractor need implement in appropriate time to avoid influences on students’ studies (if the canal is near schools) and sleep of people around;

In areas where management roads are built, perhaps soil has to be transported to or from other areas and this also leads to air and noise pollution, therefore contractor needs to have plans to control and mitigate the above impacts appropriately, particularly on dry and hot days.

Table 31. Calculation of correspondent noise level from implementation equipments

<table>
<thead>
<tr>
<th>Types of vehicles/equipments</th>
<th>Noise level at a distance 1m from point source</th>
<th>Noise level calculated at a distance 10m from point source</th>
<th>Noise level calculated at a distance 20m from point source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td><strong>Average</strong></td>
<td><strong>Range</strong></td>
<td><strong>Average</strong></td>
</tr>
<tr>
<td>Bulldozer</td>
<td>93</td>
<td>73</td>
<td>67.0</td>
</tr>
<tr>
<td>Grader</td>
<td>72.0</td>
<td>74.0</td>
<td>54</td>
</tr>
<tr>
<td>Excavator</td>
<td>72.0 - 84.0</td>
<td>78.0</td>
<td>58</td>
</tr>
<tr>
<td>Truck</td>
<td>82.0 - 94.0</td>
<td>88</td>
<td>68</td>
</tr>
<tr>
<td>Concrete mixer</td>
<td>75.0 - 88.0</td>
<td>81.5</td>
<td>61.5</td>
</tr>
</tbody>
</table>

Vietnamese standard 26/2010/BTNMT normally: 6.00 to 21.00 is 70 dBA; from 21.00 to 6.00 is 55 dBA;

National standard for working environment issued by Ministry of Health: 85 dBA (8 hours/working day)

In comparison with standard of allowed noise level, noise level caused by operation of vehicles, machines and equipments during construction in this area, construction workers are not allowed to work continuously in 24 hours.
Table 32. Vietnamese standard 26:2010/BTNMT: Maximum limit of allowed noise level

<table>
<thead>
<tr>
<th>No.</th>
<th>Area</th>
<th>From 6.00 to 21.00</th>
<th>From 21.00 to 6.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Restricted areas</td>
<td>55 dBA</td>
<td>45 dBA</td>
</tr>
<tr>
<td>2</td>
<td>Normal areas</td>
<td>70 dBA</td>
<td>55 dBA</td>
</tr>
</tbody>
</table>

Normal areas: Apartment complexes, separate or adjacent individual houses, hotels, motels, administrative agencies.

Restricted areas: Areas inside fences of medical centers, libraries, kindergartens, schools, churches, temples, pagodas and other areas where have special regulations.

Concrete mixing activities: Maximum noise level at a distance 15m away from concrete mixing area is 90 dB and at a distance 100m away from there is only approximately 74 dB which meets standards.

b. Domestic and construction wastewater and wastes

Wastewater generated during the construction of access road and irrigation canal is almost insignificant, because canal construction has to be at the same time with cutting/water; water used for mixing materials is used cautiously;

Regarding municipal wastewater, there are not many workers, daily household wastewater is not much as hiring local labours is a common practices for this kind of work. Wastewater discharged by construction workers containing SS, BOD, COD, coliform, oil may affect quality of surface water in the construction area.

Area which may be impacted on the household wastewater is the construction workers’ camps along constructed canals.

In order to calculate amount of household wastewater, EIA team bases on Vietnamese Construction Standard 33:2006 of Ministry of Construction, in which standards of using water are as follows:

Table 33. Construction standard of Ministry of Construction

<table>
<thead>
<tr>
<th>Objects using water</th>
<th>Standard of water supply per capita (average per day) l/person/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big cities tourism cities, large industry zone</td>
<td>300 - 400</td>
</tr>
<tr>
<td>Medium and small cities, small industry zone</td>
<td>200 - 270</td>
</tr>
<tr>
<td>Towns, industrial – agricultural centers, industrial –</td>
<td>80 - 150</td>
</tr>
<tr>
<td>fishery centers, rural residential</td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>40 - 60</td>
</tr>
</tbody>
</table>

In terms of Quang Nam Subproject, amount of household wastewater calculated for rural area is 60 l/person/day * 70% = 42 l/person/day

If the workload is huge and needs to mobilize minimum number of construction workers at from 40 – 50, contractor needs to have a plan from the beginning regarding constructing camps along with auxiliary works to ensure proper handling of waste and sanitation issues;
In wastewater, there are nearly 55% of organic matters, 45% of inorganic ones and virus and bacteria causing cholera, dysentery, typhoid. If these substances are not collected and handled in contravention of regulation, they will impact on environment sanity, spread disease. These impacts are short-term and can be mitigated by building septic toilets.

**Municipal wastes:** has normal norm which is 0.5kg/day/person. However, the waste is calculated based on implementation progress and capacity of using local labours. Therefore, the waste will be about 50% of the norm. If the household waste is not collected, it will affect the environment sanity, particularly the irrigation canals. However, these impacts are short-term and can be mitigated.

**Construction wastes:** majority of them are soil and mud dredged from renovated canals. scrap, packages, waste materials from removing (improving, rebuilding constructions). However, in fact, construction wastes are often reused; mud dredged from Phu Ninh reservoir irrigation scheme is used for fertilizing garden and some industrial plants.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Influencing capacity of soil and mud dredged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dredging, making canal section</td>
<td>Increase turbidity of waste from stirring when dredging</td>
</tr>
<tr>
<td></td>
<td>Exhaust emissions from mud when collecting them to the shallows</td>
</tr>
<tr>
<td></td>
<td>Oil from dredging equipments pollutes water</td>
</tr>
<tr>
<td>Transporting dredged mud</td>
<td>Leave mud due to non coverage</td>
</tr>
<tr>
<td></td>
<td>Impacts on traveling, circulation and landscape</td>
</tr>
<tr>
<td>Dumping dredged mud</td>
<td>Dredged mud which is not handled and dumped in accordance with regulation may affect plants, landscape and people’s health</td>
</tr>
</tbody>
</table>
5.1.2.2. Impacts without wastes

a. Soil: erosion and excavation

Excavation activities will have long-term impacts on consolidation of irrigation canals’ section and positive influences on reduction of erosion at solidificated routes. Excavation only affect slightly the area’s use of land with a certain area which is temporarily converted. Pollution from these activities is not much and can be reversed naturally. Grass can be planted on certain parts of canal slops to minimise erosion risks.

Land for coverage can be exploited in the material yard surveyed in WB3 and WB5. If reserves is not sufficient, it can zone more material yards during the technical design period.

b. Surface water hydrology, access to water front

Water in canals will be cut off at certain period of time for construction thus affect water supply and irrigation. While this impact is not avoidable, mitigation measures can be implemented in order to minimise negative impacts of water unavailability.

Local community may access to water front in the canals for various purpose. Access may be quite convenience at unimproved canal, and it is maintainable by inclusions of steps/stair on the concrete embankment designs.

c. Groundwater: water layer and water exchange

Relationship between groundwater and paving canal may lead to changes in groundwater resource. Solidification of canals (including concrete at the bottom or culvert) will prevent exchanging water with water resource at agricultural layer, especially clearly in dry season.

Calculation describing water balance in FS Report for Phu Ninh Subproject shows that 1) Regarding Phu Ninh reservoir, current water amount in the reservoir is enough for irrigation for 19.427 ha, including additional 1,800ha of expansion of the irrigated area at the right side of Ba Ren River of where is in charge by the pump stations and expanded 200ha of the irrigated area of which is in charge by N22-1, to ensure 94.31 million m$^3$/year for urban and industrial water supply from now until 2020; 2) Regarding Khe Tan reservoir, normal increase water level of the reservoir at the height of 21.8m and canal solidification are enough for water use demand at the downstream.

Therefore, decrease in additional underground water for agricultural layer can be covered through increase in irrigation for rice and crops.

d. Terrestrial ecosystem and forest

Disturbance to terrestrial ecosystem during implementation in subproject area is temporary, localised, at scale very limited and can be mitigated. There are no impacts on forest.

e. Aquatic ecosystem and biological diversity

Aquatic ecosystem and biological valuesof the communities in the irrigation canals is not significant; therefore, impacts of the constructions are very light and negligible. However, the period of time when the water is cut off often is short (the water cut often exists in approximately 4 months in a year, including 2 phases from mid-April to mid-May and from mid-September to mid-December annually) therefore, these negative impacts are short-term and can be mitigated.

f. Impacts on agricultural production
The water cut has certain impacts on disruption in the local people’s cultivation. This impact is not avoidable. Period of the water cut will be arranged to best suit local production schedule.

In order to avoid adverse impacts and to let the people support the project, the water cut needs to be consulted with the people in beneficial area, beside of consulting with related agencies such as Quang Nam Department of Agriculture and Rural Development and Phu Ninh Irrigation Mining Company (IMC Phu Ninh).

The upgradation of the canals and structures on the canals as well as the canal side relate to mobilization of many mechanical machinery to excavate, transport and gather materials and waste, etc. Therefore, it may impact on the people’s crops and obstruct approach to cultivation location, especially canal level 3 and in-field ones. This impact is short-term and can be mitigated by using small transport vehicles, comply strictly with operation procedure of the machines and labour discipline at the construction site. Community consultation and information dissemination will also contribute to mitigation of these impacts.

g. Exposure of physical cultural objects

During the project preparation, the project will not have impacts on any known historical, cultural and archaeological monuments in the affected area, including some districts and Tam Ky city of Quang Nam province (see more in Section 4.3.3 above). The upgradation and solidification of the canals of WB 3 project did not have to apply chance find procedures at all. However, the construction activities in the expanded area may impact on physical cultural assets (such as historical and archaeological monuments and graves) which “can be found unexpectedly” during construction. In that case, it is necessary to apply the procedures for chance finds included in this EMP to address Physical Cultural Resources found unexpectedly during construction.

h. Social impacts

*Risks of diseases and social problems*: During the construction, a great number of workers and immigrants will be present at the construction areas. Immigrated labour force might cause difficulties in controlling social order, may lead to conflicts and problems.

If the management is not good, there might be chances of spreading social diseases such as gonorrhea, AIDS, pathogens transmitted by water causes a number of diseases such as dysentery, diarrhea, hepatitis, trachoma, etc. affecting the people’s health and lives. However, this risk is low and can be mitigated.

5.1.3. Operation phase

a. Impacts on natural resources and environment

*Regarding quality of surface water and groundwater*: In the operation phase, with extended irrigation area, amount of used fertilizer and pesticide is estimated to increased. However, this is an unquantifiable impact including interactions of many other factors such as application of organic cultivation, integrated pest control (IPM) \(^5\) or increasing irrigation level may dilute concentration of chemicals, etc.

Result of monitoring groundwater in Phu Ninh subproject area during recent years shows that there are no influences of fertilizer and pesticide on quality of groundwater at monitoring

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\(^5\) IPM Program, which will be conducted as a mitigation measure in Phu Ninh subproject, aims to develop vegetation protection activity in the locality, reduce chemical amount used in fields, increase effectiveness of prevention, manage well vegetation protection chemical and usage of them, in order to decrease potential pollution caused by pesticide to the environment and people’s health.
positions (reference to Environmental monitoring reports submitted by DRCC for WB 2 project from 2008 to 2012).

Survey result in Quang Nam province shows that regarding fertilizer, currently average of 350kg of inorganic one and 3-4 tons of organic one are used for 1ha/harvest; regarding pesticide, average of 1.5kg of pesticide and 0.6 kg of herbicide are used for 1.0ha of plants.6

<table>
<thead>
<tr>
<th>No.</th>
<th>Province</th>
<th>Increased area (ha)</th>
<th>Increased amount (tons)</th>
<th>Chemical fertilizer</th>
<th>Organic fertilizer</th>
<th>Pesticide</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Quang Nam</td>
<td>6.389</td>
<td>2.236,1</td>
<td>25.556</td>
<td>13.42</td>
<td></td>
</tr>
</tbody>
</table>

Table 7. Amount of increased fertilizer and pesticide after the subproject is complete

With the increased amount of fertilizer and pesticide as projected above, if there is no control and mitigation method, there will be considerable impacts on environmental quality and people’s health in the project area.

In terms of terrestrial ecosystem: There are no impacts.

In terms of aquatic ecosystem: It is not clear to see impacts although the use of pesticide and fertilizer is possibly increased. However, this is an unpredictable influence affected many interactions from other factors.

b. Impacts on society and economy

Impacts on agricultural production: irrigated areas expansion is guaranteed, make transferring of plants and animals structure towards priority trend of high economic pieces, increase productivity and output.

Impacts on domestic and industrial water supply: Beneficiary will have more water source for living. Water supply assistance for industrial zones in the area. In addition, water supply leveland increasing irrigation area will contribute to mitigate salinity status in Thu Bon and Ba Ren rivers.

Impacts on traffic: When roads over the main and level 1 canal are upgraded, traffic status will be positively improved. Thereby, increasing of access capability to services, goods circulation, mitigation of accident risks due to bad roads are basic benefits.

Impacts on community’s customs and traditions: There is no this type of impacts during the project operation.

Impacts on landscape, historical and cultural monuments: After the project completion there will be positive impacts on regional landscape improving.

5.1.4. Risks and incident

Common risks during the implementation are bombs, mines, explosion, labour and traffic accidents, special incidents of mechanism, etc. With regard to the canal improvement and upgradation, risks of labour accidents are the most common and may appear in any construction process and activities, such as excavators, material and waste transportation, etc. However, scale and intensity of construction in improvement of current canal scheme is not large; therefore these risks can be reduced and even eliminated by obeying labour safety, transport instruction, procedure of operation and maintenance of mechanism and working regulations.

5.1.5. General assessment of the impacts

6 WB 7 Project’s ESMF 2013
The subproject will have some positive and negative impacts when being implemented; basically and in the long-term, positive ones overweight.

- All of impacts mentioned above via the environmental management and monitoring program.
- The subproject’s positive impacts are very clear in improving aquacultural capacity. Accordingly, jobs and income of people in the area will be improved, contributing to poverty reduction.
- The subproject is expected that there will be no negative impacts on terrestrial ecosystems, rare animals which are threatened to extinct, to biodiversity, natural protected area, ecosystem and aquatic biodiversity. Especially, people do not think that the subproject will have adverse impacts on the ecosystem and socio-economic conditions of the residential area.
- During the construction, it is expected that there will be no adverse impacts on terrestrial ecosystems, rare animals which are threatened to extinct, to biodiversity, natural protected area, ecosystem and aquatic biodiversity. However, issues mentioned above will be made mitigation plan during the implementation period.

5.2. Mitigation measures

5.2.1. Design task

Design of irrigation canal scheme and construction on them needs to ensure efficiency of water supply, reduce water loss, prevent pollution; synchronize with improved canal scheme of WB3 project to obtain overall efficiency of the subproject.

All of the subproject’s design profiles will be implemented in accordance with technical regulations and bidding document/contract. Preparation of bidding document/contract includes mitigation measures of impacts on environment and environmental monitoring plan. Following measures in designing works should be taken into consideration and applied where applicable:

- Protection barriers should be properly built along the access roads that runs along the canals to prevent human, vehicles, animals from falling into the canal.

- Sedimentation in canals: On the other hand, rain water may wash/flush the soil on the surface into the canals thus affect the flow/designed capacity. Engineering design and construction practice should include solutions to retain/create vegetation cover along the canal/road side and build sedimentation traps would be useful to address this potential risk.

- Communities living along the canals have the practice of accessing canal water for various purposes. Steps/staircases should be included in the detail design of canal banks to maintain such access. Conversely, in signboards should be placed permanently for both construction and operation phases in areas where unauthorised access to water is completely prohibited.

Prevention of risks of unexploded ordnances

Conduct mine clearance is necessary with construction in the depth over 2m. It is essential to put mine clearance into bidding profile. Construction contractors are required to make mine clearance plan before implementing construction.

Compensation, site clearance
It is required to investigate exactly land area to support, compensate; consult stakeholders about issues related to the community; analyze community’s general and separated benefits brought by the project.

Current policies of government, Quang Nam province regarding assistance compensating for land and existing works need to be disseminated.

Assistance and compensation for affected people according to motto: contribution to improve DPs’ living standard better than before the project and ensure their participation during assistance and compensation period. Resettlement policy applied to this project will harmonize requirement of WB (safeguards policies) and Vietnamese regulations. Principles of the project’s Resettlement policy include the followings:

- All of the AP, regardless of ownership status and socio-economic position, will be compensated and supported for their losses of properties, income, production and business according to replacement price and recovered their living standard, income and production capacity as before there is the project.
- Land price to compensate (and support) for the loss is determined close to practical price of land use right transfer in the market in normal conditions. When there is a difference from practical price of land use right transfer in the market, it is necessary to amend it properly.
- Compensation for affected houses and structures by price and rebuilding houses and structures which have similar technical standards as houses do.

Disseminate deeply and widely about nation’s economic development and compensation policies as well as implementation of rights, obligations and the national law to people. Public the compensation price (details for each assets); public and inform accurately compensation amounts to each household.

5.2.2 During construction

a. Stop supplying water while paving canals

The construction contractor needs to have detailed plan in construction activities, taking into account local schedule of stop supplying water. This plan has to be agreed by PMU, IMC and people in the project area before the construction and PMU is responsible to monitor this activity.

b. Exhaust emission, dusts and noise

Choose appropriate implementation methods to reduce number of vehicles participating in construction, reduce dusts and noise:

Main canals and constructions on canals

- Use mechanical methods in excavating, backfilling, transporting materials from gathering places to construction site and using manual labour force in available procedure.
- Transporting materials: materials from exploitation (buying) area to gathering area by trucks of which weight is no more than 7 tons; make the most of transportation by wheelbarrows and improved cars from outside to construction position of small canal; limit storage time of materials (sand, gravel) to reduce dusts, exhaust emission and rain will wash away.
- Gravel and sand are transported when wind is not strong and trucks have cover to avoid leave sand out.
• Periodically irrigate temporary roads, areas where there are site levelling on dry days, 4-5 times/day.

• Loaders and excavators will be assigned to work on daytime, avoid working from 23.00 to 5.00 at places near residents. Usually maintain equipments’ muffler parts.

Canals level 1-2-3

• Excavation and transportation of materials and wastes from and to the construction use local manual labour force and have participation of benefited community at communes to mitigate number of existing transportation vehicles in the area.

c. Domestic and construction wastewater and wastes

• Use local labour force in manual labour force to decrease mechanical population growth during construction phase at locale; mitigate arrangement of living place for the labour force, reduce household wastes.

• Discuss and get agreement with local authorities about an appropriate disposal sites for domestic wastes assigned for each camp or group of camps or make a contract with local waste collection unit to transport to the local landfill. Burrying solid waste at the construction site is strictly forbidden.

• For other components having short time of construction, it is recommended to make the most of small local labour force and households’ toilets which adjacent to the construction area.

• Solid wastes need to be reused if possible. Scrap such as broken bricks, excess soil and sand can be used in levelling sites. Other collected scrap such as concrete packages, bottles, excess pieces of iron and steel, etc. can be recycled or reused. Common hazardous wastes are waste oil and rags for machine and waste oil need to be collected to containers to be transported to hazardous waste treatment center as contracted.

d. Reduce traffic jam and accidents in material transportation

• Strictly obey regulations on traffic safety and particular rules when participating in circulation.

• If there are incidents, it is necessary to actively scope, for example, contacting with authorities to cooperate to resolve properly and mitigate extent of damage.

• Inform the community in the area about construction plan and schedule; localize safety zones, put signs, warning lights at the construction areas.

e. Reduce impacts on local community’s lives

• Stimulate local labour force to participate in the construction process which does not require skills, so as to avoid immigrants and conflicts between people and implementation workers;

• Do not paving and gathering material close to schools, medical centers, hospitals, pagodas, etc. and other sensitive areas.

• Formulate living regulations for the construction workers, including requiring them to have proper behaviours, obey local customs, traditions and values.

• Equip fire control equipments such as CO₂ tank, water tank at the camp areas near to residential to scope timely with incidents in order to avoid fire in the construction site.

5.2.3. Operation phase
a. **Surface water quality**

In the project operation phase, it is essential to periodically measure and observe the project implementation indicators as well as obey environmental monitoring and management methods. The project’s environmental monitoring mechanism is presented in Impact table below.

b. **Aquatic ecosystem**

The aquatic ecosystem is possibly affected negatively due to increasing amount of fertilizer and pesticide. However, the improvement of the irrigation scheme and application of IPM program will have integrated impacts to mitigate risks due to pesticides in the project area (reference to Annex 7: Integrated pest management framework). Increasing monitoring the water quality and combination with IPM and organic agricultural methods are main mitigation measures.

c. **Industrial pollution**

It is predicted that the irrigation areas may be polluted from industrial enterprises. Regarding Vietnam water resource assistance project (WB3), there was a preliminary research on industrial pollution status at sample irrigation areas of Ke Go, Bac Giang and Dau Tieng subproject. The research showed that risks of industrial pollution was generally insignificant. In Quang Nam subproject, there is no big industrial enterprises in the project area, current canal scheme is mostly polluted due to small business and production activities along the canals and household waste and wastewater. In general, with current industrial development, in short-term and medium-term, impacts of industrial pollution on the canal scheme are categorized at low level.
### Table 8 - Mitigation measures of the subproject’s impacts

<table>
<thead>
<tr>
<th>Stt</th>
<th>The project operations</th>
<th>Environmental impacts</th>
<th>Environmental protection measures</th>
<th>Budget for implementation</th>
<th>Time for implementation and completion</th>
<th>Responsibilities in organization and implementation</th>
<th>Responsibilities in monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Design</td>
<td>Negative impacts on design</td>
<td>Design in compliance with water supply effecton, mitigation of losses, prevention of potential pollution; synchronization with improved canal system of WB3 project to comply with overall efficiency of the subproject.</td>
<td>Included in design package</td>
<td>Design contractor</td>
<td>PMUPMU, PMU, EMC, Local communities</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4.1.1 Prevention of risks of unexploded ordnances</td>
<td>Mine clearance</td>
<td>Conduct mine clearance is necessary with construction in the depth over 2m. It is essential to put mine clearance into bidding profile. Construction contractors are required to make mine clearance plan before implementing construction.</td>
<td>Included in construction package</td>
<td>Construction contractor</td>
<td>PMU, EMC CMC, community</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Compensation, site clearance</td>
<td>Land acquisition, Compensation, resettlement</td>
<td>It is required to investigate exactly land area to support, compensate; consult stakeholders about issues related to the community; analyze community’s general and separated benefits brought by the project. Current policies of government, the province regarding assistance compensating for land and existing works need to be disseminated. Disseminate deeply and widely about nation’s economic development and compensation policies as well as implementation of rights, obligations and the national law to people.</td>
<td>Included in design package</td>
<td>PMU, The project environmental consultant</td>
<td>PPC, community</td>
<td></td>
</tr>
</tbody>
</table>
Public the compensation price (details for each assets): public and inform accurately compensation amounts to each household.

### Construction phase

| 1 | Stop supplying water while paving canals | Water supplying stage because of canal paving | - Have a proper timetable of paving canals and consult with management agencies, IMC and water users  
- Reduce the suspension of water supply | Included in technical design package | PMU, PPC, DARD, IMC, community |
|---|---|---|---|---|---|
| 2 | Main canal building, construction s- over the canal, level canal 1,2, | Clearance and dredging for site preparation | - Have a plan of building dumping yard for waste and waste mud; the dumping yard must not penetrate the water resource  
- Surface earth layer needs to be separately storage to backfill later  
- Make the most of waste to backfill, -Implement compensation and assistance in compliance with the regulation | In construction package | Construction contractor, PMU, EMC CMC; community |
| 3 | Main canal building, construction - over the canal, level canal 1,2, | Household wastes, Construction solid wastes | Use local labour force in manual labour force to decrease mitigate arrangement of living place for the labour force, reduce household wastes.  
Build landfill for household wastes for each camp or group of camps or make a contract with local waste collection unit.  
For other components having short time of construction, it is recommended to make the most of local labour force and households’ toilets which adjacent to the construction area.  
Solid wastes need to be reused if possible. Scrap such as broken bricks, excess soil and sand can be used in levelling sites. Other collected scrap such as concrete packages, bottles, excess pieces of iron and steel, etc. can | In construction package | Construction contractor, Communal garbage collection team/group, PMU, EMC CMC; community |
<table>
<thead>
<tr>
<th>No.</th>
<th>Main canal building, construction - over the canal, level canal 1,2,</th>
<th>Traffic jam and accidents</th>
<th>Strictly obey regulations on traffic safety and particular rules when participating in circulation. If there are incidents, it is necessary to actively scope, for example, contacting with authorities to cooperate to resolve properly and mitigate extent of damage. Equip fire control equipments such as CO2 tank, water tank at the camp areas near to residential to scope timely with incidents in order to avoid fire in the construction site. Inform the community in the area about construction plan and schedule; localize safety zones, put signs, warning lights at the construction areas.</th>
<th>Included in construction package</th>
<th>Construction contractor</th>
<th>PMU, EMC CMC; community</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Main canal building, construction - over the canal, level canal 1,2,</td>
<td>Dusts, noise, exhaust emission from excavator, levelling, material transporting for construction on the canals</td>
<td>Use mechanical methods in excavating, backfilling, transporting materials from gathering places to construction site, prioritize small vehicles and using manual labour force in available procedure. Transporting materials: materials from exploitation (buying) area to gathering area by trucks of which weight is no more than 7 tons; make the most of transportation by wheelbarrows and improved cars from outside to construction position of small canal; limit storage time of materials (sand, gravel) to reduce dusts, exhaust emission and rain will wash away. Gravel and sand are transported when wind is not strong and trucks have cover to avoid leave</td>
<td>Included in construction package</td>
<td>Construction contractor</td>
<td>PMU, EMC CMC; community</td>
</tr>
</tbody>
</table>
### Environmental management plan (EMP) – Quang Nam Irrigated agriculture improvement subproject

| Periodically irrigate temporary roads, areas where there are site levelling on dry days, 4-5 times/day. |
| Loaders and excavators will be assigned to work on daytime, avoid working from 23.00 to 5.00 at places near residentials. Usually maintain equipments’ muffler parts. |
| For canals level 1-2-3: Excavation and transportation of materials and wastes from and to the construction use local manual labour force and have participation of community to mitigate number of existing transportation vehicles in the area. |
| Stimulate local labors to participate in the construction process which does not require skills, so as to avoid immigrants and conflicts between people and implementation workers; Ensure operation of machinery compliant with the procedure, obey labour discipline to mitigate impacts on the local people’s current cultivation area and activities. Do not paving and gathering material close to schools, medical centers, hospitals, pagodas, etc. and other sensitive areas. Formulate living regulations for the construction workers, including requiring them to have proper behaviors, obey local customs, traditions and values. Disseminate transmitted diseases and prevention methods. The contractors must have proper plans of organizing camps and places for gathering, constructing paving slabs and box culverts in order not to cause losses for local historical and cultural and religious monuments, health care, etc. |

| Main canal building, construction - over the canal, level canal 1,2, 3 | Other impacts (on communities, agricultural production, cultural and religious monuments, health care,...) | Construction contractor |
| PMU, EMC CMC; community |
### Operation phase

<table>
<thead>
<tr>
<th></th>
<th>Canal system operation and construction -s on canal</th>
<th>Water pollution and water ecosystems</th>
<th>It is essential to periodically measure and observe the project implementation indicators as well as obey environmental monitoring and management methods. The aquatic ecosystem is possibly affected negatively due to increasing amount of fertilizer and pesticide. It is evitable to increase monitoring water quality and cooperate with IPM as well as organic agricultural methods. Prohibit using a large amount of pesticide and toxic chemical; these types are mentioned in “FAO and WHO’s list of non-use items” - Prohibit encroach aquaculture ponds and protected areas; all farms will comply with National standards or implement aquaculture well. - As throwing garbage into canals is common in many areas. Sign boards and communication campaigns are recommended to partially address this problem</th>
<th>Construction contractor</th>
<th>PMU, EMC CMC; community</th>
</tr>
</thead>
</table>
CHAPTER 6 - ENVIRONMENTAL QUALITY AND COMPLIANCE MONITORING PROGRAM

Content of the environmental monitoring program includes the followings:

- Monitoring of the compliance with implementing mitigation measures of the contractors;
- Monitoring and evaluating quality of environmental air, water and sludge;

Environmental monitoring program is conducted continuously during the subproject construction and two years after the project starts operating.

Table 9. Environmental Monitoring Program during the Project Construction and Operation Period

<table>
<thead>
<tr>
<th>Impact</th>
<th>Parameter</th>
<th>Location</th>
<th>Frequent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission</td>
<td>Dust</td>
<td>Area adjacent to the construction site</td>
<td>In windy condition</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>Noise level meets the requirements of Vietnamese standard</td>
<td>Adjacent sensitive area</td>
<td>In case of resolving complaints</td>
</tr>
<tr>
<td>The erosion and the sedimentation</td>
<td>Effectiveness of controlling the erosion and the sedimentation</td>
<td>Control the erosion and the sedimentation</td>
<td>After heavy rain</td>
</tr>
<tr>
<td>Decrease of the surface water quality</td>
<td>pH, salinity, TSS, BOD, total amount of pesticide and herbicide, Coliform</td>
<td>Build pumping station, channel, drains; discharge waste water and other waste into the channel and to Red River as well as Da River.</td>
<td>Regular during the construction</td>
</tr>
</tbody>
</table>

6.1. Monitoring the construction contractor’s implementation

Monitoring of the subproject owner: PPMU will monitor the compliance with the safeguard policy of the contractor during the construction phase. In addition, PPMU will appoint construction supervision and consultant (CSC) to implement daily monitoring based on approved contractual specific environmental plan (CSEP) and pay attention to minimize potentially adverse impacts caused by construction activities. Outline of terms of reference (TOR) for construction supervision and consultant mentioned in Annex. PPMU will appoint environmental supervisor unit (ESU) and provincial environment and management consultancy (PEMC) to supervise the compliance with the implementation of the safeguard policy.

Community supervision: Local community supervision board was established by “Decision No 80/2005/QD-CP dated on 04/18/2005 by Prime Minister on monitoring regulation of community investment’. Communal community supervision board has right and responsibility for monitoring construction activities, adversely impacts on the environment caused by the construction activities and ensure that mitigation measures of potentially adverse impacts were implemented effectively by the contractor. In cases of arising environmental issues which affects the community, the board will report to the field construction supervision and consultant (CSC) and/or PPMU by filling out the information forms of environmental safety or through hotline (the hotline is set up as soon as the agreement takes effect)
6.2. Effective monitoring of mitigation measures proposed

At the sub-project level, environmental safety officials of PPMU and construction supervision and consultant (CSC) will regularly monitor implementation of the proposed mitigation measures during the construction stage, and consult with local authorities as well as communities. If necessary, mitigation measures will be modified in order to suit actual impacts based on agreements with the key stakeholders. Results/records will be archived in sub-project documents. PMU will also report the implementation progress of contractual specific environmental plan (CSEP) in progress report of the sub-project. The monitoring cost of proposed mitigation measures is a part of monitoring cost of PPMU. In addition, PPMU will also ensure the compliance with the conditions of government regulating on environmental impact assessment.

At the project level, consultancy and environmental supervisor unit (CESU) of CPO will also implement periodic monitoring each 6 months to monitor mitigation measures proposed for the subproject.

6.3. Monitoring of environmental quality

Environmental observation will focus on data collection relating to changes in surface and underground water under the project's and agricultural activities' impacts. EMP is implemented during the 3 phases of the project: Preparation, construction and the first year of operation. The program's objective is to monitor impacts of the project and agricultural activities on water quality and to assess if water resource meets criteria of surface water, irrigation and living water. Water environment monitoring is planned to be conducted in 15 places as shown in below table:

Table 10. List of proposed places of surface water monitoring (*)

<table>
<thead>
<tr>
<th>Code</th>
<th>Location</th>
<th>Code</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Khe Tan reservoir</td>
<td>D10</td>
<td>N24 extended, adjacent to National Route No. 1 traversing residential area</td>
</tr>
<tr>
<td>D2</td>
<td>N-30 Duy Xuyen District</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D3</td>
<td>River near pumping station into Duy Xuyen irrigation area</td>
<td>D11</td>
<td>D11 End of canal N14, adjacent to National Route No. 1, next to the gas station</td>
</tr>
<tr>
<td>D6</td>
<td>N20 Thang Binh, connected to Phu Ninh main canal</td>
<td>D12</td>
<td>D12 N2 adjacent to Phu Ninh main canal</td>
</tr>
<tr>
<td>D7</td>
<td>N14 Thang Binh District</td>
<td>D13</td>
<td>Drainage canal of Aquatic area, receiving water from N2</td>
</tr>
<tr>
<td>D8</td>
<td>N22 Thang Binh District</td>
<td>D14</td>
<td>N2-9 end of canal N2, Northern canal, Nui Thanh</td>
</tr>
<tr>
<td>D9</td>
<td>N24 connected to Northern Phu Ninh main canal</td>
<td>D15</td>
<td>Adjacent position to transportation road for construction soil</td>
</tr>
</tbody>
</table>

* Map of locations for getting environmental samples is presented in Annex 3 of this plan.

Synthetic indicators include pH, salinity level, TSS, BOD, total amount of pesticide and herbicide, Coliform.

With regard to dust noise pollution, soil environment observation, observation plan will be implemented according to agreement between environmental supervision and consultant and
PPMU based on the implementation progress of the project items and balanced budget for proposed observation activities.
CHAPTER 7- IMPLEMENTATION ARRANGEMENTS

7.1. Roles and responsibilities of agencies

7.1.1. The State Management level

**MARD** is responsible for adopting the ESMF, the Environmental Management Plans (EMP) and other social safeguard instruments, and Integrated pest management program framework (IPMF).

**Provincial Level** – PPC, DPC and DARD, DONRE, based on approved frameworks, are responsible to approve documents relating to resettlement and ethnic minority plan, assess environmental impacts and environmental management program (EMP)

7.1.2. Project Owner

**Central level:** CPO is the project owner who is responsible to monitor and adjust the implementation of the project’s approved safeguard policies and documents.

**Local level:** DARD is responsible to monitor and adjust the implementation of the project’s safeguard policies in the subproject area.

7.1.3. Project Management level

**CPMU** – established by CPO, is responsible for overall management of the project activities, including the implementation of environmental safeguard policies. CPMU will give decisions on project management to support effectively implementation of the EMP, including:

- Approval of TORs, bidding documents and contracts with contractors about environmental safeguard policies;
- Instruction, checking, monitoring and/or adjustment of EMP Sub-Project for practical implementation;
- Manage the annual environmental monitoring reports, and submit to WB.
- Organizing training/capacity building programs on environmental protection, which are carried out by training consultancy.

**Provincial level:** Quang Nam PPMU is responsible to monitor daily activities of the subproject, monitor and manage the construction’s quality, control compliance with environmental safeguard in the subprojects’ construction activities. PPMU has responsibilities to cooperate with local authorities, of where there are the project activities, to redress grievance (if any). Regarding information disclosure, Quang Nam PPMU will:

- Disseminate Vietnamese version of the project’s EIA, EMP in the subproject area
- Inform the local community and authorities at district/commune level about the implementation plan of the construction components two weeks prior to starting the construction.

**Design Consultants:** Engineering design consultants will be responsible to incorporate engineering solutions to address the socio-environmental potential impacts and risks identified in this EMP where possible. The Design Consultant also be responsible to incorporate all mitigation measures proposed for construction phase in this EMP into construction bidding document and contracts.

**Construction Contractors:** The responsibility of the construction contractors will be to properly and effectively implement the environmental mitigation terms and conditions contained in their construction contracts signed with PPMU, including:
• Prepare specific safeguard policy implementation plan to submit PPMU for consideration and approval before construction implementation.

• Implement information disclosure sufficiently and timely about the construction activities.

• Comply with the environmental safeguard policies during construction process effectively.

• Together with PPMU to solve any complaints and/or grievance.

**Construction Monitoring Contractors (CMC):** is hired by PPMU, will monitor and make daily notes about the contractor’s compliance with safeguard policy on behalf of PPMU. Responsibilities of Construction Monitoring Contractors (CMC) in the construction phase will be:

• On behalf of the PMU, perform daily monitoring of compliance with safeguard policies of contractors;

• Prepare monthly reports on compliance with safeguard policies of the contractor and submit to PPMU, this report will be used for payment of Contractors on environmental protection;

• Report PPMUs any "find" during construction process.

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**Figure 4 – Diagram of implementation organization of the environmental safeguard policy of Quang Nam subproject**

**Note:**

*Implementation organization*

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7 The contractor has to inform the district/commune authorities about the implementation plan of the package, (permanent and/or temporary) land acquisition scope so the community can cooperate to implement. At the construction area, the contractor has put the signs presenting information of the subproject, its name, the package’s name, the contractor, the implementation time and land acquisition scope (the construction section drawing)
7.2 Mechanism of Internal monitoring, external monitoring and Community monitoring.

- **CPO** will conduct the monitors periodically through environmental consultant to oversee the implementation of the CPMU, PPMU and contractors for compliance with the mitigation measures and implementation results.

- **CPMU** will mobilize Consultants for environmental safeguard Policy, who is responsible for periodic monitoring the implementation of safety measures in Sub-Project Area, included clarify the safeguard issues and training on the safeguard policy for staffs and other consultants of SP.

- **PPMU** is the provincial project management unit is responsible for ensuring effective implementation of safety measures and timely progress reports of Sub-Project. PMU will establish a social organization-environment (ESU), which has at least 01 officer in charge of environmental safety, have the responsibility to guide and remind the contractor implement environmental safety measures. PMU is responsible for coordinating with contractors and local authorities resolve incidents, complaints, grievance (if any).

- **DONRE** in collaboration with PPMU to monitor compliance the safeguard policies of environment of Contractor and to solve the environmental incident (if any).

- **Environmental Monitoring Consultant (EMC)**: Environmental Consultant is responsible for providing guidance, monitoring and evaluation of compliance with environmental safety of contractors, training on environmental safety policy for staffs of PPMU and field engineers. EMC will perform periodic monitoring 2 times / year at a construction site. Each period of supervision, (a) checking the contractor's compliance with the environmental plan, (b) conduct remedial happens when non-compliance and or the appearance of a negative impact, (c) investigating complaints, assessing and identifying remedial measures, (d) advise contractors on environmental improvement, awareness, and pollution prevention measures, (e) monitoring the contractor activities on answering the complaint, (f) guidance and training on site for field technicians on different aspects in order to avoid or minimize the potential negative impact the environment and local communities in the construction phase.

**Local Community**: The commune/village community supervision was established by Decision No. 80/2005/QD-CP of the Prime Minister, dated 18/4/2005 on the community monitoring of investment Project. The Community Supervision Board is responsible for daily compliance monitoring of environmental safety in the construction phase, and reflects with Local Authority/PPMU about the incident, or via telephone 'hotline' reflect the PMU for timely resolution. Government and local authority and the communal social organizations will also monitor the performance of contractors, and monitor the social and the environment impacts in all phases of the project. When there are complaints and grievances of the people in the project area (for example, land acquisition, compensation, issues related to the environment etc.), the affected persons/Community Supervision Board report to local government/contractor and PPMU to solve the problems.

7.3. Mechanism of environmental complaints and grievances redress
• Construction supervisor and consultant (CSC) will be responsible for daily supervision of the contractor’s compliance. When there is a complaint, CSC and representative of the contractor will investigate causes and commit to remedy if necessary. CSC will follow and record the remedies until the complaint is redressed completely.

• CSC will determine tasks of environmental impact mitigation which will be implemented by the contractors and require monthly payment or propose sanctions, PPMU implement payment and can fine as compliance framework.

• Community supervision board is responsible for daily monitoring compliance in environmental safety in construction and report to local authorities/PPMU on incidents or via “hotline” to resolve timely, PPMU will incorporate with the stakeholders to redress the complaints.

7.4 Cost estimation for the implementation of the environmental monitoring program

Cost estimation of the environmental management program implementation was presented in table below, based on initial estimation. Quang Nam PPMU will determine exactly these costs and adjust annual distribution of budget in compliance with the job requirement.

<table>
<thead>
<tr>
<th>No.</th>
<th>Items of Environmental management plan</th>
<th>Estimate (VND million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Environmental monitoring in the construction field (10-15% of monitoring implementation cost)</td>
<td>400</td>
</tr>
<tr>
<td>2</td>
<td>External environmental monitoring (including cost of sampling water environmental quality) (5 years)</td>
<td>1500</td>
</tr>
<tr>
<td>3</td>
<td>Training and increase of the environmental management capacity Assistance for increase PPMU’s environmental capacity Training the community, the beneficiaries, the contractor, the construction workers about the environmental management Training about the community supervision in the construction Equipment and logistics</td>
<td>300</td>
</tr>
<tr>
<td>4</td>
<td>Total estimate of EMP</td>
<td>2300</td>
</tr>
</tbody>
</table>
CHAPTER 8 - CONSULTATION AND INFORMATION DISCLOSURE

8.1. Consultation and information disclosure process

SMU submitted official dispatch to People’s Committees of all the communes attached the subproject summary report.

EIA consultant organized consultation meetings from 8/3/2013 to 13/3/2013 at district and commune levels. In these meetings, District People’s Committee invited representatives of CPCs in the project area to listen to summary of the project information, requirements of environmental protection regulated in Vietnamese law and WB’s policies, anticipated impacts during the preparation, implementation and operation of the irrigation at the locals. After listening to queries, representative of the investor and EIA consultant resolved the queries and get experience from the comments.

Rapid survey questionnaires on environment were distributed randomly to households adjacent to the canal scheme and/or benefiting from the canal scheme to research the local environmental current status and their opinions (total 31 questionnaires from 6 districts). The questionnaire survey was cooperated with in-depth interview to know about the households’ thoughts and expectations to the project owner and the contractors during the implementation.

8.2. Result of consultation and information disclosure

Table 12. Results of Consultation and Information Disclosure

<table>
<thead>
<tr>
<th>No</th>
<th>Districts</th>
<th>Time of consultancy</th>
<th>Communes/Towns</th>
<th>Comment/Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Duy Xuyên</td>
<td>08/03/2013</td>
<td>Duy Vinh</td>
<td>Commune is consistent with project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>08/03/2013</td>
<td>Duy Trung</td>
<td>Commune agrees with project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>08/03/2013</td>
<td>Duy Thanh</td>
<td>Commune agrees with project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>08/03/2013</td>
<td>Duy Phuoc</td>
<td>Commune agrees with project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>08/03/2013</td>
<td>Nam Phuoc</td>
<td>Locality agrees with project</td>
</tr>
<tr>
<td>2</td>
<td>Dai Loc</td>
<td>08/03/2013</td>
<td>Dai Tan</td>
<td>Commune supports project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>08/03/2013</td>
<td>Dai Thang</td>
<td>Project does not impact seriously on environment of commune. The commune proposes to investigate drainage due to inundation hindering production. Building drainage to solve inundation problem for 100 ha of field</td>
</tr>
<tr>
<td></td>
<td></td>
<td>08/03/2013</td>
<td>Dai Minh</td>
<td>Commune supports project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>08/03/2013</td>
<td></td>
<td>Proposing to have bridge crossing irrigation to pass roads</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The old canal system is not effective so it is suggested to repair and upgrade</td>
</tr>
<tr>
<td>Date</td>
<td>Location</td>
<td>Comment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08/03/2013</td>
<td>Dai Chanh</td>
<td>Proposing to implement project early</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commune agrees completely with project</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recommending to upgrade two irrigations being downgraded crossing commune.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08/03/2013</td>
<td>Dai Thanh</td>
<td>Commune agrees completely with project</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Suggesting adjusting some unreasonable bridges crossing irrigation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The commune areas is located along Thu Bon river, due to serious erosion,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>proposing to support to build embankment for river.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commune has one irrigation pump station for an area of 14ha degraded so</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>irrigation activities limited. Proposing to renovate and upgrade pumping</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>station.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08/03/2013</td>
<td>Dai Cuong</td>
<td>Commune agrees completely and support project</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Localities, located at the bottom of Khe Tan canal, have annual flood happened. Proposing the project to improve T1 drainage, strengthening capacity of flowing into Quang Que river. To recommend the project to implement soon.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08/03/2013</td>
<td>Dai Phong</td>
<td>Commune agrees completely with project</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dai Phong has eight villages and seven of which irrigated, Thuan My hasn't been watered. Proposing the project to set up siphon to irrigate for the village instead of open canal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/03/2013</td>
<td>Thang Binh</td>
<td>Commune agrees completely with project</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Binh Tu</td>
<td>Level two canal system has been solidified and level three canal system hasn't pitched landmarks. Proposing the project to take care and support the canal. Bridge trough in canal 18 is unreasonable, causing flood for residential areas. Suggesting having measures to overcome.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Location</td>
<td>Feedback</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-------------------</td>
<td>--------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/03/2013</td>
<td>Binh Chanh</td>
<td>Commune agrees completely with project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental problem is not affected considerably because canals located</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>mainly in field where there are few residential areas.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/03/2013</td>
<td>Binh Dan</td>
<td>Commune agrees completely with project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commune has two canals: N22-1; N22-5 in which N22-5 is not only irrigation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>but also drainage canal. Now, both of them have been downgraded. It is</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>necessary to investigate to improve efficiency of the canals.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/03/2014</td>
<td>Binh Doan</td>
<td>Commune agrees completely with project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commune finds difficulty in irrigating rice during harvest. People are</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>looking forward to project taking care and investigating canals system of</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Binh Doan Commune.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/03/2013</td>
<td>Que Xuan 1</td>
<td>Commune agrees completely with project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commune is chosen to carry out form field. However, infrastructure is</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>still weak and topographic is low that often flooded and waterlogged.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Proposing the project to take care and find out solutions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/03/2013</td>
<td>Que Xuan 2</td>
<td>Commune agrees completely with project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to commune located at the bottom of canal that makes dry partially,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>in raining season, it is always waterlogged. Recommended project to</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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### Environmental management plan (EMP) – Quang Nam Irrigated agriculture improvement subproject

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<td>Commune agrees completely with project. Suggesting adjusting some unreasonable bridges crossing irrigation. The commune areas is located along Thu Bon river, due to serious erosion, proposing to support to build embankment for river. Commune has one irrigation pump station for an area of 14ha degraded so irrigation activities limited. Proposing to renovate and upgrade pumping station.</td>
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<td>Commune agrees completely and support project Localities, located at the bottom of Khe Tan canal, have annual flood happened. Proposing the project to improve T1 drainage, strengthening capacity of flowing into Quang Que river. To recommend the project to implement soon.</td>
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<td>Commune has two canals: N22-1; N22-5 in which N22-5 is not only irrigation but also drainage canal. Now, both of them have been downgraded. It is necessary to investigate to improve efficiency of the canals.</td>
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<td>Commune finds difficulty in irrigating rice during harvest. People are looking forward to project taking care and investigating canals system of Binh Doan Commune.</td>
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<td>Commune is chosen to carry out form field. However, infrastructure is still weak and topographic is low that often flooded and waterlogged. Proposing the project to take care and find out solutions.</td>
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<td>Due to commune located at the bottom of canal that makes dry partially, in raining season, it is always waterlogged. Recommended project to research and find out solutions to solve.</td>
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</table>
8.3. Conclusion (the ideas of authorities and local communities)

Ward and Commune People’s Committee’s opinions

All of the consulted Ward and Commune People’s Committee agreed with the project in documents and opinions at the consultation meetings, summarized as follows:

- Agreement with the project investment guidelines mentioned above at the local
- When implementing the project, PMU and the contractors need to pay attention to pollution, air, dust, noise, surface water, etc. and mitigation of the land acquisition's impacts, compensation assistance, resettlement (if any) at the commune.
- PMU needs to commit to carry out mitigation methods of adverse impacts on the environment and the society as well as order and security, cultural, historical and religious heritages in the area.
- PMU has to ensure the implementation of the project in compliance with the planned progress and quality.

Households’ opinions

All of the consulted households would like the project is conducted soon to improve the agricultural production as well as their lives and consider the project adverse impacts as short-term and possible to mitigate.
ANNEXES

ANNEX 1 - OUTLINE (TOR) FOR CONSTRUCTION SUPERVISOR AND CONSULTANT (CSC)

Overview

To avoid potential adverse impacts of the subproject activities on natural and social environmental, the construction contractors are required to obey prepared and approved Environmental code of practice (ECOP) and Environmental management plan (EMP).

CSC is responsible for provide specialized “service” to ensure the subproject’s ECOP and EMP are carried out effectively.

Service scope

Service provided by CSC includes checking, monitoring the construction activities in order to make sure the mitigation methods mentioned in ECOP/EMP are implemented properly and the adverse impacts are mitigated.

On behalf of PPMU, CSC will carry out following tasks:

- Check the field regularly;
- Review implementation of the environmental protection methods in comparison with EMP and terms in contract;
- Evaluate effectiveness of the mitigation methods of environmental impacts and implementation results;
- If needed, consider environmental possibility of construction methods (of both permanent and temporary works) and relating design drawings. At the same time, CSC has to research and recommend the designer, PPMU and the contractors about substitute plan to minimize the environmental impacts;
- Review checking result of any noncompliance of the implementation of the mitigation methods of the environmental impacts and effectiveness of the substitute methods;
- Provide feedback of the checking result regularly for the contractor’s engineer leader when there is noncompliance with EMP;
- Instruct the contractor to have remedies in a particular frame of time and if needed, additional monitoring will be conducted in case of noncompliance or complaints according to the contract requirement and procedure;
- Instruct the contractor to have mitigation activities of the impacts and these activities must be compliant with the EMP procedure in case of noncompliance;
- Instruct the contractor to stop activities causing disadvantaged influences and to stop ones when they do not implement requirements mentioned in EMP or the remedies.

With regard to contracts requiring Contractual specific environmental plan (CSEP)

CSEP will provide consideration and final recommendations about the site clearance of all items of the subproject in order to protect the environment. The recommendations focus on the mitigation of impacts caused by material transportation, which leads to dust, noise and traffic obstruction, the construction waste disposal and the construction workers’ camps. CSC will review the contractors’ CSEP and submit to PPMU for approval.
Complaint resolving

The local people’s complaints relating to environmental scope such as dust, noise, traffic safety, etc. will be sent to PPMU and the contractor. Engineer leader will be responsible for dealing or researching solutions for the complaints with CSC. CSC will be provided a copy of the complaints and monitor the contractor in resolving the complaints as well as their attitude towards complaints verified during inspection progress at the subproject field.

Monthly cost commitment

CSC will verify monthly cost for environmental activities conducted by the contractor.

Regarding reports, CSC will have to prepare following ones:

- Report on violation: every two weeks;
- Monthly summary report on important issues, reviewing results and monitoring activities;
- Final report when the subproject completes, this report will summary main results of their work, number of violation of the environmental safety and solutions, as well as warnings and instruction for future tasks.
### ANNEX 2 – RESULT OF ENVIRONMENTAL SAMPLE ANALYSIS

**Quality of surface water in some areas of Phu Ninh subproject 2013**

#### KẾT QUẢ PHÂN TÍCH MÔI TRƯỜNG

*Dự án: Hỗ trợ phát triển nông nghiệp có tuổi WB 7
TDA: Hỗ trợ phát triển nông nghiệp có tuổi tỉnh Quảng Nam*

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*Ghi chú: Nhiệt độ nước từ 25.6°C đến 30.3°C*
Ký hiệu mẫu:

D1  Hồ chứa nước Khe Tần
D2  N-30 Huyện Duy Xuyên
D3  Nước sông gạn trạm bom vào khu vực huyện Duy Xuyên
D6  N20 Thăng Bình, nội kềnh chính Phú Ninh
D7  N14 Huyện Thăng Bình
D8  N22 huyện Thăng Bình
D9  N24 nội với kềnh chính Bắc Phú Ninh
D10 N24 kéo dài tiếp giáp QL1 chạy qua khu dân cư
D11 Cuối kềnh N14, tiếp giáp với QL1, cánh cày xăng
D12 N2 tiếp giáp với kềnh chính Phú Ninh
D13 Kênh thoát khu chăn nuôi Trà Sào, lấy nước vào từ N2
D14 N2-9 cuối kềnh N2, kềnh chính Nam, Núi Thành
D15 Điểm tiếp giáp với đường vận chuyển đất công trình
## II. Chất lượng môi trường không khí

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Phòng Hòa lý
Khoa XN & PTKTC

Lê Thái Hà

VIỆN TRƯỞNG

Nguyễn Duy Bảo
ANNEX 3. MAP OF LOCATIONS FOR GETTING ENVIRONMENTAL SAMPLES

Note:

D6  N20 Thang Binh, connected to Phu Ninh main canal
D7  N14 Thang Binh District
D8  N22 Thang Binh District
D9  N24 connected to Northern Phu Ninh main canal
D10 N24 extended, adjacent to National Route No. 1 traversing residential area
D11 End of canal N14, adjacent to National Route No. 1, next to the gas station
D12 N2 adjacent to Phu Ninh main canal
D13 Drainage canal of Aquatic area, receiving water from N2
D14 N2-9 end of canal N2, Northern canal, Nui Thanh
D15 Adjacent position to transportation road for construction soil
ANNEX 4 - ENVIRONMENTAL STANDARDS AND REGULATIONS

Current Vietnam National Standards (TCVN) and Vietnam Technical Regulations (QCVN) on the environment are established by MONRE and they are to be applied for all agencies, enterprises and projects implemented in Vietnam.

- QCVN 03:2008/BTNMT – National Technical Regulation on the allowable limits of heavy metals in the soils.
- QCVN 05:2009/BTNMT – National Technical Regulation on limit values for parameters in the ambient air.
- TCVN 5502:2003: Supplying water – requirement of quality
- TCVN 6774:2000: Water quality for fishery feeding protection
- TCVN 7222:2002: Water quality- central domestic water quality
ANNEX 5 - COMMUNITY CONSULTATION MEETING MINUTES

Minutes of Binh Tu Commune, Thang Binh District

Minutes of Dai Phong Commune, Dai Loc District

Minutes of Dai Tan Commune, Dai Loc District

Minutes of Tam Dan Commune, Phu Ninh District
ANNEX 6 - SOME IMAGES OF THE SUBPROJECT CURRENT STATUS

Unimproved canals

Improved canals (WB3)

Consultation with the local people

Water sampling
Environmental management plan (EMP) – Quang Nam Irrigated agriculture improvement subproject

Cannal will be upgraded by the project

Cannal will be upgraded by the project

Cannal will be upgraded by the project

Cannal will be upgraded by the project
ANNEX 7- INTEGRATED PEST MANAGEMENT (IPM) FRAMEWORK

1. Objectives

a. General objectives

Strengthening flora protection at local level, reducing pesticide use in the field, improving the efficiency of prevention, managing well pesticide and pesticide use process to reduce the risk of contamination pesticides on the environment and affect human health

b. Specific objectives

- Support of the Department of Plant Protection of 7 provinces in strengthening pest management and pesticide management in accordance with the national action plan on food hygiene and safety, food security, adaptation to climate change and the concerned international conventions that the Government has approved;
- Strengthening the capacity of IPM in Vietnam, including farmer groups to implement training IPM and research activities with farmers producing rice, vegetables ... to improve life, better and more sustainable crop production, minimizing the from pesticides.
- Strengthening environmental protection, food safety through strengthening the role of predators; reduce pesticide residues to ensure food hygiene and safety, reduce environmental pollution (water, land, air)
- Improving farmers’ knowledge: distinguish the major pests, secondary; identify predators and their role in the field, clearly understand the effect of two colors of pesticides, property use, know how to survey pest and use threshold control; understand and apply pest control measures in IPM to increase income for farmers.

2. The basic principles of IPM framework

The following principles will be applied to all sub-projects likely to increase the use of fertilizers and pesticides:

a. "Prohibited list": As defined in the screening criteria in Environmental and social Management Framework (ESMF), the project will not finance the purchase of pesticides in large quantities. However, if there is a serious infestation of pests in the region, the project will support to buy small quantities of pesticides; the acquisition, pesticides, storage and transportation will be subjected to the provisions of the Government and without objection of the Bank, the purchase of pesticides can be done. The list of banned pesticides will not be used and circulated

b. IPM program and project support: All the benefits of sub-projects from the renovation of irrigation systems are supported by the project and implementation of IPM program is part of the EMP for the sub-project. Support project will include technical assistance (consulting) to perform the non-chemical options, and priority support for agricultural extension services, including additional operating costs. The bank support fee for integrated prevention program of all sub-projects and will be required or approved an independent program or as a part of EMP. A proposed budget has been allocated for the implementation of IPM programs for the project area (in the component C). Detailed planning work will be completed through consultation close to farmers, local authority/PCP organization.

c. The project will apply IPM programs as a method to minimize the potential negative impact of the increased use of fertilizers and chemicals. However, the improvement of
knowledge and experience in the use of fertilizers and chemicals are through research surveys and training courses in the work as well as selecting safe use of non-chemicals, other techniques, is being investigated and/or applied in Vietnam. National IPM Program has also summarized the results of the implementation and the lessons of experience. The project will apply National IPM program results and detailed technical guidance.

d. IPM Program subproject can be set up to support the implementation of the Government's policy and objectives focusing on reducing the use of chemical fertilizers and pesticides.

e. In normal conditions, if pesticide use is considered to be a necessary option, only pesticides registered with the government and the international recognition in use and project will also provide technical and economic information for chemicals use demand. It should consider the options in the management of not harmful chemicals and can also reduce reliance on the use of pesticides. The measures will be incorporated into the project design to reduce risks related to the handling and use of pesticides to allowed possible level and managed by users

f. The planning and implementation of mitigation measures and other activities will be carried out closely with the authorities, powers and stakeholders, including suppliers of chemicals, to facilitate cooperation and understanding each other.

3. The approach of IPM

Focus more on the risks of abuse and excessive use chemical of plant protection products. The concerned plant are rice, vegetables, tea ... these plants tend to be sprayed more of pesticides.

Focus on community education, the initial survey will be incorporated into the task with the aim of clarifying the root cause of the abuse and excessive use of plant protection products and the associated risks. Support the capacity building of the instructor (trainer) IPM. The current program will need to be reviewed and new modules will be supplemented to increase the portion related to reducing the risk of plant protection products. The training program will be enriched with the integration of many activities such as System Rice Intensification (System Rice Intensification - SRI), minimum tillage (minimum tillage), production community and use of bio-products replacing plant protection chemicals ... the training activities, the application will be made in the wide area application of the model.

To perform this content, it should perform the following steps:

- **Step 0:** Hiring consultants: A group of consultants (IPM consultants) will be hired to assist PMU in implementing IPM programs including ensuirng results and cooperation among the agencies, farmers, and other stakeholders. The task for the consultant will be implemented at an early stage of project implementation.

- **Step 1:** Set up the basic requirements and register the program of farmers. This step should be implemented as soon as possible with appropriate questionnaire to establish base in 2013 for the use of fertilizers and of pesticides in the project area. Consultation with key agencies in the conduct of training, registration of participating farmers.

- **Step 2:** Set program goals and prepare a work plan. Based on the results from the questionnaire and consultation at Step 1, work plan and schedule will be prepared, including budgeting and implementation object. The work plan will be submitted to the PMU and approved by the World Bank for review and comment.

- **Step 3:** Implementation and annual review. After approval of the work plan, the activities will be implemented. Implementation progress will be included in the project progress reports. An annual evaluation report will be implemented by PMU and Sub-Department of Plant Protection.
Step 4: Evaluate the impact. An independent consultant will be hired to carry out the impact assessment. This is to assess the performance of the project and to provide lessons. PMU will hire a national consultant to perform impact assessment of IPM the program.

4. The contents of the sub-projects

4.1. Collection of information and selection of solutions

Before implementing IPM program, consultants must have the original investigation to have the necessary information such as:

- Survey to collect data on: staple crops have economic significance in the project area: seeds, crop, growth characteristics, farming techniques,
- Survey to collect data on soil conditions, pedology, local climate
- Investigate the situation of the pest, harmful rule arises, their economic damage causing on the major crops in the project area
- Investigate the role of natural enemies parasitic of pests on the major crops in the project area
- Investigate the actual situation of pest control measures, pesticide use and their effect at the local
- Investigate the socio-economic conditions, income, technical knowledge, and practices etc.

On the basis of these findings, a proposal to evaluate IPM measures will apply on specific crops in regions and localities implement the project through the following measures:

- Cultivation methods: Soil, field sanitation, crop rotation, intercropping, crop seasons, reasonable sowing and planting density, rational use of fertilizers; appropriate caring measures
- Using seed: the tradition seed and the proposed seed in use
- The biological measures: taking advantage of available natural enemies in the field, using probiotics, etc.
- Determination of the level of harm and prevention threshold
- Chemical measures: safe using with natural enemies, the economic threshold; 4 correct use of medicines;

4.2. Develop of demonstration models IPM

This section done by the Department of Crop Production, based on soil characteristics, climate, farming skills etc. Department of Crop Production will propose to the TDA of pilot field for agricultural development with the highly effective main crops. IPM activities in the pilot field will serve for sightseeing and guidance of practice.

Some of the main contents when building the IPM in the pilot field, as follows:

- Construction of demonstration models for applying IPM measures proposed above
- Building model involved by the people with the guidance of technical staff
- In the model, there need to build nuclear farmers, group leader
- In addition to technical assistance there should be support materials, ... for households participating in demonstration models
- Compiling IPM guiding documentation for major crops: rice, vegetables ...
4.3. Coaching and training of IPM staff

TOT (Training of trainers) and Farmer Field School (FFS):

- Each sub-project will organize workshops and staff training of IPM. The content of the training includes:
  - Distinguish the major and secondary pests
  - Identify the natural enemies of pests and diseases in the field
  - Investigate methods to detect worms and diseases
  - Understand the impact of two pesticides, using appropriate pesticides
  - The techniques pest control under IPM principles
  - Advanced farming techniques

- The understanding must be trained in theory and practical application in the field. The contents above can be trained under thematic groups: farming thematic, identification thematic and detection methods of pests and their natural enemies, the thematic of IPM techniques in production ...

- Training object: The technical staff of the Department of Agriculture, Sub-department of plant protection, agricultural extension of districts, communes, and cooperatives. These students will train to the farmers in the project area, the implementing of models.

- The size of each class is from 20 to 30 students, held in each district. Learning time in each stage. According to the thematic training session, each session may last 3-5 days on both theory and practice.

- Lecturer: hire experts from University/Research institute/Agricultural Extension Center v.v

4.3. Coaching and training of farmers

Training of Farmers (TOF) follows Farmer Field School (FFS):

- Method: Combine theoretical training and base on practical fields of farmers and demonstration model on demonstration IMP in the pilot field;

- Contents are the same as IMP staff training;

- Participants: participating farmers, farmers who direct implement the models and farmers outside if interested;

- Classes are organized in each commune.

- Lecturer: staffs attended TOT classes

4.4. Evaluate and visit the field based on demonstration models and field applied of IPM following the models of farmers

Visit the coast conference, farmers performing the demonstration models are reporters. The farmers implement the model directly with the participants; visiting farmers will calculate, compare economic performance and identify lessons, limitations and the work being done and not being done

4.5. Scientific Seminar, evaluation of result and exchange of experience and information, expand the model
Invite experts in related fields participating in the assessment, analysis and additional evaluation, perfecting the processes; the mass media, the propaganda extension organization, expansion and transfer the result, the technical advances to farmers, and production areas with similar conditions

5. The expected results and activities of the project

The project is expected to achieve the following results:

- The risk of food safety and the environment are minimized through the implementation of existing regulations in business management and use of plant protection products and other provisions in national policy and the implementation.
- The capacity of the provincial PPD, farmer trainers are enhanced meeting training work, IPM training and IPM practice advocacy are maintained.
- Support for farmer groups after learning IPM to continue experiment to determine the application technical advances more effectively in production and popular in the community.
- Support for strengthening commune locality, strengthening pesticide management including the implementation and enforcement of legislation controlling plant protection products. Construction and distribution of a short list of specific plant protection products proposed use for rice and safe vegetables production.

6. Implementation of IPM programs

Currently, Vietnam is implementing the national IPM program, so sub-projects requires coordinated planning and integration of the IPM program of the project with the National IPM program to perform more effectively within of each sub-project.

- Central Project Office (CPO):
  - Guide subprojects in building program of integrated pest management IPM
  - Responsible for overall supervision and monitoring progress of the IPM program of subprojects.

- Provincial Project Management Unit PPMU:
  - Developing and implementing IPM program
  - To be responsible for the preparation of periodic reports on the implementation and submitting to CPO, WB. Final plan and budget will be completed and discussed with the CPO. All documents will be stored in the project file.

- Sub-Department of Plant Protection (BVTV):
  - Provide policy and technical guidelines for the implementation of the IPM program.
  - Join in IPM model building
  - Join coaching and staff training IPM

- Plant Protection Station at district level
  - Coordinate with IPM staff to implement coaching and trained of farmers implemented IPM through the approach and provide of knowledge, support for of farmers on the safe use of pesticides when necessary.
  - Guide the list of banned pesticides
  - Examine the distribution facility providing pesticides to ensure the provision of safe pesticides for farmers

- People's committee at commune level
Organizing for farmers decided to maintain the routine IPM was formed from a training course by organizing IMP-clubs or groups of farmers with the different levels of organization and structure, along with many activities (including the integration of the contents of cattle, credit, market access, etc.)

- Households in the project area:
  - Implementing IPM program has trained
  - The members of the IPM club support together to develop agricultural activities. They also play a central role in the task of organizing community IPM program and general agricultural planning of commune and district as well.

- Environmental Safety Monitoring Consultant
  - Monitoring the implementation of IPM program of sub-projects
  - Guides local PMU in the implementation
  - To recommend measures to improve the efficiency of implementation of IPM program of sub-projects

7. Funds for implementation of IPM program

Funding estimates of the sub-projects implement IPM program includes the following categories:

(i) Funds for research and initial testing

(ii) Funds for Building of demonstration models

(iii) Funds for coaching and IPM staff training: Calculated for the classes held in each district = unit price x number of district of each sub-project

(iv) Funds for coaching and training of farmers: Calculated for the organization of class in each commune = unit price x number of commune in each sub-project

(v) Funds held assessment and the shore tours based on demonstration models and field applying IPM following models of farmers. Each district held a conference for shore tours in 1 day

(vi) Scientific conference, evaluating results, information and experiences exchange, expanding the model. Each District held a scientific conference