

**PEOPLE’S COMMITTEE OF HAU GIANG PROVINCE  
PEOPLE’S COMMITTEE OF VI THANH CITY**

**SCALING UP URBAN UPGRADING PROJECT  
SUBPROJECT OF VI THANH CITY, HAU GIANG  
PROVINCE  
(Draft Final)**

**ENVIRONMENTAL  
AND SOCIAL IMPACT ASSESSMENT**

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ASSESSMENT**

*(Draft Final)*

**SCALING UP URBAN UPGRADING PROJECT  
VI THANH CITY SUB-PROJECT, HAU GIANG  
PROVINCE**

**PROJECT OWNER**

**PEOPLE COMMITTEE OF VI  
THANH CITY**

**CONSULTANT**

**INTERNATIONAL ENGINEERING  
CONSULTANT JOINT STOCK COMPANY  
(INTEC)**

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## **TABLE OF CONTENTS**

<b>TABLE OF CONTENTS .....</b>	<b>ii</b>
<b>ABBREVIATIONS.....</b>	<b>ix</b>
<b>CHAPTER 1: INTRODUCTION AND PROJECT DESCRIPTION .....</b>	<b>1</b>
<b>1.1. BACKGROUND AND OBJECTIVES OF SCALING UP URBAN UPGRADING PROJECT .....</b>	<b>1</b>
1.1.1. General Background of Scaling Up Urban Upgrading Project.....	1
1.1.2. Project objectives .....	2
1.1.3. Project components.....	2
<b>1.2. BASIC OF LAWS, LEGISLATIONS AND REGULATIONS .....</b>	<b>3</b>
1.2.1. National Regulations and Technical Basic .....	3
1.2.2. Safeguards Policies and Guidelines of WB .....	6
<b>1.3. DECRPTION of VI THANH CITY SUBPROJECT.....</b>	<b>7</b>
1.3.1. Vi Thanh Sub-project location.....	7
1.3.2. Detailed Description on Vi Thanh sub-project investments .....	8
1.3.3. Construction methods .....	11
1.3.3. List of machinery and equipment .....	12
1.3.4. Demand for raw materials, fuel and disposal site .....	14
1.3.5. Project area of influence .....	17
1.3.6. Implementation arrangement .....	17
<b>1.4. METHODS APPLIED IN THE ESIA .....</b>	<b>19</b>
<b>CHAPTER 2. NATURAL, ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS IN PROJECT AREA .....</b>	<b>21</b>
<b>2.1. GEOGRAPHICAL CONDITIONS .....</b>	<b>21</b>
2.1.1. Geographical and topological condition .....	21
2.1.2. Climate condition, hydrographic and oceanographic conditions .....	22
2.1.3. Natural Resources .....	24
<b>2.2. EXISTING ENVIRONMENTAL QUALITY IN THE PROJECT AREA.....</b>	<b>27</b>
2.2.1. Air quality .....	28
2.2.2. Surface water quality .....	31
2.2.3. Ground water quality .....	35
2.2.4. Wastewater quality .....	35
2.2.5. Soil quality .....	36
2.2.6. Sediment quality .....	37
2.2.7. Aquatic environmental quality.....	39
<b>2.3. SOCIO - ECONOMIC CONDITIONS .....</b>	<b>41</b>

2.3.1. Economic Development Situation .....	41
2.3.2. Social Conditions .....	42
<b>2.4. INFRASTRUCTURE CONDITIONS .....</b>	<b>48</b>
2.4.1. Transport System .....	48
2.4.2. Water Supply System.....	49
2.4.3. Solid Waste Collection and Treatment .....	50
2.4.4. Power System .....	50
2.4.5. Drainage and Sewage Treatment .....	50
<b>2.5. NATURAL AND SOCIAL CONDITIONS OF THE PROJECT AREAS .....</b>	<b>51</b>
2.5.1. Existing conditions of Component 1 locations – Low-income areas (LIAs) .....	52
2.5.2. Existing conditions of items of Component 2 – Primary, secondary infrastructure upgrading .....	55
2.5.3. Existing conditions of items of Component 3 – Resettlement area in Ward 4 and Vi Tan Commune.....	63
<b>2.6. PHYSICAL CULTURE RESOURCES AND SENSITIVE POINTS.....</b>	<b>63</b>
2.6.1. Physical culture resources.....	63
2.6.2. Sensitive structures .....	65
<b>CHAPTER 3. ANALYSIS OF ALTERNATIVES .....</b>	<b>69</b>
<b>3.1. “WITHOUT PROJECT” ALTERNATIVE .....</b>	<b>69</b>
<b>3.2. “WITH PROJECT” ALTERNATIVES.....</b>	<b>70</b>
3.2.1. Component 1 – Upgrading level-3 infrastructure .....	70
3.2.2. Alternatives of embankment designs .....	72
3.2.3. Alternatives of Tam Giac lake’s designs .....	74
<b>CHAPER 4. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT .....</b>	<b>76</b>
<b>4.1. ENVIRONMENTAL IMPACT ASSESSMENT .....</b>	<b>76</b>
4.1.1. Positive impacts:.....	76
4.1.2. Negative impacts.....	76
4.1.3. Impact assessments for Component 1 – upgrading tertiary infrastructure .....	80
4.1.3.1. Component 1: Impacts during Preparation.....	80
4.1.3.2. Component 1: Impact Assessment during Construction .....	80
4.1.3.2.1. Component 1: Generic Impacts during construction.....	81
4.1.3.2.2. Component 1: Site –specific impacts during construction .....	92
4.1.3.3. Component 1: Impacts during Operation .....	93
4.1.4. Impacts of Component 2 – Prioritized primary and secondary infrastructure items .	94
4.1.4.1. Component 2: Impacts during Preparation.....	94
4.1.4.2. Component 2: Impacts during Construction.....	94
4.1.4.2.1. Component 2: Generic impacts during construction .....	94

4.1.4.2.2. Component 2: Site-specific Impacts during Construction.....	107
4.1.4.3. Component 2: Impacts during Operation .....	113
4.1.5. Impacts of Component 3 – Resettlement area .....	115
<b>4.2. SOCIAL IMPACT ASSESSMENT .....</b>	<b>115</b>
4.2.1. Positive Impacts .....	116
4.2.2. Negative Impacts .....	118
<b>4.3. CUMULATIVE IMPACT ASSESSMENT.....</b>	<b>120</b>
<b>CHAPTER 5. ENVIRONMENTAL AND SOCIAL MITIGATION MEASURES .....</b>	<b>121</b>
<b>5.1. ENVIRONMENTAL IMPACT MITIGATION MEASURES GENERAL.....</b>	<b>121</b>
5.1.1. General principles .....	121
5.1.2. Measures to mitigate environmental impacts in the detailed technical design.....	121
5.1.3. Mitigation Measures During Pre-construction phase .....	122
5.1.4. Mitigation Measures During Construction Phase .....	124
5.1.4.1. Mitigation Measures for Generic Impacts.....	124
5.1.4.2. Site-Specific Mitigation Measures during Construction Phase.....	124
5.1.5. Specific Mitigation Measures During Operation.....	138
<b>5.2. SOCIAL IMPACT MITIGATION MEASURES.....</b>	<b>140</b>
<b>5.3. MEASURES TO MITIGATE CUMULATIVE IMPACTS .....</b>	<b>142</b>
<b>CHAPTER 6. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) 143</b>	
<b>6.1. BASIC PRINCIPLES.....</b>	<b>143</b>
<b>6.2. KEY IMPACT MITIGATION MEASURES .....</b>	<b>143</b>
6.2.1. ECOPS .....	143
6.2.2. Site-specific Impacts and Mitigation Measures.....	159
6.2.3. Management of Impacts on Physical Cultural Resources .....	177
6.2.4. Emergency Procedures .....	177
<b>6.3. SOCIAL ACTION PLAN.....</b>	<b>181</b>
6.3.1. Occupational training foundation .....	181
6.3.2. Supporting internal and external forces for the people.....	181
6.3.3. HIV/AIDS and other sexually transmitted diseases, human trafficking.....	182
6.3.4. Temporary impact mitigation measures .....	182
6.3.5. Gender action plan.....	182
<b>6.4. ENVIRONMENT MONITORING PROGRAM.....</b>	<b>183</b>
6.4.1. Objective and Approach .....	183
6.4.2. Monitoring of Contractor’s Safeguard Performance .....	183
6.4.3. Environmental Quality Monitoring .....	184
6.4.4. Estimated Costs for Environmental Monitoring Program .....	188

6.4.5. Monitoring Effectiveness of the ESMP .....	188
<b>6.5. SOCIAL MONITORING PROGRAM .....</b>	<b>188</b>
<b>6.6. ROLE AND RESPONSIBILITIES FOR ESMP IMPLEMENTATION.....</b>	<b>191</b>
6.6.1. Implementation Arrangement.....	191
6.6.2 Environmental Compliance Framework.....	193
6.6.3. Estimated Costs for Each Work of Environmental Protection Measures.....	197
6.6.4. Responsibilities for the implementation(mục này to lên).....	197
<b>6.7. CAPACITY BUILDING PROGRAM.....</b>	<b>197</b>
<b>6.8. TOTAL ESTIMATES.....</b>	<b>199</b>
<b>6.9. GRIEVANCE REDRESS MECHANISM (GRM) .....</b>	<b>200</b>
<b>CHAPTER 7. PUBLIC CONSULTATION .....</b>	<b>204</b>
<b>7.1. PUBLIC CONSULTATION PROCESS .....</b>	<b>204</b>
<b>7.2. PUBLIC CONSULTATION RESULTS .....</b>	<b>205</b>
7.2.1. The first public consultation .....	205
7.2.2. The results from the second public consultation .....	208
<b>7.3. RESPONSES AND COMMITMENTS OF SUBPROJECT OWNER.....</b>	<b>210</b>
<b>7.4. INFORMATION DISCLOSURE .....</b>	<b>210</b>
<b>CHAPTER 8. CONCLUSIONS, RECOMMENDATIONS AND COMMITMENTS</b>	<b>211</b>
<b>8.1. CONCLUSIONS.....</b>	<b>211</b>
<b>8.2. RECOMMENDATION .....</b>	<b>212</b>
<b>8.3. COMMITMENT OF IMPLEMENTATION.....</b>	<b>212</b>
<b>APPENDIX 1 - VI THANH DREDGED MATERIALS MANAGEMENT PLAN.....</b>	<b>214</b>
<b>APPENDIX 2 - DUE DILIGENCE REVIEWS.....</b>	<b>220</b>

## **LIST OF TABLES**

Table 1.1: Key investment items of Vi Thanh Sub-project.....	8
Table 1.2: List of equipment, machines use for project .....	13
Table 1.3: The list and quantity of raw materials used for projects .....	14
Table 1.4: Location and distance sourcing raw materials .....	15
Table 1.5: Solid waste and sediments generated from construction work .....	15
Table 2.1: The number of monitoring samples in project .....	27
Table 2.2: Results on air quality monitoring .....	29
Table 2.3: Position of Sampling surface water quality.....	31
Table 2.4: Analytical results of surface water samples .....	33
Table 2.5: Sampling positions of Underground water quality .....	35
Table 2.6: Analytical results of underground water samples .....	35
Table 2.7: Sampling positions of wastewater quality.....	35
Table 2.8: Analytical results of waste water samples.....	36
Table 2.9: Analytical results of soil samples.....	36
Table 2.10: Sampling positions of sediment quality .....	37
Table 2.11: Analytical results of sediment samples .....	38
Table 2.12: Sampling positions of aquatic environmental quality .....	39
Table 2.13: Analytical results of Aquatic environmental quality.....	39
Table 2.14: Physical and sensitive locations of “LIA 1 Upgrading” item .....	64
Table 2.15: Sensitive locations in the project area .....	65
Table 3.1: Alternatives analysis of “with” and “without project” scenario.....	70
Table 3.2: Alternatives for widening alleys in LIAs .....	71
Table 3.3: Alternatives for the structure of embankment for Cai Nhuc and 62 canals .....	73
Table 3.4: Alternatives for technical designs for green park item, combining with Tam Giac lake’s landscape.....	74
Table 4.1: Level of potential negative impacts of Vi Thanh subproject .....	77
Table 4.2: Volume of demolition, excavation, backfilling activity in LIAs in component 1... 81	81
Table 4.3: Dust emission from demolition, excavation, backfilling activity .....	82
Table 4.4: Load of dust regeneration from transportation of demolition materials, backfilling, excavation activities in LIA areas .....	83
Table 4.5: Subjects and impact scale of dust emission from excavation and backfilling activity in LIAs.....	84
Table 4.6: Noise levels of some types of transportation vehicles and construction machineries .....	84
Table 4.7: Subjects and scope of impacts by noises of construction vehicles/machineries of Component 1 .....	86

Table 4.8: Pollution factors and volumes of pollutant in wastewater (before treatment) of the LIAs .....	87
Table 4.9: Concentration of pollutants in construction wastewater .....	87
Table 4.10: Total volume of overflow storm - water at construction locations of Component-1 .....	88
Table 4.11: Volume of and Concentration of pollutants in WW generated by machinery maintenance .....	89
Table 4.12: Generated solid waste volume of each work item.....	90
Table 4.13: Generated Hazardous waste .....	91
Table 4.14: Volume of demolition, excavation, backfilling of Component 2.....	95
Table 4.15: Dust emission by demolition, excavation and filling activities of Component 2.....	95
Table 4.16: Location/area of sensitivity to generated dust of excavation, filling activities under Component 2 .....	97
Table 4.17: Dust emission generated by transportation of excavation, levelling, demolition and dredging materials of Component 2.....	97
Table 4.18: Fuel consumption rates and exhaust gas volumes of demolition, excavation, filling and dredging activities of Component 2.....	98
Table 4.20: Locations/areas of sensitivity to generated noises of Component’s construction vehicles/machineries.....	101
Table 4.22: Concentration of pollutants in domestic WW (before treatment) .....	102
Table 4.24: Concentration of pollutants in storm-water.....	103
Table 4.25: Total volumes of overflow storm-water at construction sites of Component 2....	103
Table 4.26: Locations/areas susceptible to impacts of WW.....	104
Table 4.27: Generated solid waste volume of each work item.....	105
Table 4.28: Hazardous solid waste of Component 2’s items .....	106
Table 4.29: Positive Social Impacts in the Project Area .....	117
Table 4.30: Positive Social Impacts in the Project Area .....	118
Table 6.1: Environmental Codes of Practices for addressing general construction impacts (ECOPs).....	144
Table 6.2: Site-specific impacts and mitigation measures .....	160
Table 6.4: Social impact mitigation measures.....	182
Table 6.5: Location, parameters and frequency of monitoring .....	184
Table 6.6: Summary of number of monitoring samples.....	188
Table 6.7: Monitoring costs.....	188
Table 6.8: Proposed social monitoring program for Soc Trang city subproject.....	189
Table 6.9: Roles and responsibilities of key parties .....	191
Table 6.10: Regular Reporting Requirements .....	196
Table 6.11: Costs for environmental protection items .....	197



Table 6.16: Advanced training program on environmental monitoring management capacity ..... 198

## **LIST OF FIGURES**

Chart 1.1: Administrative maps of Vi Thanh City ..... 8

Chart 2.1: Hydrological map of Vi Thanh city..... 23

Chart 2.2: Existing LIA 1 and LIA 2..... 53

Chart 2.3: Some photos of LIA 1 and LIA 2 ..... 53

Chart 2.4: Existing LIA 3 ..... 54

Chart 2.5: Some photos of LIA 3 ..... 54

Chart 2.6: Existing LIA 7 ..... 55

Chart 2.7: Some photos of LIA 7 ..... 55

Chart 2.8: Existing Nguyen Hue Road..... 57

Chart 2.9: Some photos of Nguyen Hue Road ..... 57

Chart 2.10: Existing 01/05 Road ..... 58

Chart 2.11: Some photos of 1/5 Road ..... 58

Chart 2.12: Existing Cai Nhuc Canal embankment area ..... 60

Chart 2.13: Some photos of Cai Nhuc Canal embankment area ..... 60

Chart 2.14: Existing Canal 62..... 61

Chart 2.15: Some photos of Canal 62 area ..... 62

Chart 2.16: Existing Tam Giac Lake ..... 62

Chart 6.1: Chance-finding procedure in case of archeological artifacts found during the project construction. .... 177

## **ABBREVIATIONS**

Ahs	Affected Households
CC	Climate change
AC	Asphalt concrete
CeC	Cement concrete
CMC	Construction monitoring consultant
DED	Detailed engineering design
DOC	Department of Construction
DOF	Department of Finance
DONRE	Department of Natural Resources and Environment
DOT	Department of Transport
DPI	Department of Planning and Investment
DD	Detailed Design
MKD	Mekong detail
EIA	Environmental impact assessment
ESIA	Environment and Social Impact Assessment
ECOP	Environmental Code of Practice
EMC	External Monitoring Consultant
EMP	Environmental Management Plan
EMS	Environmental monitoring system
FS	Feasibility study
LIA	Low-income area
MOC	Ministry of Construction
MUDP	Management of Urban Development under Urban Development Agency
NUUP	National urban upgrading program
ODA	Official Development Assistance
PPMU	Project Management Unit
PPU	Project Preparation Unit
PSC	Project Steering Committee

RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
RP	Resettlement Plan
P/CPC	Provincial/City People’s Committee
UDA	Urban Development Agency
URENCO	Urban Environment Company
WB	World Bank

## CHAPTER 1: INTRODUCTION AND PROJECT DESCRIPTION

### 1.1. BACKGROUND AND OBJECTIVES OF SCALING UP URBAN UPGRADING PROJECT

#### 1.1.1. General Background of Scaling Up Urban Upgrading Project

The Vietnamese part of the Mekong Delta (MRD) covers about 3.9 million hectares and is home to about 17.5 million inhabitants (accounting for 20% of the national population). The area is bounded with My Tho to the east, Chau Doc and Ha Tien in the northwest, Ca Mau in the southernmost tip. The delta is situated in the low lying area with the base elevation of only about 0.8 m above the mean sea level with a dense river and canal network. The two main branches of the Mekong River are Tien (Mekong) and Hau (Bassac) running through the areas out to the East Sea. The key economic driver for the region is agriculture production including paddy rice, fruit planting and aquaculture based on the fertile land and diversified livelihood options. Rice, fruits and seafood are among the top national export commodities. It is however, majority of people in the delta is still living in poor conditions. The multi-dimensional poverty rate is approximately 8% in the urban areas, which is rather high compared with other regions, partly due to the lack of infrastructure and basic services.

Like other municipalities across the country, the Mekong Delta region is experiencing a rapid urbanization at a rate of 25%, bringing positive changes to cities in the area. Yet there are more development needed to address current urban challenges, including but not limited to: a) an existence of low income areas (LIAs) b) A boom but without well planned infrastructure c) An asynchronous social and technical infrastructure system; d) A degraded drainage system; e) increasing environmental pollution. The situation in Mekong Cities is worsened by the imminent climate change threats, namely drier dry season and wetter wet season, extreme weather events, saline intrusion and sea level rising.

Realizing these challenges in the delta, the Government clearly sets out strategic goals to gradually develop and transform urban infrastructure into a system that is synchronous, modern, sustainable and climate resilient; enhance urban connectivity, promote integrated development of the technical and social infrastructure and landscape architecture, use resources efficiently, create a better living environment for residents and gradually close the gap between urban and rural areas. Specifically, the Decision No. 939 MD/QD-TTg dated 19/07/2014 issued by the Prime Minister approves the socio-economic development master plan (SEDP) for the Mekong Delta towards 2020, paving the way for the Mekong Delta to become the economic driving force of the country, having a development-oriented infrastructure and a comprehensive socio economic development system.

Vietnam Government has operated two urban upgrading projects financed through the World Bank during the period from 2004 to 2017, namely the Vietnam Urban Upgrading Project (VUUP) in 4 cities of Nam Dinh, Hai Phong, Ho Chi Minh, and Can Tho and the Urban Upgrading Project in Mekong Delta (MDR-UUP, involving 6 cities of Can Tho, Cao Lanh, My



Tho, Tra Vinh, Rach Gia and Ca Mau). The project has significantly transformed the urban areas, changing perceptions of urban management and project management for the cities involved. In view of the Government, the upgrading of cities in the Mekong Delta are special priorities as this will increase the city’s resilience and help reduce the city’s vulnerabilities to water related risks.

The proposed Vietnam Urban Upgrading project (SUUP) is in alignment with the Government’s priority, stock taking the ongoing investments and the built up experiences in the areas. The proposed investments are to address the development needs of the cities for upgrading of low income areas, enhancing the city’s connectivity with the construction of roads, bridges, improving environment and sanitation situation and flood prevention and controls with canal dredging, canal embankment, and sewage and drainage system... among others. The construction plan and technology will be based on the specific type of work, specification, construction conditions and construction requirements and will integrate green design where possible. The design and organization of construction will be implemented in accordance with the current Vietnamese construction standards, regulations and norms. The Vietnam Urban Upgrading Project includes 7 subprojects for 07 cities of Bac Lieu, Long Xuyen, Ben Tre, Vinh Long, Vi Thanh, Tan An and Soc Trang. These cities are capital cities of Bac Lieu, An Giang, Ben Tre, Vinh Long, Hau Giang, Long An and Soc Trang provinces respectively.

### ***1.1.2. Project objectives***

The proposed project development objective is to improve access to infrastructure in priority city areas and improve urban planning in the participating cities.

### ***1.1.3. Project components***

The project comprises of 4 sub-components, as described below:

The project comprises of 4 sub-components, as described below:

#### ***Component 1: Tertiary Infrastructure Upgrading in Low Income Areas (US\$ 39.9 million)***

The Project will support tertiary investments in about 30 LIAs, covering about 650 ha, including: (i) construction, rehabilitation, and upgrading of roads and lanes; (ii) construction and rehabilitation of drains; (iii) improvements to environmental sanitation by rehabilitating or constructing public sewers, constructing septic tanks, providing access to septic management services, and house connections to public sewers; (iv) improvement of water supply including the installation of metered domestic connections; (v) provision of metered domestic connections for electricity and public lighting in residential lanes and streets; and (vi) construction and rehabilitation of social infrastructure facilities such as schools, markets, community halls, public places and green spaces.

The package of tertiary investments in each LIA is determined in conjunction with a Community Upgrading Plan (CUP) which is based on extensive community consultations and social surveys to identify priority investments. Investments are designed with flexible standards and attention to universal accessibility, and are screened to minimize social and environmental impacts. Inundation solutions at the tertiary investments are aligned with recommendations from the hydraulic modelling at the primary and secondary scale. The consultation process and updating of CUPs will continue throughout the project life, from upstream identification through to construction.

#### ***Component 2 – Priority Primary and Secondary Infrastructures (US\$ 148.6 million)***

Component 2 provides support to improve priority networked infrastructure in line with the broader city development agenda, and with a view to increasing connectivity of primary and secondary infrastructure with tertiary infrastructure in LIAs. Social infrastructure facilities such

as markets, community halls, public places, schools and green spaces will also be included to benefit urban poor, where needed. An initial hydraulic model will be developed for the catchment areas of the upgrading sites and integrated with existing urban plans for flood and salinity intrusion control, drainage, and waterways investments. Investments that increase urban connectivity of roads and drainage networks are prioritized to encourage compact urban development and reduce flood risk within the core city and particularly for populations living in LIAs.

### ***Component 3 – Resettlement Sites***

This component will include the construction of resettlement areas for affected persons, including construction of primary, secondary and tertiary infrastructure and public facilities. An estimated 1,900 households will be resettled across the seven project cities.

### ***Component 4 – Implementation Support and Capacity Building (US\$ 3.2 million)***

The physical investments of the project will be complemented by a Technical Assistance (TA) package under Component 4, which is intended to provide implementation support as well as enhance the cities' capacity to manage urban development in a risk informed manner, thereby reinforcing urban resilience..

## **1.2. BASIC OF LAWS, LEGISLATIONS AND REGULATIONS**

### ***1.2.1. National Regulations and Technical Basic***

#### ***a) Law and Legislative Documents***

Law on Environmental Protection No. 55/2014/QH13 passed by the National Assembly on 23 June 2014 and took effect since 01 January 2015;

Construction Law No. 50/2014/QH13 issued on 18 June 2014 and took effect since 01 January 2015;

Land Law No. 45/2013/QH13 passed by the National Assembly of the Socialist Republic of Vietnam on 29 November 2013 and took effect since 01 July 2014;

Law on Water Resources No. 17/2012/QH13 passed by the National Assembly on 21 June 2012;

Labour Law No. 10/2012/QH13 passed by the National Assembly of the Socialist Republic of Vietnam XIII on 18/06/2012;

Urban Planning Law No. 30/2009/QH12 passed by the National Assembly of the Socialist Republic of Vietnam XII on 6/17/2009;

Biodiversity Law No. 20/2008/QH12 passed by the National Assembly of the Socialist Republic of Vietnam XII on 11/13/2008;

Law on amending and supplementing some articles of the Law on Fire Prevention 40/2013/QH13 passed by the National Assembly of the Socialist Republic of Vietnam XIII on 11/11/2013.

Standards and Regulations Law No. 68/2006/QH11 passed by the National Assembly of the Socialist Republic of Vietnam XI on 6/29/2006;

Law on Protection of People's Health 21/ LCT/HDNN was the National Assembly of the Socialist Republic of Vietnam VIII, adopted on 30/06/1989.

Decree No. 59/2015/ND-CP of 18 June 2015 of the Government on management of construction investment projects;

Decree No. 18/2015/ND-CP of 14 February 2015 of the Government on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plans;

Decree No.19/2015/ND-CP of 14 February 2015 of the Government detailing the implementation of a number of articles of the Law on Environmental Protection;

Decree No. 38/2015/ND-CP of 24 April 2015 of the Government on management of waste and discarded materials;

Decree No. 43/2014/ND-CP of 15 May 2014 of the Government detailing the implementation of a number of articles of the Land Law;

Decree No. 47/2014/ND-CP of 15 May 2014 of the Government on compensation, support and resettlement when the State recovers land;

Decree No. 80/2014/ND-CP of 06 August 2014 of the Government on drainage, and wastewater treatment and took effect since 01 January 2015;

Decree No. 59/2007/ND-CP of 09 April 2007 of the Government on solid waste management;

Circular No. 27/2015/TT-BTNMT of 29 May 2015 of the Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment and environmental protection plans;

Circular No. 36/2015/TT-BTNMT of 30 June 2015 on harmful waste management;

Circular No. 32/2013/TT-BTNMT of 25 October 2013 of the Ministry of Natural Resources and Environment on the issuance of national technical regulations on environment;

Circular No. 22/2010/TT-BXD of 03 December 2010 of the Ministry of Construction on labor safety in work construction;

Circular No. 16/2009/TT-BTNMT and 25/2009/BTNMT of the Ministry of Natural Resources and Environment on the issuance of National technical regulations on environment;

Decision No. 02/2009/TT-BTNMT dated 19 March 2009 of the Ministry of Natural Resources and Environment on the assessment of capacity to receive wastewater of water sources;

***b) Applicable Vietnam’s Technical Standards and Regulations***

The ESIA assessment makes reference to the following technical standards and norms:

❖ Water quality:

QCVN 01:2009/BYT - National technical regulation on drinking water quality.

QCVN 08:2015/BTNMT - National technical regulation on surface water quality.

QCVN 09:2015/BTNMT - National technical regulation on underground water quality.

QCVN 14:2008/BTNMT - National technical regulation on domestic wastewater.

QCVN 40:2011/BTNMT - National technical regulation on industrial wastewater.

QCVN 25:2009/BTNMT - National technical regulation on wastewater of the landfill sites: Permitted maximum concentration of pollution parameters in wastewater of the solid waste landfill sites when discharging into receiving sources.

❖ Air quality:

QCVN 05:2013/BTNMT – Air quality – National technical regulation on ambient air quality.

QCVN 06:2009/BTNMT – Air quality – Permitted maximum concentration of hazardous substances in ambient air.

TCVN 6438:2001 - Road traffic means - Permitted maximum level of exhaust gas.

❖ Quality of soil and sediment

QCVN 03:2015/BTNMT – Soil quality - National technical regulation on the allowable limits of heavy metals in the soils.

QCVN 15:2008/BTNMT - Soil quality - National technical regulation on the pesticide residues in the soils.

QCVN 43:2012/BTNMT - National technical regulation on sediment quality in fresh water areas.

❖ Noise and vibration

QCVN 26:2010/BTNMT - National technical regulation on noise.

TCVN 5948:1999 - Acoustic - Noise emitted by accelerating road vehicles - Permitted maximum noise level.

QCVN 27:2010/BTNMT - National technical regulation on vibration.

❖ Water supply and drainage

TCVN 7957:2008 - Drainage and sewerage - External Networks and Facilities - Design Standard.

TCXDVN 33:2006 - Water Supply - Distribution System and Facilities. Design Standard.

❖ Labor safety and health

Decision No. 3733/2002/QĐ-BYT dated 10 October 2002 on application of 21 standards on safety and health.

***c) Legal documents related to the project***

Decree No. 16/2016/ND-CP dated 03/16/2016 of the Government on the management and use of official development assistance (ODA) and preferential loans from foreign sponsors.

Decree No. 59/2015/ND-CP dated 18/06/2015 of the Government on management of construction investment projects.

Decision No. 758/QĐ-TTg dated 8/6/2009 of Prime Minister - Program urban upgrading the period from 2009 to 2020.

Decision 1659 / QĐ-TTg dated 11/07/2012 of the Prime Minister to approve the program on the national urban development the period 2012-2020;

Decision 445/QĐ-TTg dated 07/4/2009 of the Prime Minister to approve the readjusted overall planning orientations for development of urban system in Vietnam to 2025 and vision to 2050

Decision No. 2623 / QĐ-TTg dated 31/12/2013 of the Prime Minister on approving the project of urban development of Vietnam cope with climate change from 2013 to 2020.

Decision No. 403 / QĐ-TTg, 2014 by the Prime Minister on approving the National Action Plan on green development.

Decision No. 11/2012 / QĐ-TTg dated 10/02/2012 of the Prime Minister on approving the development plan transport key economic zone Mekong Delta region through 2020 and orientations 2030.

Decision No. 1397 / QĐ-TTg dated 25/9/2012 of the Prime Minister on approving irrigation planning Mekong Delta period from 2012 to 2020 and orientations towards 2050 in the context of climate change and sea level rise



Decision No. 1581 / QD-TTg dated 9/10/2009 of the Prime Minister on approving the construction of the Mekong Delta Master Plan to 2020 and vision to 2050;

Decision No. 245 / QD-TTg dated 12/02/2014 of the Prime Minister approving the master plan of socio-economic development of key economic regions Mekong Delta region to 2020 and vision to 2030.

Decision No. 939 / QD-TTg dated 19/7/2014 to the Prime Minister on approving the master plan for socio-economic development in Mekong Delta to 2020

Decision No. 1810 / QD-TTg of October 4, 2013 of the Prime Minister on approving the orientations and criteria used financed by the WB period from 2014 to 2018 and subsequent years.

Decision No. 1496 / QD-TTg dated August 27, 2013 of the Prime Minister on approving the adjustment and supplement of the master plan on socio-economic development of Hau Giang Province through 2020

Decision No. 792/QD-UBND dated May 26, 2016 of Hau Giang People's Committee on approving the adjustment and supplement of the master plan on socio-economic development of Vi Thanh city through 2020.

Memorandum of World Bank working mission on identifying Vietnam urban upgrading projects from 21 to 29 March 2016;

Official letter No...../UBND dated / /2016 of Hau Giang People's Committee on assigning the project owner for Vi Thanh People's Committee.

***d) Documents and data created by project owners***

The FS of SUUP - subproject Vi Thanh City, Hau Giang Province by Vi Thanh People's Committee in association with consultant units.

Basic design drawings of SUUP - subproject Vi Thanh City, Hau Giang Province.

The relevant legal documents by People's Committee of Vi Thanh City offers.

***1.2.2. Safeguards Policies and Guidelines of WB***

According to the Bank Operational Policy on Environmental Assessment OP/BP 4.01 (<http://go.worldbank.org/OSARUT0MP0>), this subproject is classified as a Category A subproject due to its significant impacts related to land acquisition and resettlement issues. Therefore, as per the Bank policy, a full ESIA is required to examine the subproject's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The negative impacts will be mitigated by the application of comprehensive mitigation measures that indicated in the Environmental and Social Management Plan (ESMP) of the Sub-project, including monitoring plan and the requirements of health and safety for construction workers. The implementation of the ESMP will be a requirement for contractors during subproject implementation.

The environmental and social screening for the subproject according to the criteria defined by the Bank's safeguards policies has been carried out, and the result shows that the following WB safeguard policies are triggered for the Vi Thanh subproject:

- Environmental Assessment (OP/BP 4.01)<sup>1</sup>

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<sup>1</sup>Full treatment of OP/BP 4.01 can be found at the Bank website:

- Involuntary Resettlement (OP/BP 4.12) 2
- Natural Habitats (OP/BP 4.04) 3
- Indigenous People (OP/BP 4.10);
- Physical Cultural Resources (OP/BP 4.11) 4 .
- Project on International Waterways (OP/BP 7.50)<sup>5</sup>.

#### *World Bank Group Environmental, Health, and Safety Guidelines<sup>6</sup>*

World Bank-financed projects should also take into account the World Bank Group Environmental, Health, and Safety Guidelines (known as the "EHS Guidelines"). The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice.

The EHS Guidelines contain the performance levels and measures that are normally acceptable to the World Bank Group and are generally considered to be achievable in new facilities at reasonable costs by existing technology. The environmental assessment process may recommend alternative (higher or lower) levels or measures, which, if acceptable to the World Bank, become project- or site-specific requirements. This subproject should conform to the general EHS Guidelines and industry specific EHS Guidelines on Water and Sanitation

### **1.3. DESCRIPTION of VI THANH CITY SUBPROJECT**

#### ***1.3.1. Vi Thanh Sub-project location***

Vi Thanh city located at the west of Hau Giang province is the center of the west of Hau river, with geographical coordinates: 105°19' 38" - 105° 30' 11"E; 09° 49' 30" - 09° 40' 49" N. Vi Thanh city is access to the follow areas: The west bordered by Go Quao district, Kien Giang province; the north bordered by Giong Rieng district, Kien Giang province; the east bordering Vi Thuy district; the south bordered by Long Vi province. Vi Thanh city has 09 administrative units including 5 wards and 4 communes. By September 31, 2015, the total population of Vi Thanh was 75.017 persons with total area of 118,6km<sup>2</sup>. The proposed project components are expected to be implemented in 07/09 administrative units of Vi Thanh city, including: I, III, IV, V wards and Vi Tan commune.

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<http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543912~menuPK:1286357~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html>

<sup>2</sup>Detailed description of OP/BP 4.12 is available at the Bank website:<http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543978~menuPK:1286647~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html>

<sup>3</sup>Full description of OP/BP 4.04 is available at <http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543920~menuPK:1286576~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html>

<sup>4</sup> OP/BP 4.11 is accessible at <http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543961~menuPK:1286639~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html>

<sup>5</sup> OP/BP 7.50 is accessible at <http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20544007~menuPK:1286706~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html>

<sup>6</sup>The EHS Guidelines can be consulted at [www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines](http://www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines).



Chart 1.1: Administrative maps of Vi Thanh City

### 1.3.2. Detailed Description on Vi Thanh sub-project investments

The project includes 4 components: (1) Upgrading Tertiary Infrastructure in low income area; (2) Construction and upgrading primary and secondary infrastructures; (3) Resettlement area; (4) Technical assistance and implementation support. The main investment items of Vi Thanh sub-project are showed in table 1.2.

Table 1.1: Key investment items of Vi Thanh Sub-project

No.	Vi Thanh investment item	Description
1	Component 1	<b>Upgrading tertiary infrastructure systems of the four LIAs (1, 2, 3, 7) (total area of 75.00ha; 7,732 HH members)</b>
	Upgrading infrastructure systems of LIAs 1, 2, 3, 7	Investment items are: <ul style="list-style-type: none"> <li>- Expanding the key alleys of 3 – 4m wide into concrete alley roads with minimum width of 4 m and total length of 13,052 km;</li> <li>- Upgrading existing branch alleys of 2 – 3 m wide into concrete alley with total length of 0.5 km;</li> <li>- Dredging small canals in LIA 3 and LIA of total 3.94 km long</li> <li>- Installing round concrete culvert system, D=400-600 , L=1.92 km;</li> <li>- Installing water supply pipelines (D63) with total length of 13.6 km;</li> <li>- Providing light system and trash bins</li> </ul>
2	Component 2	<b>Prioritized primary and secondary infrastructure systems</b>

No.	Vi Thanh investment item	Description
2.1	Upgrading Nguyen Hue Road	<p>Investment items are:</p> <ul style="list-style-type: none"> <li>- Upgrading Nguyen Hue Road with total length of 2.3 km consisting of 3 sections: <ul style="list-style-type: none"> <li>(i) Section 1: from Diem Tua Canal to Xa No Bridge, with total length of 1.5km and width of 10.5 m (7 m of road-bed and 3 m of sidewalk)</li> <li>(ii) Section 2: From Hau Giang Provincial Party Committee to Canal 62, with total length of 0.43 km and width of 23 m (15 m of road-bed and 8 m of sidewalk)</li> <li>(iii) Section 3: From Tac Huyen Phuong Canal to Ba Huyen Canal, with total length L= 0.38 km and width of 13.5 m (7.5 m of road-bed and 6.0 m of sidewalks)</li> </ul> </li> <li>- Constructing separate drainage system along the road consisting of storm-water drainage system (RC, D600, 2.3 km long) and wastewater collection system (UPVC 220, 2.3k m long)</li> <li>- Constructing light system and tree planting</li> </ul>
2.2	Rehabilitating Muong Lo Canal and construction 01/05 Road	<p>Investment items are:</p> <ul style="list-style-type: none"> <li>- Dredging Muong Lo Canal from existing depth of 1.1m to design depth of 2.5 m, with existing width of 22 m and length of 2.3 km</li> <li>- Construction of Muong Lo Canal embankment on the side of 01/05 Road with the combined soft and hard structure <ul style="list-style-type: none"> <li>(i) Reinforced concrete embankment foot of 2.0 m wide, and 0.3m thick reinforced underneath using timber sheet piles;</li> <li>(ii) Stone embankment section at the lower part with trapezoidal shape: 1.2 m high; lower side of 1.4 m wide, upper side of 0.2 m wide; non-base side has slope of 1:1 and width of 1.2 m. Reinforced beams of 0.2 m x0.2 m is above embankment wall.</li> <li>(ii) Earth embankment section at the upper part, with slope of 1:1, height of 1.2m, width of 1.2 m and grass grown above</li> </ul> </li> <li>- Construction of 1/5 road of 2.6 km long, 13.5 m wide (road-bed 7.5 m and sidewalks 3 m each side); construction of technical infrastructures for the road: lighting, tree planting, storm water concrete drainage pipes along two sides of the road with D=600, 5.2 km, wastewater pipelines of UPVC 2.6 km long</li> </ul>
2.3	Rehabilitating Cai Nhuc Canal	<p>Investment items are:</p> <ul style="list-style-type: none"> <li>- Dredging Cai Nhuc Canal from existing depth of 0.4 m to design depth of 2.5 m with existing width of 18-20 m and length of 2.4 km;</li> <li>- Constructing embankment for Cai Nhuc Canal with the soft structure <ul style="list-style-type: none"> <li>(i) The trench part is built of rubble gabions (2x1x0.5m) reinforced underneath using cajeput sheet piles (16 piles/m2)</li> <li>(ii) Soft embankment part is built of eco-soil mixed with grass seeds with height of 1.5 m, slope of 1:1.5 and width of 2.25 m</li> <li>(iii) The green part above soft embankment of 0.46 m high, 0.92 m wide, slope of 1:1.2 and trees planted above</li> </ul> </li> <li>- Constructing, rehabilitating roads on embankment sides: <ul style="list-style-type: none"> <li>(i) Rehabilitating Tran Ngoc Que earth road on the left side into asphaltic road on existing base of 7m, with sidewalk on residential house side of 3m wide and sidewalk on embankment side of 8 m wide, total length of 1.9 km</li> <li>(ii) Constructing asphaltic road on the right side with total length of</li> </ul> </li> </ul>

No.	Vi Thanh investment item	Description
		<p>1.6 km, width of 4 m, sidewalk on embankment side 3m wide</p> <ul style="list-style-type: none"> <li>- Constructing drainage systems for these two roads: (i) storm-water drainage system (RC D600 3.4km long); (ii) wastewater collection system (UPVC 220, 3.4 km long)</li> <li>- Constructing light systems and tree planting trees along the roads</li> </ul>
2.4	Upgrading Canal 62 and Le Hong Phong Road	<p>Investment items are:</p> <ul style="list-style-type: none"> <li>- Dredging Canal 62 from existing depth of 1.7m to design depth of 2.5m based on existing width of 22 m and length of 2.3 km;</li> <li>- Constructing embankment for two banks of Canal 62 with the soft structure, total length of 2.3 km: <ul style="list-style-type: none"> <li>(i) The trench part is built of rubble gabions (2x1x0.5m) reinforced underneath using cajeput sheet piles (16 piles/m2)</li> <li>(ii) Soft embankment part is built of eco-soil mixed with grass seed, with height of 1.5 m, slope of 1:1.5 and width of 2.25 m</li> <li>(iii) The green part above soft embankment with height of 0.46 m, width of 0.92 m, slope of 1:1.2, and trees planted above</li> <li>(iv) On rightside there’s a combined greenery stripe and flower beds 2m wide acting as the protective corridor for the embankment</li> </ul> </li> <li>- Constructing asphaltic operation roads on embankment sides with width of 3.0 – 4.0 m and length of 4.4 km;</li> <li>- Upgrading existing 7 m wide Le Hong Phong concrete road nearby the operation road on the left of the embankment,- into asphaltic road of total 2.2 km long, and 20 m wide (roadbed of 9 m wide, sidewalk on residential side of 3m wide and sidewalk of embankment side of 6m wide). Provision of road infrastructure: drainage pipeline (UPVC D200, 2.2km long); tree planting, lighting.</li> </ul>
2.5	Rehabilitating Tam Giac Lake	<p>Investment items are:</p> <ul style="list-style-type: none"> <li>- Dredging Tam Giac Lake with total area of 3.0 ha from existing depth of 1.4 m to design depth of 2.5m;</li> <li>- Constructing embankment around the lake with the combined soft and hard structure with total length of 0.76 km; <ul style="list-style-type: none"> <li>(i) Reinforced concrete embankment foot of 2.0 m wide, 0.3 m thick reinforced underneath using timber sheet piles.</li> <li>(ii) The stone embankment section at the lower in trapezoidal shape: 1.2 m high, lower side of 1.4 m wide, and upper side of 0.2 m wide, non-base side has 1:1 slope and width of 1.2 m. Reinforced beams of 0.2 m x0.2 m is above embankment wall.</li> <li>(iii) The earth mbankment section at the upper of 1.2 m high, slope of 1:1, width of 1.2 m, and grass grown above.</li> </ul> </li> <li>- Constructing asphaltic operation road around the lake with total length of 0.76 km and total width of 3 m;</li> <li>- Constructing drainage system along operation road consisting of reinforced concrete storm-water drainage pipe( D600, 0.76 km long) and wastewater collection system (UPVC 220; 0.764 km long);</li> <li>- Constructing light system and green area 5m wide around the lake;</li> </ul>
<b>3</b>	<b>Component 3</b>	<b>Resettlement area</b>
	Resettlement area	The subproject will not construct but use existing resettlement areas:

### **1.3.3. Construction methods**

Component 1, Component 2 and Component 3 focus on the construction of connecting roads and embankments. Construction methods of these items are summarized below.

#### **➤ Road construction methods**

The road construction measure includes the following steps:

##### **1. Preparation**

Positioning and localizing works;  
Preparing construction site and workers camps;  
Mobilizing machineries and equipment.

##### **2. Concrete road construction**

Step 1: Digging and dredging organic soil  
Step 2: Cover ground to standard rigidity in each design layers  
Step 3: Digging the road mold following the width of each segment; placing formwork and pouring cement concrete under the mold.  
Step 4: Drawing formwork => completed.

##### **3. Construction of asphalt concrete layer**

Step 1: Digging and dredging organic soil  
Step 2: Cover ground to standard rigidity in each design layers  
Step 3: Digging the road mold following the width of each segment  
Step 4: Spreading and compacting each soil layer, ballast type 2 and type 1 (within the road) to standard rigidity in design layers.  
Step 5: Drawing formwork => completed.

#### **➤ Embankment construction method**

As presented in Table 1.1, the embankment upgrading will include works as site preparation, dredging canal, dyke embankment and other works behind the dyke (operation roads on both sides, drainage, lighting, trees). The construction measures for these works are presented as follows:

##### **+ Site preparations**

Positioning and localizing works;  
Preparing construction site and workers' camps and site office;  
Mobilizing machinery and equipment;  
Locating temporary area at site to gather dredging sludge.

##### **Dredging**

The dredging is carried out based on a successive basis in the following orders:

Construction of temporary drain system;  
Demarcate construction section on the canal by using melaleuca piles or sand sacks at the two ends of the demarcated section. On average each section is 50-100 m long;  
Dry off the section by water pump in the pile/sack coffer;  
Use specialized equipment combined with manual labor to dry dredge canal to the designed elevation;

Sludge is temporarily gathered in an identified area at site. After sludge volume reduces, transport it by truck to landfill;

Construction of embankment as designed.

Notes: Dredging activities will not be conducted during extreme weather events (heavy rains, floods, cyclones, etc).

### **Construction of concrete embankment and auxiliary works**

#### **Construction of embankment**

- The pilling test

Casting the test pile to the designed length

Excavating foundation to the designed elevation; positioning the test pile

Installing positioning bracket

Driving test pile and determining the length of mass piles

- The mass pilling

Positioning and erecting pile driving machine

Driving piles to the designed elevation

- Construction of embankment

Applying geotextile layer to separate the sand filling and embankment foundation

Constructing sand layers to the designed elevation

Removing the pile shackle, driving pile to the steel bottom of embankment

Pouring the concrete foundation primer

Installing rebar, formwork and the bottom, and the embankment vertical wall

Casting concrete floor and wall embankment

#### **Construction of the on-dyke works**

Constructing drainage system and other underground structures

Installing the embankment fence

Constructing sidewalks, planting flower tubs, lighting systems, decorative lights.

#### ***1.3.3. List of machinery and equipment***

Table 1.3 provides a list of key equipment deployed for construction work. Depending on the nature of work, contractor capacity, weather conditions the use of equipment may vary

**Table 1.2: List of equipment, machines use for project**

No.	Machine	Component 1				Component 2				
		Lia 1	Lia 2	Lia 3	Lia 5	Tam Giac lake	Cai Nhuc canal	Nguyen Hue street	Canal 62	1/5 street
1.	Excavators with one bucket, bucket capacity of 0,8m3	1	1	1	1	3	2	5	3	5
2.	Bulldozers 108 CV	1	1	1	1	3	2	5	3	5
3.	scraper 1,20m3	-	-	-	-	3	-	-	-	-
4.	Self-propelled graders 108CV	1	1	1	1	2	1	4	2	4
5.	Excavator 2m3	1	1	1	1	2	1	4	2	4
6.	Road roller 10T	1	1	1	1	3	2	6	3	7
7.	Wheeled Compactors 16T	-	-	-	-	2	2	3	3	3
8.	Watering Car 5m3	1	1	1	1	2	2	4	3	4
9.	Crane 130T	1	1	1	1	2	2	3	2	4
10.	Mortar mixers	4	4	4	4	4	3	6	6	6
11.	Water pumps	1	1	1	1	3	2	3	3	3
12.	Asphalt machines	-	-	-	-	2	1	3	3	3
13.	Pile presses	-	-	-	-	-	-	1	1	1
14.	Generator	1	1	1	1	1	1	1	1	1
15.	Tipper cars	2	2	2	2	5	3	6	6	8
16.	Bending mowers	3	3	3	3	10	4	8	8	8
17.	Electric welding machines	3	3	3	3	10	2	6	6	6
18.	Welding transformers	1	1	1	1	4	2	2	2	2
19.	Toad compactor	5	5	5	5	5	4	6	5	6
20.	Concrete Drill	3	3	3	3	4	1	2	2	2



### 1.3.4. Demand for raw materials, fuel and disposal site

#### a) Construction materials:

According to the feasibility study report the demand for raw materials used for the construction of subproject investments are presented in the following table 1.4:

**Table 1.3: The list and quantity of raw materials used for projects**

No	Items	Weight					
		Cement (kg)	Sand (m <sup>3</sup> )	1×2 stone (m <sup>3</sup> )	Asphalt (kg)	Macadam type 1 (m <sup>3</sup> )	Macadam type 2 (m <sup>3</sup> )
1.	<i>Lia 01</i>	494.253,54	703,53	1.218,98	47.573,57	-	1.478,00
2.	<i>Lia 02</i>	113.264,41	173,95	292,69	14.468,11	-	285,39
3.	<i>Lia 03</i>	389.304,23	426,70	831,83	-	-	1.250,40
4.	<i>Lia 07</i>	1.671.542,33	1.832,10	3.571,59	-	-	5.368,80
5.	<i>Nguyen Hue road</i>	165.810,15	2.273,03	2.278,16	607.424,72	-	8.062,50
6.	<i>1/5 road</i>	88.689,15	1.215,81	1.218,55	324.901,59	5.805,00	4.312,50
7.	<i>62 canal</i>	57.840,75	651,00	665,90	169.513,88	3.105,00	2.250,00
8.	<i>Cai Nhuc Canal</i>	53.984,70	244,13	303,53	52.739,93	1.620,00	882,00
9.	<i>Tam Giac Lake</i>	28.920,38	219,90	249,89	56.507,06	-	945,00
Total		3.063.609,63	7.740,15	10.631,11	1.273.128,85	10.530,00	24.834,59

#### Supply resources

- Materials such as sand, earth materials and gravel will be purchased from Can Tho An Giang –the nearby provinces.
- Steel will be purchased at factories in Can Tho, Ho Chi Minh city. Cement will be purchased from factories in Kien Giang, Can Tho.
- Hollow brick, solid brick, pavement brick and ceramic tile will be bought in HCM city, Long An, Dong Nai, Binh Duong.

Locations of potential sources, capacities and operation permits are listed in Tables 1.5.

- All the materials shall be tested for the quality according to the current regulations. If the materials do not meet the technical standards, the contractor shall change to the other qualified sources.
- Demands for materials and technical supplies will be in accordance with the construction progress.
- The material supply will take into account the depreciation due to transport and unloading.

**Table 1.4: Location and distance sourcing raw materials**

Parameter	Sand mine	Stone mine	Soil mine
Supplier/Companies (will be identified at later stage)			
Location	Tan Chau of An Giang)	Dong Nai (An Giang)	nearby
Distance from project (km)	10-60	150	
Capacity (m <sup>3</sup> )	2.000to 5.000	2.000to 5.000	2.000to 5.000
Mode of Transportation	Domestic waterway	Domestic waterway	Road
Environmental License	Obtained by supplier	Obtained by supplier	Obtained by supplier

Sand, stone quarries and soil pits are operational since 2009 with permission granted by Dong Nai, An giang PPC. Their supplies are not only for infrastructure projects in Hau Giang but also Dong Nai and An Giang Province. The Vi Thanh subproject does not involve large scale extraction of sand, stone and earth materials, therefore, does not require opening of any new quarry. None of those quarries is an exclusive source for the project.

### Power supply

Power will be supplied via the national grid which is an easy access to the project area. Back-up power generator will be also in place to make sure the construction work will be not disrupted in case of power outages. Fuel, oil and gas are supplied from from the local oil and gas company whose fuel station network is accessible to all.

### Water supply

Water at Vi Thanh are subject to salt intrusion in the period March-April due to the discharges from the Mekong River being at their lowest and salt water from the sea penetrates into the estuaries. Water sources for work execution and domestic water use depending on conditions of given sites, water can be supplied from the available centralized water supply schemes or the permitted groundwater wells at the construction sites. Where water schemes are not accessible, water from wells will be purified through an on-site simple filter system and/or clean water in tanks is supplied to ensure the hygienic/clean water is available for use.

### Waste Spoil Disposal

The construction works in Vi Thanh project include roads, canal embankment, sewage installation, green space development thus the waste generated during the construction work will be typically solid waste, sludge and domestic waste and wastewater. The amount of waste of project interventions is summarized in the Table 1.5 below:

**Table 1.5: Solid waste and sediments generated from construction work**

Work	Dredged sediment (m <sup>3</sup> )	Landfilling (m <sup>3</sup> )	Backfilling(m <sup>3</sup> )	Domestic wastes (tons)
Component 1	35.236	30.873	-	28
Component 2	266.750	331.500	66.000	30
<b>Total</b>	<b>301.986</b>	<b>362.373</b>	<b>66.000</b>	<b>58</b>

Dredged organic contaminated sludge: The estimated volume of sludge is about 35,236 m<sup>3</sup> from sewage system in LIA 03 and LIA 07; they are contaminated with organic and should be disposed at Tan Tien landfill.

Dredged sediments: 331,500 m<sup>3</sup> of sediments from dredged work in Canal 62, Cai Nhuc canal, and Tam Giac lake. According to the analyses, the sediments from the canal and lake dredged work are not hazardous, with the levels of heavy metals. However, it has high amount of organic compounds and pathogenic microbials (e.g. *Ecoli*) thus should not be used directly for used for agricultural purpose. This could rather be drained out and kept at least 03 months so as to remove the microbial and partial decomposition of organic compounds. The sediments could then be used for preennial crops or planting tree for urban landscape purpose, based on the actual needs of local peple. Otherwise, it will be transported and disposed at Tan Tien landfill.

In fact, along the canals, some households farming argriculture (coconut, banana...) use the amount of sludge to manure crop plants to take advantage of organic contents in the sludge for providing nutrition.

- *Waste from soil and stone:* according to FS consultant, the total of excavated soil is about 66.000 m<sup>3</sup>, volume of filling soil is 362,372.750 m<sup>3</sup>. Excavated volume will be reused for road backfill in the project area.

- Solid waste from activities: Solid waste generated 58 tons from activities at the site will be collected in the garbage can and contractor will sign a contract with authority offices for transportation and treatment. At present in Vi Thanh city, Vi Thanh Urban Environment Co.ltd will impelement solid waste collection and transport to landfills in Tan Tien .

- Hazardous waste: a small amount of solid waste will be generated 523 lit per month from project activities. These will be collected and temporarily stored at the project construction site. After that, the contractor will sign a contract with competent functional units (to transport of waste treatment plants for industrial and hazardous waste. The competent agencies for hazarous management could be Company Limited Urban Environment Vi Thanh or companies active in the field of collection and treatment of hazardous waste is meet specified conditions under Circular 36/2015 date 6/30/2015 of MONRE on hazardous waste management

At present, there are only one landfill Tan Tien in My Hiệp 1, Tan Tien commune, Phung Hiep district, about 7,5 km from the city urban core area/the project area, that are managed by Drainage branch – Urban construction in Vi Thanh city. The total capacity are 130 m<sup>3</sup>/day, including the amount of waste of Vi Thuy district and Vi Thanh city with area of 1,2 ha.

Tan Tien landfill currently receives the sludge from canal and drainage from Vi Thanh city. The remaining area of the landfill is adequate to receive the sludge generated from the SUUP project as well as other ongoing projects. Every year, on the dry season, the company will carry out the cleanup to take reserves for the next year in form incineration and dredged mud will be handled through process: waste water is deposited and lead to available treatment station, dry sludge will be packed into each bag and used for embankment construction and backfills.

In case, the amount of waste from project is larger than reserves of landfills, Hau Giang people’s committee will prepare to promote investors in construction Hoa An landfill about 25 ha.

Due diligence of the Tan Tien landfill has been carried out during EA process, is presented in Annex 2

### **1.3.5. Project area of influence**

In the process of assessing the environmental impact and social consideration, determine the impact of the project plays an important role. The Vi Thanh city subproject will be implemented in 05 wards of Vi Thanh city. During project implementation, the environment and society of these area as well as its surrounding as well is likely to be impacted. The project area of influence are as follows:

- Ward 1: affected during construction of improving Tam Giac lake, Cai Nhuc cannal, upgrading LIA 1, LIA 2
- Ward 3: affected during construction of Cai Nhuc cannal
- Ward 4: affected during construction of Nguyen Hue street, improving cannal 62, resettlement at ward 4.
- Ward 5: affected during construction of Cai Nhuc cannal, 1/5 street and upgrading LIA 7.
- Vi Tan commune: affected during construction of resettlement area

Besides the ward directly affected by the construction project, the ward neighboring localities in Vi Thanh city such as ward 7, Hoa Luu commune, Hoa Tien commune, Tan Tien commune may be impacted during construction.

In addition to these areas, waste disposal site, anticipated transportation routea for raw material and disposal waste also belong to affected boundary of the sub-project. People who are involved in transport, local residents and other sensitive buildings along the route are considered as affected objects. The routes for transportation of construction materials and waste are: Tran Hung Dao, Vo Nguyen Giap, Nguyen Thai Hoc, Luu Huu Phuoc, Nguyen Cong Tru, Ly Thuong Kiet, Nguyen Trai, Le Hong Phong, 61 Highway,...

Tran Hung Dao Road and Highway No. 61 are two main roads of Vi Thanh City, which run parallel with Xang Xa No Canal, these two routes are common roads of all subprojects to disposal site at Tan Tien Commune landfill. It is about 10 km from intersection with Vo Nguyen Giap to Tan Tien Commune landfill, it is paved road, two lanes, with the width of road section is about 12 – 15 m for the segment through city center. Segment of Highway No. 61 runs through Tan Tien Commune with average width is 9m is in good quality.

In addition, feeder lines go into each subproject such as Nguyen Thai Hoc, Luu Huu Phuoc, Nguyen Cong Tru, Le Quy Don (Ward No. 1, Ward No. 3) and Ly Thuong Kiet, Nguyen Trai, Le Hong Phong (Ward No. 4) are paved roads and have been invested with average width about 7 – 9m. Recently, 3/2 road, Nguyen An Ninh, Vo Nguyen Giap have been improved with better quality surface, average width is about 12 – 15m, especially Vo Nguyen Giap road is 30m width.

### **1.3.6. Implementation arrangement**

#### **1.3.6.1. General information**

- a) Line Agency: People’s Committee of HauGiang province.
  - Address: No. 2, Hoa Binh street, ward V, Vi Thanh city.
  - Telephone: 07113.878840 Fax: 07113.878846
- b) Project’s owner: People’s Committee of Vi Thanh city.
  - Address: No. 425, Tran Hung Dao street, ward I, Vi Thanh city.

- Telephone: 07113. 876315 Fax: 0711.3870609

- Email: vithanh@haugiang.gov.vn

c) Proposing agency: People’s Committee of Vi Thanh city.

- Address: No. 425, Tran Hung Dao street, ward I, Vi Thanh city.

- Telephone: 0711.3876315 Fax: 0711.3870609

- Email: vithanh@haugiang.gov.vn

Project’s management and implementation: Project’s owner directly manage the implementation of the project.

### **1.3.6.2. Personnel management and implementation**

#### ***\* Viet Nam Government and the World Bank***

Viet Nam Government and the World Bank will manage, monitor and supervise the implementation of the project by: Monitoring and checking the management and implementation of the project; pushing and supporting the disbursement of the ODA fund; resolving any arising issues beyond authority of the project’s owner.

#### ***\* People’s Committee of Hau Giang province***

Cooperating with the MPI and relevant agencies to develop a strategy and plan to attract and utilize ODA and coordination of ODA; developing policies and measures for coordinating and improving efficiency of ODA utilization in the province and town;

To coordinate with the Ministry of Planning and Investment to submit to the Government the signing of specific international treaties on ODA for programs and projects in their respective domains;

To ensure the quality and efficiency of utilization of ODA capital directly under local management and implementation;

To be responsible for land acquisition, clearance, implementation of policies for compensation and resettlement for programs and projects in the province in accordance with the law.

To organize and direct the implementation efficiently of urban upgrading project in the province under the management of the approved plan, periodically making reports to the Ministry of Construction.

To approve the feasibility study report for each component of the Subproject in Hau Giang province.

#### ***Project’s Owner –People’s Committee of Vi Thanh city:***

- To implement procurement procedures in compliance with the law on procurement
- To provide information and documents related to the contract and advise the setting up and implementation of programs and projects; to be responsible for the legal basis and the reliability of the information and documents provided; to record and keep documentation of programs and projects in accordance with law
- To take full and continuous responsibility for management and utilization of investment capital from the preparation, investment and implementation until exploitation of a program or project in order to retrieve and repay for ODA capital (for the case of on-lending).

- To perform supervision, project assessment, management and exploitation of the programs and projects;
- To take full responsibility for errors or violations committed in the course of program/project management which cause adverse effects on the economy, society, ecology, environment and national prestige
- To be responsible in accordance with the law to compensate for any damages in economics or to change the project’s owner for any delay or violation with the investment decisions and approved documents or technical assistance, causing loss, waste and corruption, affecting the objectives and overall effectiveness of the programs and projects;
- Other rights and responsibilities as prescribed by law.

### 1.3.6.3. Investment Fund And Implementation Progress Of The Project

#### ❖ Investment fund

Total investment fund of the Subproject is US \$ 36.606.814 , in which:

- ODA fund: US \$ 25.000.000 accounting for 68,3 % of total investment
- Counterpart fund: US \$ 11.606.814 accounting for 31,7 % of total investment

❖ Implementation schedule: Estimated implementing time: 5 years, from 2017 to 2022

## 1.4. METHODS APPLIED IN THE ESIA

In order to conduct environmental and social impact assessment, various methods and techniques were deployed in the ESIA as follows:

1. **Checklist:** this method is a common approach which is widely to applied for defining the study area, sampling sites, identifying influence/impact areas, sensitive areas may be affected by the project’s activities during pre-construction and construction phases.
2. **Rapid assessment:** Empirical emission factors and coefficients were applied for calculating fugitive exhausts and dust (TSP) emission; predict noise and vibration generation spreading over nearest settlements; greenhouse gas emission; solid and hazardous wastes; etc. For air emissions, Sutton model...., was adopted to modeling emissions of dust and exhausted gases as a rapid assessment for the project’s activities. Further, WHO’s rapid inventory source techniques (1993), including Environmental Assessment Sourcebook (Volume II, Sectoral Guidelines, Environment, World Bank, Washington D.C 8/1991) and Handbook of Emission, Non-Industrial and Industrial source, Netherlands) were deployed for these rapid assessments.
3. **Expert adjustment:** This method was deployed with the experts’ knowledge and experience, in associated with site investigation, on socio-economic development situation, inhabitants’ life, cultural and religious asset; natural environment (current status of baseline conditions on air, water and soil quality); regional and local climate characteristics such as hydro-meteorology, geology, geography, topology, and landscape; and ecology (flora and fauna characteristics); etc.
4. **Matrix:** This technique was applied for the prediction of potential impacts caused by the project activities. This matrix is set up based on sources causing impacts and potential objects affected by the project.
5. **Comparison:** Results of survey on natural environment and laboratory analysis were compared with national technical regulations on the physical environment components to assess the baseline conditions of the environments in the project area.

6. **GIS mapping:** Use GIS, coordinate to available maps (such as topographical map) and special soft-wares (such as MapInfo, AutoCAD) to create comprehensive maps serving ESIA process, including: maps of sampling sites for flora and fauna survey; maps of sampling sites for air quality and surface water quality.
7. **Field investigation and survey:** Based on available environmental data and maps (topographical map, existing land use map of Vi Thanh city, etc), the implementation of on-site measurements, sampling, investigations and field surveys on natural environment components (air, water, soil and flora and fauna) in the project area was conducted throughout the year both in dry and rainy seasons.
8. **Sample analysis:** All water, air and soil samples collected in the field were stored and brought the laboratory for analyzing at Technology centers, Department of Defense.
9. **Public consultation:** Public consultation is used to help identify opportunities and risks, improved subproject design and implementation, and increase subproject ownership and sustainability. Public consultation is specifically required by the World Bank’s environmental and social safeguard policies. A meaningful public consultation will be used. This is a two-way process in which beneficiaries provide advice and input on the design of the proposed subproject that affect their lives and environment, promotes dialogue between governments, communities, and implementing agencies to discuss all aspects of the proposed subproject. The feedbacks from consultation will be incorporated into the subproject ESIA and design. Those affected by the subproject include those resettled and those in the nearby communities affected by subproject impacts, intended beneficiaries of the subproject, key interest groups – depends upon the project, local mass organizations, including women’s unions, local, state and central governments, other donor and development agencies, and other stakeholders.
10. **Disclosure of information:** Disclosure of the subproject information including the subproject safeguards and instruments will allows the public access to information on environmental and social aspects of the subprojects. Disclosure is mandated by policies for the WB’s Environmental Assessment, Involuntary Resettlement, and Indigenous Peoples. The subproject safeguards and instruments will be disclosed in country and in local languages and at the World Bank Infoshop, like all consultations, it is an ongoing process during the subproject preparation and supervision process.
11. **Statistical and data processing:** All statistical data and documents acquired from local levels (Commune, Ward and City levels), as well as on-site measurements were processed and expressed in tables, figures and charts for interpretation. This data is systematized according to time, adjusted to serve the determination of natural and socio-economic environment situation; the analysis of trend in environmental change in the project area. These data are very crucial to make the basis of environmental impact assessment and prediction when implementing the project, as well as proposing countermeasures.

## **CHAPTER 2. NATURAL, ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS IN PROJECT AREA**

### **2.1. GEOGRAPHICAL CONDITIONS**

#### ***2.1.1. Geographical and topological condition***

##### Geographical location

Vi Thanh city is located in the South west of Hau Giang province and is the center of Hau Giang province and Western area of the Hau River. Geographical location: 105°19' 38" to 105°30' 11" East longitude; 09° 49' 30" to 09° 40' 49" North latitude. The city is adjacent to following areas:

- Go Quao district of Kien Giang province in the West.
- Giong Rieng district of Kien Giang province in the North.
- Vi Thuy district in the North East.
- Long Vi district in the South.

##### Topographical features:

Vi Thanh city has average low terrain, with an average elevation from 0.4 m-0.6m, quite flat and divided by canals. Surface topography tends to be lower toward the south and southwest, can be divided into three sub-regions:

- Inner area: high terrain (0.5 ÷ 0.7m) in comparison with the neighborhood, due to the process of urbanization with fast level of construction, the ground is more elevated.
- The Northern and Northeastern area of the city (Vi Tan commune): relatively flat terrain, popular elevation about 0.3 ÷ 0.5 m.
- South and Southwest Regional municipalities (Hoa Luu, Hoa Tien communes): Low terrain (0.2 ÷ 0.3m), easily submerged in the flood season and also affected by saline from the West sea through Cai Lon river in the dry season.

##### Geological conditions:

Vi Thanh city, Hau Giang province is located in the center of the Mekong Delta, so geological history of the city also shares common characteristics of geological history of the Mekong Delta. Study results show that Vi Thanh city is located in the wet area of the Mekong Delta, surrounded by lifting blocks Hon Khoai in the Gulf of Thailand, Ha Tien, Chau Doc, Saigon. Tectonic characteristics of the area can be divided into two areas:

##### a. Lower lying layer includes:

Ancient bedrock formed by granite and other crystalline rocks, above is hard rocks formed by sea or mainland sedimentary rocks (sandstone - shale - limestone ...) and intrusive magma or erupting rocks. Vi Thanh is located in the area with relatively lifting structure from the right bank of Hau river to Thailand gulf, with thin surface slightly tilt to the sea.

##### b. Upper-lying layer :

Along with change of geological structure, gradual sinking of low-lying Southern area facilitates formation of sedimentary systems contain mainly dry particles including 65-75% of sand, more than 5% of grit, rounded gravel and less flexible clay usually with gray, pale yellow color of continental environment.

Early fourth century, the southern part of our country sank, so Mekong river silt spread on this lower area. A part of silt run into sea, the rest spread in this flood field, lift ground of the city.



New silt is found in all surface of the city which is 0 – 5m deep. Depth of new silt layer gradually increases in North - South direction from inland to sea. Analysis results show that new silt contains about 46% of sand. But most of this sand does not form a layer and encounters block by sandy soil and heavy soil.

In short, sedimentary soils creates a weak soil layer on the surface with depth of 20 - 30m, mainly containing organic material of natural moisture higher than flow limit, and and mechanical indicators have low value.

**Results of geological conditions are recorded as follows:**

Layer 1: Clay, mixed clay containing organic substance with young alluvial sedimentary origin. This layer covers all of the the surface in the project area and has a relatively big thickness. Typical characteristics of sedimentary complex are high organic content under the process of decomposition, biochemical absorption, water saturation, at the beginning of consolidation process, very soft with low bearing capacity, easy deformation. Therefore, during construction, it is necessary to reinforce these layers with geo-technical solutions. For structures “bridges, culverts for tidal prevention and embankment” pile foundation should be used throughout these layers put the work load on lower layers.

Layer 1b, Layer 2 - Layer 2a, 2b: Average bearing capacity is relatively high. It is possible to arrange foundation for small and medium structure (revetment, culvert).

Layer 3, layer 4: Has high bearing capacity, so it is possible to stabilize foundation for structures with big load (bridge).

Foundation depth depends on load of specific structures, economic - technical comparision results among foundation solutions.

Based on the aforesaid survey results, appropriate technical solutions have been proposed for structures on soft ground, to prevent landslides and depression during dredging and ensure that works with structures have strong and stable foundations with long life cycle.

**2.1.2. Climate condition, hydrographic and oceanographic conditions**

**a) Climate**

Vi Thanh city is located in tropical climate – monsoon area of Mekong Delta and has typical characteristics of the western bank of Hau river. Climate pattern is clearly divided into two seasons in a year: rainy season begins in May and ends in November with rainfall of about 1,603 mm, accounting for 92.5% of total rainfall of an entire year. Dry season begins from December until the end of April of the following year.

- Temperature: temperature varies by season. The temperature is evenly high all year round with insignificant difference of temperature among consecutive months (about 0.1-1.9<sup>0c</sup>). The lowest monthly average temperature occurs during dry season from December to January (about 24-26 °C).
- Air humidity: monthly average humidity within a year is 79-81% with the highest and the lowest humidity is 88% and 73% respectively. Humidity difference among months is insignificant. The months with the highest humidity are in rainy season (July-September), and the ones with the lowest humidity are in dry season (February-April). Average evaporation amount is 644mm, equal to 25-30% of rainfall. In months of dry season, evaporation amount is >50 mm.
- Rain regime: rainy season begins from May until the end of November in a calendar year; dry season begins from December until the end of April of the following calendar year.

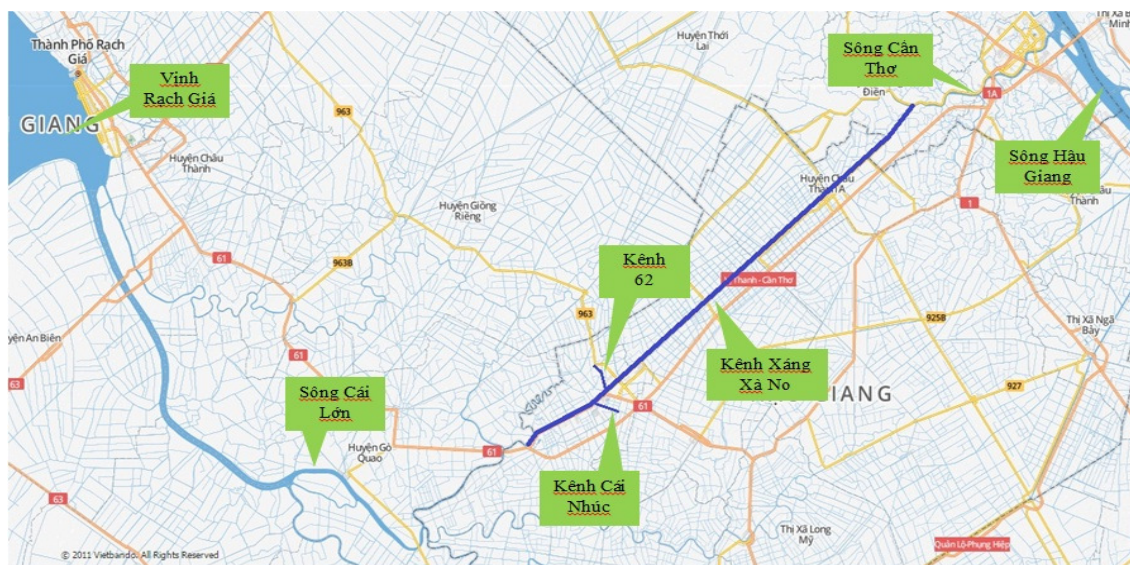
Annual average rainfall reaches 1,200-1,711 mm unequally distributed even in months of rainy season, mainly in July-October, some months have rainfall of more than 300 mm; in dry season, rain can occur, just accounting for 5-10% except for 2012 accounting for 22.7%; the average number of rainy days is 93 days/year.

- Wind: average speed/year is 3.5m/s. There are 3 prevailing wind directions in a year. From November to December, it is North-East wind direction, causing dry and cold. From February to April, it is the South-East wind direction, causing dry and hot with increasing air temperature and decreasing air humidity. From May to November, it is South - West wind direction blown from sea with lots of steam causing rains and hurricane.
- Sunshine: the number of sunshine hours in Hau Giang province in general and Vi Thanh in particular is quite high. Total annual average number of sunshine hours varies from 2400-2700 hours. Months in rainy season usually in June or September have the lowest number of sunshine hours, ranging from 148-161 hours. Months in dry season usually in March have the highest number of sunshine hours, ranging from 221-305 hours. On average, the number of sunshine hours in dry season is approximately 35 hours higher than that in rainy season.

### **b) Hydrology:**

#### System of rivers, canals and creeks:

Vi Thanh city has interlacing river, canal and creek system. River and canal density is relatively high with 1.5 km/km<sup>2</sup>. Big rivers across Vi Thanh city include Cai Tu river (about 10km) in the North of Hoa Tien commune, Cai Nhu river (about 16 km) in the North of Tan Tien and Vi Tan communes and Nuoc Duc river (about 22 km) in the South of Hoa Tien, Tan Tien and Hoa Luu communes. Besides, Vi Thanh city has many other natural flows such as Cai Nhuc, 3/2, No 62 and Mieu Quan De canals, etc...which supply and drain water for Vi Thanh city. Besides, alongside the city center is Xang-Xa No canal which is one of the biggest canals of Hau Giang province. Xang-Xa No canal was dug by the French from 1901 and finished in 1903 with surface width of 60 m, bottom width of 40 m, average depth from 2.5-9 m connecting Hau river (from Vang Xang ditch in Can Tho) with Cai Lon river (Cai Tu ditch peak). Xang Xa No is one of the biggest canals of Hau Giang province. In addition to drainage for the city, Vi Thanh is an important canal for inland waterway trade of Vi Thanh city and Hau Giang province.



**Chart 2.1: Hydrological map of Vi Thanh city**

Hydrological regime:

Similar to hydrological regime of Hau Giang province, hydrological regime of Vi Thanh city is influenced by flow of Hau river, Eastern and Western sea tide and local rains. Hydrological regime is dominated by two main sources: Hau river (Eastern sea) and Cai Lon river (Western sea).

According to annual statistics of Hau Giang provincial Centre for Hydro-meteorological Forecasting, the highest water level of Xang Xa No canal within 5 years from 2011-2015 is 129 cm, and the lowest water level within 5 years from 2011-2015 is - 40cm.

Flooding and salinization situation

Flooding: According to 2011-2015 Environmental Status Report of Hau Giang province, Hau Giang province can be divided into 3 zones (tidal zone, tidal flooding zone and flood zone), in which Vi Thanh city is located within flood zone.

Vi Thanh city is frequently flooded by flood, rain and flood tide. Flood during rainy season occurs complicatedly, depending on time, and density of rain as well as sea tide. When heavy rain happens, coinciding with flood tide, flooding becomes more serious. In August and September, flood water from Tu Giac Vi Thanh flows into western bank of Hau river and Xa No and into Vi Thanh city. During this time, because of Southwest monsoon effects, water level rapidly increases and reaches the highest level, causing flood in most area of the city. In September and October, flood accrues, coinciding with flood tide, so causing water surge. Flooding duration is about 1.5 - 2 months with flooding depth of 0.3 to 0.5 m. Because the area is located in the system of Cai Lon river - Xa No canal - Can Tho river - Hau river, flood water does not cause significant impact on the area. Water level of flood peak from 2011 to 2015 is approximately 0.6 - 0.8 m. The highest is  $H_{max} = 0.9$  m, occurring in 2000; average waterlogged level in fields reaches 0.4 m. On the other hand, this area is adjacent to Western and Eastern sea tide, so flood occurs later and flooding time lasts longer than the area along Hau, Can Tho rivers. The average flooding time is about 2 months.

Salinization: Salinization usually happens in dry season from end of March until July. When dry season comes, water level in Hau river rapidly decreases. Besides, there is Southwest monsoon from Western sea. Western sea will cause salinization through Cai Lon river, penetrating into canals in Vi Thanh city. In Vi Thanh city, salinity at Lau canal reached 9.1‰ (2.1‰ higher than that in 2014), affecting areas of Vi Thanh city such as Hoa Tien, Hoa Luu, Tan Tien communes, ward No.7, Vi Thanh commune, ward No.1, 5, 4.

**2.1.3. Natural Resources**

❖ Water resources:

- Surface water

Surface water in Vi Thanh province mainly comes from Hau river. This water source is very important to agro-forestry development and aquaculture. Water flow of Hau river is uneven within a year. In flooded season, the water flow accounts for 70 - 85% of total water flow in a year. Water flow reaches  $> 500\text{m}^3/\text{s}$ . The highest water flow is from September to November, accounting for 50% of total water flow. Because of low-lying and flat terrain, water drainage is slow. In rainy-season months, tidal amplitude reaches 0.5 m and in dry-season months it reaches 2.16 m.

In addition, Cai Lon river connects Xa No, O Mon, Quan Lo - Phung Hiep, Nang Mau, Lai Hieu canals with Western sea. In rainy season, water level depends on water flow from Hau river upstream through Long Xuyen Quadrangle and on-site rain. In dry season, river water

regime is mainly influenced by tidal regime of Rach Gia gulf. Cai Lon river have river mouth width of 600-700m, depth of 10-12m, so water drainage capacity is good. Cai Lon is both traffic and water drainage means for Vi Thanh city and Long My district. Vi Thanh và huyện Long Mỹ. However, due to effects of Western sea tide, salinization occurs in communes in Western and Southwestern area of the province.

- **Underground water:**

Underground water in Vi Thanh city is plentiful. It can meet demand for drinking water, water for daily household activities and production. Total potential water reserve under unsalted soil is 1,399,073m<sup>3</sup>/day in which planned sub-area of Vi Thanh city is 114,530m<sup>3</sup>/day. Total potential water reserve under saline soil is 1,440,293m<sup>3</sup>/day in which planned sub-area of Vi Thanh city is 155,022m<sup>3</sup>/day;

- ❖ **Soil resources:**

Soil resources of Vi Thanh city is divided into 4 groups including saline soil, alkaline soil, alluvial soil and ... Land with heavy mechanical composition, ratio of clay and heavy soil reaches from 75-85%, structural block with strong water retaining capacity suitable with wet rice, unsuitable with short-term industrial plants. Alluvial soils covers relatively large area with good nutrient content suitable with many variety of crops. Alkaline soil is limited for cultivation because under certain depth, alkaline layer and layer causing alkaline appear.

- **Saline soil group:**

Soil formed on young sediments - Holocene aged with origin from river, sea or mixture of river and sea. There is no Potential sulfidic layer or actual acid sulphate layer within 125 cm, and at least at a sub-layer within 100cm, there is electrical conductivity of saturated extraction at 25 ° C  $\geq 4$  dS / m, classified into saline soil group. Depending on severity and mechanism of saline intrusion into soil within 125 cm, most of saline soils in Vi Thanh have low salinity.

- **Alkaline soil group**

Alkaline soil group with an area of about 4178 hectares, mainly Potential acid sulphate soils (Sp1). Land formed on the river-swamp sediments or river-sea-swamp, with potential sulfidic layer within the depth <50cm and without actual acid sulphate layer; appearing on the lower surface along Cai Lon river in the northern area Vi Thanh city, Vi Tan commune and the Southern area of Vi Thanh city, Hoa Luu commune.

- ❖ **Ecosystem and biodiversity**

*Terrestrial Biological Resources in the Subproject Area*

The subproject area has very limited natural flora and fauna due to its high level of urban development. Ecologically, the proposed subproject location is not in an area of special concern such as areas designated as having national or international importance (e.g. world heritages, wetlands, biosphere reserve, wildlife refuge, or protected areas). Consultation with the local communities and site survey results show that the subproject area is home to no endemic animals listed in the Red Book. The subproject area is mainly residential and agricultural land, household gardens, and bare land which are heavily affected by human activities. The current vegetation area mainly includes brushwood, acacia, malabar almond trees, and coconut trees. The fauna in the area mainly include domestic animals such as chickens, ducks, dogs and cats. The flora along the bank of Xang Xa No, Cai Nhuc, 62 canals are mainly coconut trees, nipa palms, and bamboos owned by local residents.

*Aquatic Biological Resources in the Subproject Area*

There have been no official research studies on aquatic flora and fauna in Xang Xa No, Cai Nhuc and 62 canals. Consultation with the local communities does not reveal any records on the appearance of rare fish or other aquatic species of concerns in Cai Nhuc and 62 canals. Wastewater from domestic activities along Cai Nhuc and 62 canals has been directly discharged into the rivers. The river banks have been seriously encroached by shops and residential houses built along the river. Therefore, this area is not a major natural habitat of aquatic species and there are no species under threat which need to be protected in the area. There has been no recorded information on fish species which need to be protected or migrating fishes in the rivers of Vi Thanh city.

#### *Terrestrial ecosystems*

Terrestrial ecosystems in Vi Thanh include agroecosystems, urban ecosystems and industrial areas. These ecosystems are artificial ones with poor and unstable living organism composition.

The province has 05 protected area in total including Lung Ngoc Hoang Nature Reserve, Vietnam-Australia Eco-Tourism Destination, Spring Agricultural Center, Forestry And Fishing Area Of Casuco Company, An Hoa Scientific Research Reserve. However, in project area, there is no nature reserve nor protected ecosystems. Some characteristics of highly diverse nature reserves and zoning map are presented as follows:

**Lung Ngoc Hoang Nature Reserve:** Total natural area is 2,800 ha divided into 3 functional zones and buffer zones accounting for 8,836.07 ha. According to statistical results of the survey of Lung Ngoc Hoang Nature Reserve from 2005 - 2012, there are 350 higher plant species of 236 lines, 89 families, 04 orders which are Polipoiophyta, Cyadophyta, Lycopodiophyta and Magnophyta. This shows that Angiospermae dominates in Lung Ngoc Hoang Nature Reserve.

The survey classified vertebrate fauna into 206 species with 80 families, 156 lines, 5 classes (Fish, Amphibians, Reptiles, Birds, mammals) of Vertebrate Animals (Chordata).. .. Aquatic fauna recorded 216 species in total; including 80 species of phytoplankton, 30 species of silic algae, 64 species of ephemera, 13 species of benthic animals and 29 species of Pathogenic nematodes.

**Vietnam-Australia Eco-tourism destination:** Located in Vinh Tuong commune, Vi Thuy district with total area of 200 ha, about 9km from Vi Thanh city to the Southeast. According to the survey in August 2015, fauna has 16 species of mammals, 98 species of birds, 13 species of reptile, 7 species of amphibian and 14 species of fish.

Invertebrate animals include 31 species of insects of 6 families, 2 phylums. In which, 04 species of dragon-fly (Odonata, Anisoptera) appear in list of IUCN Red Book with Least Concern as follows: *Brachythemis contaminata*, *Neurothemis tullia*, *Neurothemis fluctuans*. Besides, there are 2 species of insect which can cause damage to agriculture and bonsai (*Graphium agamemnon*, *Catopsilia pomona*, *Erionota thrax*).

Aquatic fauna recorded 120 species in total; including 34 species of phytoplankton, 19 species of silic algae, 42 species of ephemera, 5 species of benthic animals and 20 species of Pathogenic nematodes.

#### **Spring Agricultural Center**

According to survey results in August 2015, fauna has 22 species of mammals, 10 species of amphibian, 19 species of reptile, 75 species of birds with 9,000 individuals in which there are

three rare and valuable species in Vietnam Red Book namely Anhingar melanogaster, Ardea oscitans and Tantalus leucocephalus.

For invertebrate animals, 20 species were recorded, in which, 02 species of dragon-fly (Odonata, Anisoptera) appear in list of IUCN Red Book. Aquatic fauna and flora recorded 103 species in total; including 17 species phytoplankton, 21 species of silic alga, 30 species of ephemera, 18 species of benthic animals and 17 species of Pathogenic nematodes.

**Forestry and Fishing area of Casuco Company**

Forestry and Fishing area of Casuco Company is located at hamlet No 5, Luong Tam commune, Long My district, Hau Giang province. Forestry and Fishing area has two sides adjacent to Nuoc Trong river, other 2 sides area surrounded by canals. There is a canal across the area. With interlacing system of canals and creeks, this is a favorable condition for fauna and flora to grow diversely.

According to the survey in August 2015, fauna has 16 species of mammals, 7 species of birds, 12 species of reptile, 73 species of amphibian and 7 species of fish. For invertebrate animals, 20 species were recorded, in which, 02 species of dragon-fly (Odonata, Anisoptera) appear in list of IUCN Red Book. Besides, there are 4 species of insect which can cause damage to agriculture and bonsai (Graphium agamemnon, Catopsilia pomona, Erionota thrax).

Aquatic fauna recorded 159 species in total; including 65 species of phytoplankton, 20 species of silic algae, 52 species of ephemera, 5 species of benthic animals and 17 species of Pathogenic nematodes.

**An Hoa Scientific Research Reserve**

Hoa An is very important to scientific research and technology transfer in accordance with development requirements of the Mekong delta in general and Hau Giang in particular.

According to survey results in August 2015, fauna has 16 species of mammals, 9 species of amphibian; 18 species of reptile, 90 species of birds and 13 species of fish. For invertebrate animals, 22 species were recorded, in which, 02 species of dragon-fly (Odonata, Anisoptera) appear in list of IUCN Red Book 2015. Besides, there are 3 species of insect which can cause damage to agriculture and bonsai (Graphium agamemnon, Catopsilia pomona, Erionota thrax). For aquatic fauna, 118 species were recorded in total; including 30 species of phytoplankton, 18 species of silic algae, 50 species of ephemera, 6 species of benthic animals and 14 species of pathogenic nematodes.

**2.2. EXISTING ENVIRONMENTAL QUALITY IN THE PROJECT AREA**

The assessment of environmental quality should be studied, evaluated on the specific Charts in the typical point in the region is expected to implement the project. Therefore, to assess the status of the quality of environmental components in the project area, investors and consultants conduct surveys, surveying and environmental sampling and analysis in accordance with the Vietnam standard in laboratory, simultaneously collecting information and data relevant to the specific contents are as follows:

**Table 2.1: The number of monitoring samples in project**

No.	SAMPLES	QUANTITY	INDICATOR ANALYSIS
1	Air	21	TSP, Noise, Vibration, CO, NO <sub>2</sub> , SO <sub>2</sub> .
2	Surface Water	20	pH, DO, BOD <sub>5</sub> , COD, TSS, N-NH <sup>4+</sup> , N-NO <sup>2-</sup> , N-NO <sup>3-</sup> , P-PO <sub>4</sub> <sup>3-</sup> , Cl <sup>-</sup> , Fe, Coliform, surfactant, Ecoli.

No.	SAMPLES	QUANTITY	INDICATOR ANALYSIS
3	Underground water	3	pH, Hardness (according to CaCO <sub>3</sub> ), NH <sup>4+</sup> , NO <sup>2-</sup> , NO <sup>3-</sup> , Clorua (Cl-), Florua, Sulfat, TDS
4	Waste water	5	pH, BOD <sub>5</sub> , TSS, H <sub>2</sub> S, COD, N-NH <sub>4</sub> <sup>+</sup> , N-NO <sub>3</sub> <sup>-</sup> , P-PO <sub>4</sub> <sup>3-</sup> , coliform, Surfactant
5	Soil samples	11	Pb, As, Zn, Cu, Cd
6	Sediment	12	Cu, Pb, Zn, Cd, As, Tổng Hydrocacbon, Plant protection chemicals, Plant protection chemicals (P)
7	Aquatic	13	Qualitative, quantification

The measurement methods, field sampling, storage, transport, processing and analysis of laboratory samples shall comply with the provisions of Vietnam standards.

### 2.2.1. Air quality

#### 2.2.1.1. Measurement result of air, noise, and vibration

Results on air quality monitoring is presented in the Table 2.2. It is showed that air quality around subproject area are quite well with all indicators in permitted limits. Concentration of suspended TSP, CO, NO<sub>2</sub> and SO<sub>2</sub> were lower than permitted limit set forth in National Technical Regulation on ambient air quality (QCVN 05: 2013/BTNMT)..

The results of monitoring noise, vibration in project area is also in permitted limit of National Technical Regulation on noise and vibration (QCVN 26, 27: 2010/BTNMT). These results are similar to results of monitoring of air quality, noise, vibration in Vi Thanh City area in 2011-2015 period. According to the curent environmental report of Vi Thanh city in 2015 showed that air quality in monitoring positions in Vi Thanh through years is rather good and not exceeds permitted limit.

**Table 2.2: Results on air quality monitoring**

Code	Position	Dust (mg/m <sup>3</sup> )	Noise (dBA)	Vibration (m/s <sup>2</sup> )	CO (mg/m <sup>3</sup> )	NO <sub>2</sub> (mg/m <sup>3</sup> )	SO <sub>2</sub> (mg/m <sup>3</sup> )
KK1	At Trung Nhi- Nguyen Thai Hoc intersection	0.204	58-69	0.005	4.721	0.061	0.05
KK2	At LIA 1 residential area	0.173	55-64	0.004	2.136	0.058	0.047
KK3	At LIA2, near Vi Thanh church	0.145	57-63	0.003	1.925	0.049	0.041
KK4	At LIA2, near Tam Giac lake (intersecting Quan De temple)	0.165	58-67	0.004	2.11	0.06	0.052
KK5	Between LIA3, Nguyen Thi Minh Khai street.	0.187	60-69	0.004	3.875	0.062	0.055
KK6	The east of LIA7 (bordering Quan De temple cannal);	0.159	53-61	0.004	1.832	0.055	0.047
KK7	The west of LIA7 (bordering Quan De temple cannal)	0.162	54-63	0.005	1.926	0.059	0.052
KK8	Area of Tam Quan lake, bordering LIA 2 residential area	0.149	53-60	0.004	1.23	0.056	0.045
KK9	At 1/5- Hai Thuong Lan Ong intersection	0.237	61-69	0.006	4.716	0.064	0.057
KK10	At 1/5 street, before security gate of ward 5.	0.216	60-67	0.005	4.473	0.061	0.056
KK11	At 1/5 – cannal intersection	0.219	59-68	0.006	3.242	0.065	0.052
KK12	At the top of Nguyen Hue, bordering Vi Dong commune (section 1)	0.198	56-68	0.005	2.825	0.061	0.049
KK13	Area of Nguyen Hue street, section between Vi Hung church and cemetery (section 1)	0.187	54-65	0.004	2.531	0.058	0.046
KK14	At the end of Nguyen Hue street (section 1);	0.193	55-66	0.005	2.166	0.055	0.045
KK15	At the top of Nguyen Hue street (section 3).	0.196	55-67	0.004	2.482	0.063	0.054
KK16	At the end of Nguyen Hue street (section 3);	0.198	56-67	0.005	2.218	0.064	0.056
KK17	At Nguyen Cong Tru bridge;	0.221	60-69	0.007	4.128	0.066	0.057
KK18	At the end of Cai Nhuc cannal (intersecting with Than Hoang temple cannal);	0.159	52-63	0.004	1.233	0.052	0.045
KK19	At area access to Tam Giac lake intersecting Cai Nhuc cannal	0.162	53-65	0.005	1.362	0.056	0.048



Code	Position	Dust (mg/m <sup>3</sup> )	Noise (dBA)	Vibration (m/s <sup>2</sup> )	CO (mg/m <sup>3</sup> )	NO <sub>2</sub> (mg/m <sup>3</sup> )	SO <sub>2</sub> (mg/m <sup>3</sup> )
KK20	At 62 – Xa No cannal intersection	0.157	52-64	0.004	1.188	0.05	0.044
KK21	At 62 – Le Thi Hong Gam cannal (LIA3).	0.16	54-65	0.005	1.17	0.052	0.043
	<b>Test Method</b>	<b>0.3</b>	<b>55-70<sup>(+)</sup></b>	<b>0.03<sup>(++)</sup></b>	<b>30</b>	<b>0.2</b>	<b>0.35</b>

Note: “-“: Not specified.

- Test method: QCVN 05:2013/BTNMT- National Technical Regulation on ambient air quality (medium Ih).

- Test method (+): QCVN 26: 2010/BTNMT - National Technical Regulations on noise.

- Test method (++) : QCVN 27:2010/BTNMT- National Technical Regulation on vibration.

### 2.2.2. Surface water quality

The locations and results of surface water monitoring is presented in Tables 2.3 and 2.4.

**Table 2.3: Position of Sampling surface water quality**

Code	Position
NM1	At LIA2, near Tam Giac lake (intersecting Quan De temple);
NM2	The east of LIA7 (bordering Than Hoang temple cannal);
NM3	The south of LIA7 (bordering Phan Lo cannal)
NM4	The west of LIA7 (bordering Quan De temple cannal).
NM5	Among LIA7 (bordering Cai Nhuc cannal);
NM6	Area of Tam Quan lake, bordering LIA 2 residential area
NM7	The north of LIA7 bordering 3/2 cannal
NM8	At the end of 1/5-Hai Thuong Lan Ong street.
NM9	At 1/5 street, before security gate of ward 5;
NM10	At 1/5 street intersecting cannal
NM11	At 1/5 street intersecting HW61
NM12	At Cai Nhuc cannal under Nguyen Cong Tru bridge.
NM13	At Cai Nhuc cannal – Xa No cannal intersection
NM14	At the end of Cai Nhuc cannal (intersecting with Than Hoang temple cannal);
NM15	At area access to Tam Giac lake intersecting Cai Nhuc cannal
NM16	At 62 – Xa No cannal intersection
NM17	At cannal 62, under Le Thi Hong Gam bridge (LIA3);
NM18	At cannal 62, under Nguyen An Ninh bridge (LIA3)
NM19	At cannal 62, section intersecting livelihood bridge
NM20	At the end of cannal 62, section intersecting Vo Nguyen Giap street.

The surface water quality in the subproject area is compared with the national standard on water quality for irrigation and navigation purposed (QCVN 08: 2015/BTNMT; column B1 and B2, respectively)

Compared to the standard on water for irrigation purpose (column B1), concentrations of COD, BOD<sub>5</sub> and surfactant are higher than the allowable permitted limits at most monitoring position. Compared to the technical standard for navigation purpose, the COD, BOD<sub>5</sub> concentrations are also higher at many positions. COD concentration is higher than permitted limit from 2.4 to 3.8 times (column B2). The highest COD concentration at intersection between Cai Nhuc and Xa No cannal. BOD<sub>5</sub> concentration is higher than permitted limit from 3.4 to 4.9 times (column B2). The highest BOD<sub>5</sub> concentration at intersection between Cai Nhuc and Xa No cannal (NM13). Surfactant is higher than permitted limit from 2.9 to 4.3. Surfactant concentration is highest at NM7 position (the north of LIA7 bordering 3/2 cannal). Thus, surface water quality of the project area is contaminated organic substances. Due to canals in project area are getting waste and waste water from households living along two side of embankment of cannal. Moreover, system of waste water collection and treatment in

Vi Thanh is not completed, so waste water is flown down the sides of cannal, causing surface water pollution.

**Table 2.4: Analytical results of surface water samples**

Code	pH	TSS	DO	COD	BOD <sub>5</sub>	N-NH <sub>4</sub> <sup>+</sup>	N-NO <sub>2</sub> <sup>-</sup>	N-NO <sub>3</sub> <sup>-</sup>	Phosphat (P-PO <sub>4</sub> <sup>3-</sup> )	Cl <sup>-</sup>	Fe	Surfactant	E.coli	Coliform
	-	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	MPN/100ml	MPN/100ml
NM1	7.76	48.7	3.65	46.4	25.3	0.057	0.008	2.73	0.191	25.9	1.32	0.76	70	42x10 <sup>2</sup>
NM2	7.53	37.4	4.68	37.3	20	0.039	0.007	3.96	0.154	24.5	1.26	0.58	60	37x10 <sup>2</sup>
NM3	7.8	46.2	3.71	43.8	23.7	0.042	KPHĐ	5.81	0.187	26.1	1.34	0.69	70	41x10 <sup>2</sup>
NM4	7.6	35.4	4.36	35.9	19.3	0.037	KPHĐ	2.89	0.162	26.4	1.32	0.67	70	40x10 <sup>2</sup>
NM5	7.74	48.2	3.8	45.7	24.6	0.063	KPHĐ	2.71	0.21	28.6	1.41	0.81	80	43x10 <sup>2</sup>
NM6	7.49	35.7	4.73	36.4	19.7	0.04	0.008	1.97	0.16	25.5	1.27	0.68	70	39x10 <sup>2</sup>
NM7	7.81	51.3	3.56	49	24.8	0.061	KPHĐ	3.13	0.22	24.9	1.38	0.86	70	44x10 <sup>2</sup>
NM8	7.71	47.2	3.87	46.9	23.5	0.044	0.01	2.95	0.19	27.7	1.42	0.69	70	40x10 <sup>2</sup>
NM9	7.78	48.9	4.12	44.8	23.5	0.051	0.009	2.48	0.19	268.7	1.42	0.71	70	39x10 <sup>2</sup>
NM10	7.85	49.1	3.93	47.8	24.4	0.053	0.011	2.43	0.17	271.8	1.45	0.788	70	40x10 <sup>2</sup>
NM11	7.63	42.3	4.26	41.7	22.3	0.046	KPHĐ	1.97	0.18	278.6	1.43	0.62	70	38x10 <sup>2</sup>
NM12	7.68	44.5	4.17	45.2	22.7	0.05	KPHĐ	2.35	0.18	249.4	1.39	0.72	70	37x10 <sup>2</sup>
NM13	7.85	69.3	2.86	57.2	29.3	0.133	0.012	4.29	0.26	320.3	1.41	0.71	80	46x10 <sup>2</sup>
NM14	7.81	53.8	3.35	48.3	24.6	0.06	0.009	3.12	0.2	263.1	1.4	0.69	70	41x10 <sup>2</sup>
NM15	7.83	55	3.21	49.7	24.5	0.056	0.011	2.92	0.19	274.2	1.42	0.61	70	39x10 <sup>2</sup>
NM16	7.87	71.5	3.17	56.3	28.2	0.12	0.013	3.98	0.25	319.8	1.39	0.72	80	45x10 <sup>2</sup>
NM17	7.74	47.2	4.24	45.3	23.7	0.058	0.011	2.53	0.186	267.8	1.38	0.69	70	42x10 <sup>2</sup>
NM18	7.76	46.9	4.28	44.7	23	0.056	KPHĐ	2.42	0.185	269	1.38	0.68	70	41x10 <sup>2</sup>
NM19	7.73	48.6	4.15	48.74	24.1	0.064	KPHĐ	2.61	0.193	258.7	1.39	0.71	70	42x10 <sup>2</sup>
NM20	7.75	47.4	4.3	46.5	23.2	0.052	0.008	2.19	0.188	287.3	1.38	0.67	70	40x10 <sup>2</sup>

QCVN 08: 2015/BTNMT

Code	pH	TSS	DO	COD	BOD <sub>5</sub>	N-NH <sub>4</sub> <sup>+</sup>	N-NO <sub>2</sub> <sup>-</sup>	N-NO <sub>3</sub> <sup>-</sup>	Phosphat (P-PO <sub>4</sub> <sup>3-</sup> )	Cl <sup>-</sup>	Fe	Surfactant	E.coli	Coliform
	-	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	MPN/100ml	MPN/100ml
<b>B1</b>	5.5-9	50	≥ 4	30	15	0.9	0.05	10	0.3	350	1.5	1	100	7500
<b>B2</b>	5.5-9	100	≥ 2	50	25	0.9	0.05	15	0.5	-	2	1	200	10000

Note:

B1 - For irrigation purposes, irrigation or other uses require the same water quality or the intended use as B2

B2 – Waterway traffic and other purposes with low quality water requirements

### 2.2.3. Ground water quality

The sampling positions and analytical results on ground water quality are presented in Tables 2.5 and 2.6 below:

**Table 2.5: Sampling positions of Underground water quality**

Code	Position
NN1	Underground water samples at the east of LIA7 (bordering Than Hoang temple cannal);
NN2	Underground water samples at Tam Giac lake bordering LIA2 residential area
NN3	Underground water samples at the north of LIA7 bordering 3/2 cannal.

**Table 2.6: Analytical results of underground water samples**

No.	Analysis indicators	Unit	Result			QCVN 09-MT:2015/BTNMT
			NN1	NN2	NN3	
1	pH	-	7.24	7.16	7.22	5.5 - 8.5
2	Hardness (according to CaCO <sub>3</sub> )	mg/l	238.1	221.3	235.6	500
3	Amoni (NH <sub>4</sub> <sup>+</sup> ) (according to N)	mg/l	0.025	0.022	0.03	1
4	Nitrit (NO <sub>2</sub> <sup>-</sup> ) (according toN)	mg/l	KPHT	KPHT	KPHT	1
5	Nitrat (NO <sub>3</sub> <sup>-</sup> ) (according toN)	mg/l	1.61	1.71	1.94	15
6	Clorua (Cl <sup>-</sup> )	mg/l	23.5	22.6	24.3	250
7	Florua	mg/l	KPHT	KPHT	KPHT	1
8	Sulfat	mg/l	14.3	9.76	16.2	400
9	TDS	mg/l	327.1	319.5	338.3	1500
10	Fe	mg/l	1.97	1.89	1.99	5
11	Asen (As)	mg/l	KPHT	KPHT	KPHT	0.05
12	E.coli	MPN/100ml	KPHT	KPHT	KPHT	KPHT
13	Coliform	MPN/100ml	0	0	0	3

The quality of underground water in the subproject area is compared with the National technical regulation on ground water quality (QCVN 09-MT:2015/BTNMT).

The analysis results show the concentrations of heavy metals are under limitation, there is no pollution detection.

### 2.2.4. Wastewater quality

The sampling positions and analytical results on ground water quality are presented in Table 2.7 and 2.8 below:

**Table 2.7: Sampling positions of wastewater quality**

Code	Position
------	----------

Code	Position
NT1	Wastewater at LIA1 residential area
NT2	Wastewater at LIA2 residential area
NT3	Wastewater at LIA3 residential area (Nguyen Thi Minh Khai street);
NT4	Wastewater at the west of LIA7 (near Quan De temple);
NT5	Wastewater at the north of LIA7 (bordering 3/2 canal).

The results of the analysis showed that wastewater from the activities of the people living in the project area at NT3, NT4, NT5 position of LIA3 and LIA7 is at permitted limits of QCVN 14:2008/BTNMT (column B) – maximum permitted value in domestic wastewater flows in to water source that is for purpose of fresh water supply. Wastewater at NT1, NT2 in LIA1 and LIA2, indicators of TSS, BOD<sub>5</sub>, coliform is slightly greater than permitted limits. TSS indicator is greater than permitted limit from 1.2 to 1.5 times; BOD<sub>5</sub> is greater from 1.1 to 1.2 times. Coliform is higher from 1.1 to 1.3 times. The results reflect the fact that wastewater at positions in project area has been partly treated before flowing into the environment.

**Table 2.8: Analytical results of waste water samples**

No.	Analysis indicators	Unit	Result					QCVN 14: 2008/ BTNMT (Column B)
			NT1	NT2	NT3	NT4	NT5	
1	pH	-	7.93	7.8	7.75	7.71	7.46	5- 9
2	TSS	mg/l	156.2	121.4	99.2	98.7	79.2	100
3	COD	mg/l	118.7	103.5	98.1	96.6	93.7	-
4	BOD <sub>5</sub> (20 <sup>o</sup> C)	mg/l	59.4	51.7	48.6	48	46.8	50
5	Amoni	mg/l	12.2	9.86	7.925	7.873	4.754	10
6	Sulfua (theo H <sub>2</sub> S)	mg/l	2.763	2.485	2.246	2.165	1.98	4
7	Nitrat	mg/l	21.57	19.73	16.22	17.3	10.26	50
8	Phosphat	mg/l	2.398	2.1	1.971	1.952	1.833	10
9	Total Surfactant	mg/l	2.14	1.942	1.76	1.728	1.69	10
10	Animal fat and vegetable oils	mg/l	0.96	0.857	0.88	0.867	0.87	20
11	Coliform	MPN/100ml	63x10 <sup>2</sup>	54x10 <sup>2</sup>	49x10 <sup>2</sup>	48x10 <sup>2</sup>	47x10 <sup>2</sup>	5.000

Note: (-) Not specified; QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater

### 2.2.5. Soil quality

**Table 2.9: Analytical results of soil samples**

Code	Position	Indicators				
		(Cu)	(Pb)	(Zn)	(Cd)	(As)
		mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK
Đ1	Soil at LIA1 area	2.28	1.72	8.65	0.14	0.11

Code	Position	Indicators				
		(Cu)	(Pb)	(Zn)	(Cd)	(As)
		mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK
<b>Đ2</b>	Soil at LIA2 area	3.76	2.11	8.72	0.15	0.12
<b>Đ3</b>	Soil at LIA3 area, Nguyen Thi Minh Khai street;	1.98	1.28	6.87	0.19	0.11
<b>Đ4</b>	Soil at the east of LIA7 area (bordering Than Hoang temple canal);	2.34	1.49	7.28	0.128	0.16
<b>Đ5</b>	Soil at at the south of LIA7 area (Bordering Phan Lo canal).	2.46	1.43	7.31	0.13	0.15
<b>Đ6</b>	Soil at Tam Giac lake bordering LIA2 area	1.82	1.68	6.34	0.13	0.1
<b>Đ7</b>	Soil at the north of LIA7 area bordering 3/2 canal	2.63	2.06	7.19	0.14	0.13
<b>Đ8</b>	Soil at the top of 1/5 street intersecting Hai Thuong Lan Ong street	1.81	1.32	6.53	0.1	0.15
<b>Đ9</b>	Soil at the top of Nguyen Hue intersecting Vi Dong commune (section 1);	2.45	1.56	5.21	0.13	0.14
<b>Đ10</b>	Soil at Nguyen Hue (section 2) bordering LIA3 and Xa No canal	2.43	1.49	5.43	0.13	0.18
<b>Đ11</b>	Soil at Nguyen Hue (section 3).	2.51	1.54	5.31	0.15	0.13
<b>National Technical Regulation on Soil quality for agricultural purpose ( QCVN 03-MT:2015/BTNMT)</b>		<b>100</b>	<b>70</b>	<b>200</b>	<b>1,5</b>	<b>15</b>

The soil quality in the subproject area are compared with national technical regulations on soil quality using for agricultural purpose (QCVN 03-MT:2015/BTNMT).

According to the monitoring result, heavy metal contents (Cd, As, Zn, Pb, Cu) in project area are much lower than the allowable limits for soil using for agricultural purpose. The report on environmental condition in Vi Thanh province during 2011-2015 period, also show soil quality from 2011 to 2014 is quite good and is not contaminated. The indicators of heavy metals (Cd, As, Pb, Zn, Cu) are in permitted limit of QCVN 03:2008/BTNMT and are not still detected the Concentration of plant protection products (organic clo- and phosphorus radical).

Project construction process will remove topsoil. Depending on the soil properties, there are plans to reuse or remove. Therefore, the volume of digging soil on the routes can be reused for different purposes such as agricultural purpose or leveling.

### 2.2.6. Sediment quality

The sampling positions and analytical results on sediment quality in the project are presented in Table 2.10 and 2.11 below:

**Table 2.10: Sampling positions of sediment quality**

Code	Position
<b>TT1</b>	At LIA2 area near Tam Giac lake (intersecting Quan De temple canal);



Code	Position
TT2	At the east of LIA7 area (Bordering Than Hoang temple cannal);
TT3	At the south of LIA7 area (Bordering Phan Lo cannal);
TT4	At the west of LIA7 area (Bordering Quan De temple cannal).
TT5	Among LIA7 area (Bordering Cai Nhuc cannal);
TT6	At the north of LIA 7 area bordering 3/2 cannal
TT7	At the top of 1/5 intersecting Hai Thuong Lan Ong street
TT8	At 1/5 - HW61 intersection.
TT9	At Cai Nhuc – Xa No cannal intersection
TT10	At area access to Tam Giac lake intersecting Cai Nhuc cannal
TT11	At cannal 62, section intersecting Xa No cannal
TT12	At cannal 62, under Nguyen An Ninh bridge (LIA3).

The sediment quality in the subproject area are compared with national technical regulation on sediment quality for aquatic life protection purpose (QCVN 43-MT:2012/BTNMT

Analysis results (Table 2.11) show levels of heavy metals in the sludge in sediments are within the permissible limits of national technical regulation on sediment quality for aquatic life protection purpose (QCVN 43-MT:2012/BTNMT), Concentration of heavy metals are under permitted limit, so there will not affect water quality in rivers and canals in Vi Thanh city. Moreover, organic hazardous composition such as total hydrocarbons, pesticides with Cl-, P- radical is not detected. However, this sediment could contain organic substances, dissolved organic substances (BOD5, COD), nutrients (N, P), pathogenic bacteria (*Ecoli*, *Coliform*, etc.) Therefore, it should not be used directly for agricultural purpose. Instead of that, this should be drained for removal of these pathogen and partially decomposing of these organic compounds and before it can be used for agricultural and/or urban tree planting.

**Table 2.11: Analytical results of sediment samples**

Code	Indicator							
	(Cu)	(Pb)	(Zn)	(Cd)	(As)	Total hydrocarbon	Plant protection chemicals (Cl)	Plant protection chemicals (P)
	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK
TT1	10.2	1.21	12.1	0.72	0.023	KPHĐ	KPH	KPHĐ
TT2	11.27	1.33	13.6	0.81	0.038	KPHĐ	KPH	KPHĐ
TT3	11.18	1.28	11.12	0.79	0.04	KPHĐ	KPH	KPHĐ
TT4	12.3	1.19	12.8	0.76	0.029	KPHĐ	KPH	KPHĐ
TT5	12.36	1.34	13.43	0.74	0.022	KPHĐ	KPH	KPHĐ
TT6	13.1	1.422	13.7	0.82	0.036	KPHĐ	KPH	KPHĐ
TT7	11.52	1.371	12.5	0.81	0.035	KPHĐ	KPH	KPHĐ

Code	Indicator							
	(Cu)	(Pb)	(Zn)	(Cd)	(As)	Total hydrocarbon	Plant protection chemicals (Cl)	Plant protection chemicals (P)
	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK
TT8	10.9	1.186	11.5	0.79	0.03	KPHĐ	KPH	KPHĐ
TT9	14.7	2.28	15.41	0.79	0.034	KPHĐ	KPH	KPHĐ
TT10	13.96	1.97	17.2	0.81	0.029	KPHĐ	KPH	KPHĐ
TT11	13.75	1.88	13.17	0.72	0.036	KPHĐ	KPH	KPHĐ
TT11	13.6	1.76	12.4	0.81	0.027	KPHĐ	KPH	KPHĐ
QCVN 43:2012/ BTNMT (fresh water)	<b>197</b>	<b>91.3</b>	<b>315</b>	<b>1.5</b>	<b>17</b>	<b>100</b>	-	-
QCVN 07:2009/BTN MT Ctc (mg/l)	-	<b>15</b>	<b>250</b>	<b>5</b>	<b>2</b>	-	-	-
QCVN 03:2015/BTN MT (Agriculture Land)	<b>100</b>	<b>70</b>	<b>200</b>	<b>1.5</b>	<b>15</b>	-	-	-

*Note: (-) Not specified; KPHĐ: not detected; QCVN 43: 2012/BTNMT - National Technical Regulation on Sediment Quality for aquatic life protection purpose.*

### 2.2.7. Aquatic environmental quality

The sampling positions and analytical results on aquatic in the project are presented in Table 2.12 and 2.13 below:

**Table 2.12: Sampling positions of aquatic environmental quality**

Code	Position
TS1	At the east of LIA7 area(Bordering Than Hoang temple cannal);
TS2	At Tam Giac lake area bordering LIA 2 area
TS3	At the north of LIA7 area bordering 3/2 cannal
TS4	At Cai Nhuc - Xa No cannal intersection
TS5	At cannal 62, under Le Thi Hong Gam bridge (LIA3).

#### b) Analytical results

**Table 2.13: Analytical results of Aquatic environmental quality**

No.	Indicator	Unit	Measurement	Result				
				TS1	TS2	TS3	TS4	TS5
<b>1</b>	<b>Phytoplankton</b>	<b>cell/l</b>						

No.	Indicator	Unit	Measurement	Result				
				TS1	TS2	TS3	TS4	TS5
1.1	<i>Lyngbya sp</i>	cell/l	10200 APHA 1995	35	22	34	26	30
1.2	<i>Coelosphaerium sp</i>	cell/l	10200 APHA 1995	25	14	18	20	25
1.3	<i>Pediastrum duplex</i>	cell/l	10200 APHA 1995	23	18	25	20	22
1.4	<i>Pediastrum simplex var.duodenarium</i>	cell/l	10200 APHA 1995	25	25	32	27	35
1.5	<i>Cyclotella meneghiniana</i>	cell/l	10200 APHA 1995	52	55	47	43	30
<b>2</b>	<b>Zooplankton</b>	<b>count/m<sup>3</sup></b>						
2.1	<i>Asplanchna priodonta</i>	count/m <sup>3</sup>	10200 APHA 1995	6500	5700	6200	5300	5100
2.2	<i>Anuraeopsis fissa Gosse</i>	count/m <sup>3</sup>	10200 APHA 1995	4600	3100	3500	3200	3300
2.3	<i>Mesocyclops leuckarti</i>	count/m <sup>3</sup>	10200 APHA 1995	7500	6200	7300	7400	6800
2.4	<i>Bivalvia</i>	count/m <sup>3</sup>	10200 APHA 1995	6600	5500	6300	5500	5800
<b>3</b>	<b>Benthic species (Total)</b>	<b>count/m<sup>3</sup></b>						
3.1	<i>Dero sp</i>	count/m <sup>3</sup>	10500 APHA 1995	32	45	42	45	45
3.2	<i>Pomacea bridgesi</i>	count/m <sup>3</sup>	10500 APHA 1995	55	30	45	45	50
3.3	<i>Coerbicula moreletiana Prime</i>	count/m <sup>3</sup>	10500 APHA 1995	30	25	20	30	35
3.4	<i>Lymnogonus fossarum</i>	count/m <sup>3</sup>	10500 APHA 1995	55	46	55	45	40
3.5	<i>Grandiderella lignorum</i>	count/m <sup>3</sup>	10500 APHA 1995	45	25	35	35	30

*Characteristics of species composition:* According to the analysis results of the report on 14 aquatic fauna and flora species in surface and bottom layers of water bodies:

- All analyzed species are freshwater species without any detected brackish and marine water species in the area (data on brackish and marine water species is not presented herein).
- *Phytoplankton such as* *Lyngbya sp*, *Coelosphaerium sp*, *Pediastrum duplex* and *Cyclotella meneghiniana* indicates oxygen generation ability in the water found in water samples with a moderate amount, which is consistent with the results of chemical analysis, showing that dissolved oxygen content in water at almost all of sampling locations reaches > 4 mg/l. This proves that the water is capable of producing oxygen normally for species to survive in the water (in addition to dissolved oxygen from ambient air).
- *Zooplankton:* the number of zooplankton species such as *Asplanchna priodonta*, *Anuraeopsis fissa Gosse* (with freshwater habitats in neutral pH conditions) found in water, which shows that the area is not suffering from salinization. However, these species are capable of decomposing organic substances and living in the environment with abundant nutrition. This illustrates that surface water in the monitored area is partly contaminated by organic matter and microorganisms. This happens because most of sampling locations are near residential areas. Domestic wastewater from households is discharged to canals after pretreatment in septic tank. Particularly, in some cases, domestic wastewater is not pre-treated before discharge, causing contamination of organic material. This is also consistent with the results of surface water analysis, showing that the Concentration of COD, BOD 5, TSS and coliform is high (equivalent to limit B1 - QCVN 08-MT:2015/BTNMT).

- Benthic: big-sized benthic species are also found in bottom layer of water bodies namely Pomacea bridgesi, Lymnagorus saccus (larvae of these species grow in water then hatch and live in water or on land). This shows that the water is a suitable habitat for protozoa and protophyta as well as some benthic fauna.

- Characteristics of quantity and the most dominant species: The density of zooplankton in the survey area varies significantly, especially with the development of high numbers of protozoa with densities from 3000 - 7000 cells/m<sup>3</sup>. Protophyta and benthic fauna has modest number just from 30-70 individual/m<sup>3</sup>. However, the development of protozoa and protophyta is completely consistent with surface water analysis results in the area.

Overall, the aquatic species in the water bodies of the area are very typical and common indicating species for the water environment. None of those are listed species that require protection.

## 2.3. SOCIO - ECONOMIC CONDITIONS

### 2.3.1. Economic Development Situation

The economic structure in recent years has shifted sharply in the direction of increasing the proportion of industry - construction, trade and services. In 2015 the percentage of sector III (trade - Services) accounted for 75.93%; sector II (Industrial-construction) accounted for 19.09%; sector I (agriculture) accounted for 4.98%.

The GDP growth rate (constant 1994 prices) in the city has reached 16,49% year on average. Since the date of implementing the policy for strengthening urban development, developing service and trade sectors, economy of Vi Thanh city has significantly changed, gradually form the basis for the development of industry, trade and service, promote the urban development and step by step achieve the objectives for economic growth and shift of economic structure toward industrialization and modernization.

- ❖ **Income per capita:** Average economic growth rate in 5 years is 15,7%/year, average population growth of 1,2÷1,6%/year while average income per capita is 13,17%/year, reflecting the improvement of living condition in the city, contributing into increase in saving and purchasing capacity of residents. According to statistic data in 2015, income per capita in Vi Thanh city is 43 million dongs/person/year, equivalent to 1.976USD/person/year. This income level is considered to be low in comparison with general level of other cities in the region.
- ❖ **Agriculture- Forestry - Fishery:** The area of land used for agriculture (Zone I) occupies a large area of land use (accounting for 77.2% of total land area). The value of agricultural production by economic sectors in 2015 as follows: cultivation 86.76%, livestock 8.52%, service i and other activities accounting one small proportion of agricultural production (4.72%). For cultivation sector: agricultural products mainly include:
  - Annual crops
    - Cereals (rice, maize)
    - Vegetables, beans, flowers and ornamental plants
    - Annual cash crops: sugarcane, tobacco, pipe tobacco, fiber plant, cotton, jute, papyrus. Oil-bearing trees (soybean, peanut, sesame...).
  - Perennials:
    - Fruit trees; Perennial plants: including oil-bearing trees oil (coconut), cashew, pepper, rubber, coffee, tea.

Livestock sector: accounting for low proportion in the production structure of agriculture – forestry-fishery (8.52%). According to data from the statistics department of Vi Thanh City in 2015, the poultry has the largest number of 135,720 thousand, 5,197 pigs and 109 cows.

Forestry: In 2015, total forest area in the city area is 1,836ha, of which forest plantation accounted for half of the total forest area (918ha). The forest trees include timber and non-timber forest products (bamboo, cinnamon ...)

For aquaculture sector: aquaculture area was 141,81ha in 2015, decreased in comparison with 2012 (151,90ha). Feeding forms mainly include: Intensive, Semi-intensive, extensive farming and advanced extensive farming.

❖ Industry - Construction:

Main industries in the city include: Food processing, wood processing, timber products, bamboo products, metal products, non-metal products, electricity production and distribution...

❖ Trade-services:

Being the provincial center of Hau Giang province, trading activities and services in Vi Thanh city have been effervescent. Revenue from services in the city in 2015 reached 1,180 billion dong, 2 times more than the revenue generated by this sector in 2012 (526.86 billion).

### **2.3.2. Social Conditions**

**Population:** Vi Thanh City has 9 administrative units of commune/ward level including: 5 wards (Ward I, III, IV, V, VII) and 4 communes (Tan Area, Hoa Luu, Hoa Tien and Tan Tien). By the end of the date of 31/12/2015, population of the city is 75,017 people in which the population in urban areas accounted for 59.33% (44,508 people). Population concentrated mainly in the inner wards in which ward IV has the greatest population of 13,109 people with population density of 1,646 people/km<sup>2</sup>, Hoa Tien commune has the most scattered population density with 181 people/km<sup>2</sup>.

The rate of natural population growth annually of Vi Thanh is 1.7%. With a young population, abundant human resources, the proportion of the population by gender is fairly even (male population is 38,062 people, equivalent to 50.74%), if provided with proper investment in vocational training, this population will be able to meet the demand for labor force for socio-economic development of the city.

Results of the socio-economic survey in the project area has shown that, population in the project area is 40,964 people accounting for 54.6% of the city's population. On average, number of people in a household in the project area is 4.38 people. Maximum members in household is 12 people and minimum member in household is 1 person. Ward V is the ward with average number of household members in the largest family: 5.12 people/household, ward 1 and Vi Tan commune are two areas where the average number of household members in a small family with 4.13 people/household.

If dividing by household economy, poor households have the smallest average member with 3.9 people/household, wealthy households are households with the largest average demographic feature with 5.0 members/household. This presents that the mindset of "More children, more prosperity" of Vietnamese people still exists. Families with favorable economic conditions tend to prefer more babies.

**Ethnicity:** The survey in project area has shown that percentage of Kinh people accounts for majority (96.4% total surveyed forms). Two ethnic minorities in the project area is Khmer people (accounting for 1.5%) and Chinese people (2.1%), they are living integrated with Kinh people.

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## **Education, healthcare and accessibility to medical services**

The education level of the interviewees in this survey is mainly secondary education (up 42.5%); primary education (29.1%); highschool (15.7%); College/University accounting for 8.4%; the proportion of people with post-graduate education is 1.4% and the remaining of illiterate/not going to school accounting for 2.9%.

The survey showed that 481/581 people interviewed have participated into health insurance, reflecting the fact that people are getting more and more interested in health. 100% households in Ward V use this service. In other wards/communes, this percentage is also very high: Ward III: 97,5%; ward IV and Vi Tan commune have percentages of 82,4% and 85,8% respectively. Ward I is the area with fewest people participated into health insurance (53,5%).

## **Health status of the people**

Percentage of sicked people in the last two months before commencing this survey is 48,4% (281/581 people); this is a rather high percentage and is the warning for community health in the project area.

In fact, the patients may have one, two or more symptoms of different diseases. The most common disease are colds, fever, headache with percentage of 60.2% of the answer sheet. 12.9% of patients with headache. Other diseases such as dengue, diarrhea, injury, typhoid get small percentage.

Diseases occurring frequently cause direct impact on patients, creating fatigue and tired feeling, impaired health and reducing working capacity, on the other hand they can cause many consequences to families and their members, spreading diseases in the community. There should be some comments on the causes of the disease to take measures for preventing, protecting and improving these issues efficiently.

## **Reasons for diseases**

The main reason as identified by the community is given as: environmental pollution (32.5%), over crowded housing (9.3%), poor diet (4.1%), flies and pests (6.5%) and 19.1% as other causes (living habits, low awareness of the community on prevention, care and treatment, the other objective factors ...). Thus the main cause leading to disease in the community in project area is unqualified living condition and environment. In addition, dirty houses and littering, unqualified food... can cause diarrhea and facilitate other disease agents.

Improvement in community awareness on environmental sanitation and change in habits and daily activities can help to limit these causes so it is very necessary to have to have methods for propaganda and education of health and epidemiology for people so that they can understand and think of right actions for self-protection as well as family and community protection and health improvement.

## **Propaganda and prevention of diseases**

In propaganda on disease prevention, the authorities and social organizations in the city have had quite drastical measures, reflecting in high percentage of 88.5% people in the area having participated in the education, dissemination and propaganda on disease prevention. This ratio even reached 100% in the ward I, III, and V. For ward IV, 96.3% of local people replied that this campaign has been organized quite often, reflecting the level of interest of government in protecting public health. Only Vi Tan commune had lowest percentage of votes, only 50% of people said they have been participated in the propaganda campaign on disease prevention. The contents of this propaganda campaign include: family planning; understanding the sexually transmitted diseases, respiratory diseases, HIV/AIDS and prevention campaign for other diseases.

## **Labor, employment and income:**

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Sectoral infrastructure in an area reflects the socio-economic development orientation of that area. The amount of employment opportunities reflects economic development situation in the region. The process of surveying sectors in the project area is carried out to give out an overall assessment of the employment situation in the region, to be the basis for evaluating the economic potential of the region. The survey results show that hired labor force accounts for the highest percentage (29.1%), people working Agriculture-Forestry –Fishery accounts for 23.4%, followed by services/trade sector accounting for 18.6%. The proportion of unemployed people accounts for 5.2% of all those surveyed, focusing mainly in Vi Tan commune.

Number of people having stable jobs in families is usually 02 people (43.4%), 03 people (20.3%), 01 people (15.3%) and 04 people (11.7%). The proportion of households with 5 ÷ 9 labors with stable income accounts for smaller proportion, ranging from 1.4 ÷ 9%. Families with members working in night shifts usually have stable income, with stable life and their children get better care. The demand for stable job with stable income is common desire of the people in the area participating in the survey.

### **Classification of household economy:**

Due to typical characteristics of each project with different economic condition, viewpoint of household economy varies at different areas. In this area, this household can be considered to be good condition, but in other area, it can be considered to be medium condition. Therefore, role of surveyors in classification of the household economy is very important. The surveyor will base on following criteria to classify the household economy as followings:

- Basing on poor households by MOLISA's standard for each reporting ward.
- Basing on viewpoint of the local authority on living condition, economic condition of households (income, expenditure/household/month, assets, comfort in households, employment, children...)
- During the household interview, surveyor needs to survey economic condition of the household such as housing condition, living facilities...to classify level of household.

Basing on this criteria, the results from the the surveying of 581 households show that: 65 households are poor HH, accounting for 11.2%; 357 households are medium HHs accounting for 61.4%; 137 households of good conditions, accounting for 23.6% and households of rich condition accounting for low percentage of 3.8% equivalent to 22 households.

### **Income and expenditure**

Income per capita of poor households under assessment of surveyor and community from the survey sheet is 384,049 VND/person/month, much lower than income per capita for standard of poor urban resident in 2016 – 2020 under Decision No.59/2015/QĐ- TTg by Government dated 19 September 2015 (900.000 VND/person/month).

Income per capita per month in rich households is 8,490,910 VND, 3.9 times higher than the income in households of good condition, 6.7 times higher than medium households and 22 times higher than the average income in poor households.

Average expenditure and the distribution of expenditure reflect priorities of households for their daily needs (food, travel and other living expenses) and needs for education, healthcare, entertainment, beauty... Generally, households with low income can only afford to pay for the essential items of life (food, electricity, water ...), while medium and rich households can have greater spending amount. Average expenditure of one household per month is 5,2 all over the project area. There is great gap between the average expenditure of

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rich households (12.6 millions/month), 9 times higher than average expenditure of poor households (1.4 millions/month). In general, households with higher income will have higher expenditure but higher savings.

### **House, land and legal status of house/land**

Land and house of households in the project area are classified into 3 types: solid, semi-solid and temporary.

For the whole area of the project, solid houses account for 33.6%; semi-solid houses account for 52.5% ; temporary houses account for 13.9%.

Particularly, house analysis by ethnicity for the people in the project area showed that, 77.8% Khmer people and 50% Chinese people live in temporary houses while most of Kinh people live in solid and semi-solid houses. This is due to the fact that Kinh people have developed economic condition with more income than ethnic minorities. Therefore, it is required to have incentive policy for ethnic minorities, especially those being directly affected by the site clearance of the project, so that after resettlement, people will have better living condition .

### **Legal status of house and land:**

Knowing legal status of house and land is the basis to form suitable policy for the project during the implementation process.

Percentage of households not having legal documents proving land's legal status account for 10.8%, mostly in ward 4 and ward 5 (14.9% and 19.6% respectively).

Practical survey showed that many households illegally encroaching canal land and having no LURC but having lived in the area for a long time. This is very popular in area of Canal 62 (at the bank of Le Hong Phong street) in ward 4.

### **Analyzing on gender**

#### **❖ Division of labor in household**

Gender equality is one of the goals throughout the development process of any country. To get sustainable gender equality in society, it is required to start equality from each household. In family, husbands and wives have rights and equal obligations in the activities of the family, sharing the common sense of responsibility to exercise the rights of equality, such as decisions on childbirth, decisions on economic issues and issues relating to children caring and education ... on the basis of sharing, helping each other to create a consensus. Attention, sharing and helping each other of both husband and wife help to develop stable household economy and to have sustainable happiness. Good implementation of gender equality in the family is the first step for developing a society of progression, equality, prosperity and happiness.

The two genders have typical strengths, women with their ingenuity often undertake housework and children raising. However, nowadays, women also participate in social activities, earning money to share economic burden with their husbands while husbands also share the daily housework with their wives.

Surveying results showed that women still play a key role as a housewife of the family, caring for children, 91.4% of women in the family in charge of cooking. The percentage of men having major role in the activities of cooking, cleaning and taking care of children is very small. However, they can play a role of responsible and loving supporter for his wife and mother. The percentage of households with both men and women participating in doing housework is: 8.4% for the cooking, 7.2% for cleaning, especially for as hard as the children caring and raising, the percentage was 37.7%. When children are receiving care from

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both parents, they will have condition to fully develop in physical, intellectual and spiritual manners.

For money-making activities such as doing hired tasks, doing business, getting paid jobs, both husbands and wives contributing in economic condition for the household. From the analysis, gender equality in project area is not interested reasonably. Women can make money but still playing main role in doing housework and taking care of children.

Surveys about participation in community activities, participation in local organizations showed that there is difference between the genders: men participate in these two activities more often than women. 47.4% of respondents said that men are the main participants in the meetings in both family and local meetings while this percentage is 25.5% in women. Similarly, for the results of participation in local organizations, male-female ratio is 41.9% and 25.5% respectively.

❖ Decision making for family issues

For decisions in family, the survey results show that women are the main decision makers for issues relating to their daily housework (59% women making decision for purchasing). For property and asset ownership, most of property and assets are owned by men in family (52,7%), households with both husband and wife sharing ownership of property account for smaller percentage (35,5%), only 11,8% of women in this case survey have sole ownership for property. Other decision-making items in the families are decided under agreement between husband and wife like children's education, business, job change, bank loan, with percentage of 88.7%; 91.7% and 89.9% respectively.

❖ Will the gender equality be improved by the implementation of the project?

Through the survey results on the division of labor within the family and gender issues in making decisions in families, it is shown that gender equality issues in the project area have not been interested reasonably. The position of women in the family has not been adequately enhanced. Analysis shows that the existing contradiction existing in the project area is that although women have to work hard, contribute significantly to the economy of the family, but they are not involved in decision making important issues of family, no right to share ownership of property in family...On the other hand, with the problems of environmental sanitation, water drainage- supply, women with typical biological characteristics are the main subjects getting more serious impact than men. Unqualified water and poor environmental sanitation can cause inflammation and skin diseases in women, particularly affecting women's health. The system of roads in the alleys is gnarly, slippery and poor lighting condition also making this subject of the project get more difficulties than men. Obviously, when the conditions of infrastructure and sanitation are improved thanks to the project, living condition and life quality of people in the area, especially women will be improved. This contributes to the implementation of gender equality in the region. Surveys of public awareness on this issue, 49.7% of people believe that gender equality issues will be improved better thanks to the project and this percentage is recorded higher in men than in women.

**Screening vulnerable households**

Vulnerable households in the project area include: (i) Poor households (ii) Women-headed households with dependent; (iii) Social policy households; (iv) Ethnic minority households which are more sensitive than others under the impact of the project. Survey on this is to find out proper and suitable solution for support for them in each area during the implementation of the project.

- *Ethnic minority household*: In the five wards, there is no individual ethnic minority groups, only some Khmer and Chinese households living within Kinh people. Therefore, this subproject does not need an ethnic minority action plan.
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- *Female-headed households*: There are 14 households headed by woman, accounting for 2.4%. During the consultation and group discussion in the area, it was shown that most of these women do hired job, free job, small business with unstable income, usually get chronic disease and not affordable to cure. They get many difficulties but not getting supportive policy from the government or locality.
- *Social policy households*: In the project area, about 11 households are social policy, revolution contribution, heroic mother, martyr families.
- *Households with disability*: there are 8 households with disabilities living in the project area and getting social allowance. This is a small number and they already have support so it is not necessary to prepare separate action plan.
- *Poor household*<sup>7</sup>: According to the survey in the project area, there are 23 poor households living in the project area, accounting for 4.0%, which is higher than poor percentage of Vi Thanh city (2.9%). These households already have social allowance and supportive policies from the government like: exemption from health insurance fee, free of school tuition for children...

### **Social Network and Support Systems.**

In Vi Thanh City the social network and support system includes: i) government support through various programs; ii) mass organization; iii) NGOs and iv) citizen groups.

#### **Government Programs**

The Office of Labour Invalids and Social Affairs of Vi Thanh City under The Department of Labour Invalids and Social Affairs (DOLISA) Hau Giang Province has specific policies for poor HH. DOLISA provides in particular trainings in livelihoods skills free of charge for poor HH.

HH registered as poor at the ward level (with certificate of poor HH) are entitled to range of benefits including lower fees for services and reduced cost health care.

The Social Policy Bank of Vi Thanh City offer micro-credit loans to poor Households with no interest rate and long term reimbursement.

Schools and health centers are present in all the project area and cover the needs of the citizens.

There is a pension system in Vietnam for all workers if they have joined in social insurance enough number of years regulated by the Government. Other workers can rely only on their family for their retirement if they have not joined enough number of regulated years.

#### **Mass Organizations**

The mass organizations include, among others, the Women's Union, Farmer's Union, Veterans Union and Youth Union which are under the umbrella organization of the Fatherland Front. They operate at central/national down to provincial/city, district and commune/ward levels. Their main role is mobilization, mediating problems and dissemination of information through their members. They play a dominant role in civic life in Vietnam and in Vi Thanh City, hence, development projects are most often undertaken in partnership with them.

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<sup>7</sup> Poor HHs as defined in the Decision No. 59/2015 –QD/TTg dated 19/11/ 2015 on the issuance of poverty norm for period 2016 – 2020 as follows: Poor HHs in urban areas: (i) having average monthly income per capita from 900,000 VND, (ii) having average monthly income per capital from 900,000-1,300,000VND and deprived of at least 3 indicators measuring deprivation of access to basic social services

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Women’s Union (WU) in particular is a key organization to provide information to HH and to implement development programs. WU is present at all administrative levels (province, City, ward/commune and village). Among other activities, WU implements livelihood skills programs for women, environmental awareness programs and credit programs to HH, especially for poor HH and women.

These organizations through their network get feedback from the population and can channeled complaints and concerns regarding any impacts of development projects on the community. They are also key partners for the implementation of project programs (i.e. monitoring of resettlement, income restoration programs) and for the monitoring of resettlement activities.

#### **✚ Non Governmental Organizations (NGOs)**

Non-governmental organizations (NGOs) operating in Hau Giang city include: Saigon Children’s Charity (SCC), New Planet organization, French-Belgian non-profit organization (Sunshine community development organization), Nehemiah charity, Heifer Viet Nam organization...of which the most concern is education, poverty reduction, medical, community healthcare... NGOs may also be key partners for the implementation of the project especially regarding climate change adaptation and income restoration.

#### **✚ Citizen Groups**

Mass organizations, such as Women’s Union, Farmer’s Union, Veterans Union, Youth’s Union, Fatherland Front, continue to dominate the space for civil society in Vietnam and in Vi Thanh City and few citizen organization are present. However there is possibility for the development of citizen groups. According to The Decree No. 79/2003/ND-CP on Promulgating the Regulation on the Exercise of Democracy in the Communes also provides as a strong framework for ensuring a consultative process from the design of the Program and its specific projects, and through implementation and monitoring. For example for resettlement, groups of representatives of affected people are part of the resettlement process and can channel concerns from affected households. Community groups could also be involved in the monitoring of activities such as resettlement or environment.

## **2.4. INFRASTRUCTURE CONDITIONS**

### ***2.4.1. Transport System***

#### **Current status of alley/lane road**

The lane/alley leading to the house of resident is the path for their frequent traveling everyday. The condition of the road not only reflects the external appearance of the whole community in the area but also reflect living condition of the residents. With asphalted road, vehicles and people will get easy traveling. Soil roads with rocks, dirt, gravel, sludge.. are usually bumpy, dusty, slippery in rains causing dangers for people and affecting their health. When assessing current status of the roads in alleys/lanes, one among the tasks of the subproject is to upgrade the road system in these areas, improving life quality for the community. Results from the survey in project area on characteristics of roads in alley/lane are presented in following table and chart.

From survey results for quality of alley/lane road, only 32.2% of the alley/lane are asphalt road, 43.9% of concrete, 14.6% of gravel and stone roads and soil road accounting for 6.4%.

#### **Quality of alley/lane road by community’s assessment**

From survey results for quality of alley/lane road, 35.6% of the road are good, 5.2% usually getting inundation and flooded, 31% of narrow road, 3.8% of low-lying roadbase, 20.8% of gnarly and 3.6% not having lighting system.

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- Quality of alley/lane road in commune/ward in the project area show that:
- Ward 4 has highest percentage of votes satisfying with quality of alley/lane road: 52,1%, Vi Tan commune has lowest percentage of satisfactory votes for road quality, only 3.3% of surveyed people said the roads are good.
- Ward 1 is the place having ideas that the alley/lane is narrow, just from 1,5m – 3m, causing obstacles for traveling of people or causing difficulties in fire, emergency cases.
- The percentage of gnarly roads of wards in the project area: ward 1: 14,9%; ward 3: 11,6%, ward 4: 0,5%, ward 5: 16,0% and Vi Tan commune: 17,5%.

In general, the results of the survey on community assessment on road quality in lane/alley show that the percentage of asphalt and concrete road in the project area is quite high, but the quality of roads is still low, not meeting demand for traveling of people. Especially, alley roads in Ward 5, ward 3 and ward 1 which are low-income areas. As noted by the consultant team through group discussions and field surveys, alley roads are usually narrow, gnarly. One of the wishes of the people in these areas is getting support for improvement and upgrading of the alley roads to facilitate daily activities and economic development.

Percentage of soil roads is high in ward 5, ward 3 and ward 1 as 21,6%, 23,4 % and 9,9% respectively. Results from the survey show that ward 5, ward 3 and ward 1 are low-income areas where many poor people are living with shortage of infrastructure. The Vietnam Scaling Up Urban Upgrading project – Vi Thanh subproject will invest in upgrading the low-income areas in these wards to ensure living condition for the residents.

#### **2.4.2. Water Supply System**

Currently, Vi Thanh city has one water supply plant supplying for the whole city with capacity of 12,800 m<sup>3</sup>/day using water source of surface water from Co Chien River, serving 13,314/19,508 households in 7/9 wards and communes.

In addition, the city also has 9 mini water supply stations using groundwater for treating and supplying with capacity of 4m<sup>3</sup>/hour per station, serving water for 664 households in remote communes from the city center; 3,027 households have built wells and 17,450 households use rainwater tanks. So far, the percentage of households using treated water has accounted for 98%, the proportion of households using clean water accounted for 71.4%.

Survey results show that water sources currently used in households are mainly tap water where households have their own water meters or shared with other households. This proportion accounted for 77.9% of the surveyed households for the entire project area. In Ward I, Ward IV and ward V, this rate even greater than 90%. Vi Tan commune is the area having less households using tap water, only 31.7% of the surveyed households. This area mainly use water wells (55%). Some households also take advantage of rainwater and water from the pond/lake/river/canal. Percentage of households with affording to use bottled clean water is not large, ranging from 4.2 ÷ 10.9% for each area in the city. A small number of households in Vi Tan communes still uses water from excavated well for daily life and irrigation.

The use of unqualified water is the main reason directly affecting health and life condition of peoples in the project area. Therefore, there should be periodical surveys and assessments for water source in the area to timely warn people and to propose solutions helping more people get accessibility to clean water and this is the responsibility of the authority of the locality and the city.

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For assessment of water quality, the survey shows 77.1% of surveyed people agreed that water source is clean and good. Water quality in ward V is considered to be the best in the region with 100% voted that the water is good and qualified. Ward I and Vi Tan commune are the areas where most of people said that the water source is not clean and smelly.

#### ***2.4.3. Solid Waste Collection and Treatment***

At present, there is only one landfills Tan Tien in My Hiệp 1, Tan Tien commune, Phung Hiep district, about 7,5 km from the city urban core area/the project area, that are managed by Drainage branch – Urban construction in Vi Thanh city. The total capacity are 130 m<sup>3</sup>/day, including the amount of waste of Vi Thuy district and Vi Thanh city with area of 1,2 ha.

Tan Tien landfill currently receives the sludge from canal and drainage from Vi Thanh city. The remaining area of the landfill is adequate to receive the sludge generated from the SUUP project as well as other ongoing projects. Every year, on the dry season, the company will carry out the cleanup to take reserves for the next year in form incineration and dredged mud will be handled through process: waste water is deposited and lead to available treatment station, dry sludge will be packed into each bag and used for embankment construction and backfills. Branch of Water drainage and urban infrastructure in Vi Thanh city only collects waste from inner areas of the city but not wastes in rural area. Lacking of vehicles for collecting wastes, only using homemade vehicles with low capacity and inconvenient operation.

In case, the amount of waste from project is larger than reserves of landfills, Hau Giang people's committee will prepare to promote investors in construction Hoa An landfill about 25 ha.

#### ***2.4.4. Power System***

Currently Vi Thanh city get power supply from the national grid by Vi Thanh power station 110/22kV – 2x40MVA, (located in Nang Mau town).

Vi Thanh diesel station and the medium voltage line of 22kV (line 572) from Can Tho along Xa No canal is the backup power source.

99.8% of households in the survey have electricity for daily life, in which 97.2% have their own power meter; 2.6% share connectiong with other households and only a small percentage of households not having accessibility to electric power for dailiy life (one household in ward III, accounting for 0.2% of the whole city).

Frequency of power interruption in project area shows that 36.7% of the surveyed ideas said the area where they are living not having frequent power cut, 37% said the power cut happens 1-2 times/month, 16/7% said power cut 3-5 times/month and 3.3% complained on frequent power interruption in their living area (more than 5 times in month). Total power cuts mainly 1-2 times/month and alternately to ensure sufficient power distribution as well as urban electric lighting in the current situation.

When being asked about electric current density for domestic use, most of households said the current density is not sufficient but acceptable, the highest percentage agreed on this is 73.7% while 22.2% answered that the current is sufficient and well operated. Only 24/581 said the current density is very low, or not giving any ideas (4,2%).

#### ***2.4.5. Drainage and Sewage Treatment***

At the present, Vi Thanh city has no separate wastewater treatment plant; the existing drainage system of the city is the common drainage system for both domestic wastewater and run-off rainwater to discharge into canals.

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The water drainage system in the central area of the city was constructed with round culverts of concrete reinforcement under the sidewalks. Wastewater after running through sedimentation tank to reduce waste and dirt will be discharged into Xang Xa No canal, Muong Lo canal, Trung Doan canal, 62 canal and small ditches and canals. For neighboring area and remote area from the center of the city, wastewater is discharged by running into natural canals and ditches.

Most of the buildings in the inner area have construction foundation <1.6m so in the rainy season, some roads could get local inundation like Trung Trac Trung Nhi street, Doan Thi Diem street, Chiem Thanh Tan street, Nguyen Viet Hong street... Based on the above drainage system, it is very necessary to have a project with a full feasibility and funding to contribute to the completion of water drainage networks, improvement of technical infrastructure for the developing Vi Thanh city.

According to the survey, domestic waste water in the region is mainly discharged via channels/canals/ponds/lakes (accounting for 55.1%). In particular, the ward V does not have drainage system; 100% of the surveyed households let their domestic wastewater run directly into canal/pond/lake. Many households not locating near ponds/canals discharge their wastewater into garden or let the wastewater run off on the roads to penetrate into soil, this happens most in Vi Tan commune (with percentage of 44.2%). Only a small amount of wastewater is discharged into the common drainage system of the area.

With a population of 75,017 people, Vi Thanh, a young city, is growing strongly. The city has been mobilizing all the investment resources in building infrastructure because that's the basis of all the levers for growth. Formerly, if the road is only for local traffic among the local areas, now it has been expanded on scale and connecting trade among the regional areas.

In the urban centers, major roads were built to create urban modernity for Vi Thanh such as Vo Nguyen Giap, Tran Hung Dao ... the rate of economic growth was rather high from 11 to 19 %/year. The economic structure shifts in the right direction, reducing the proportion of agriculture, increasing the proportion of the service sector, industry - construction, with the current ratio is as follows: trade – service sector accounting for 48.13%, industry-construction accounting for approximately 43.9%, agriculture accounting for 7.96%. This development is not sustainable in terms of conversion of agricultural land, the cost of providing high infrastructure, adversely affecting migration, and the increase in the number of households living in low land areas, flooded areas.

*Flooding situation:* Vi Thanh City was usually flooded by floods, rain and tides. Flooding during the rainy season is very complicated, depending on the duration and intensity of the rain and the sea tide. When heavy rains meet tides, flooding becomes more severe. On August – September, floodwaters from Vi Thanh quadrangle moving to the west of Hau river, Xa No canal and into the city. This period affected by the southwest monsoon, the water level increased rapidly and reached the highest value in the year, causing flooding most City area. From September to October, flooding concentrated more, meeting tide will create the tide surges. Flooding time is from 1.5 to 2.0 months; flooding depth is about 0.3 ÷ 0.5m. Due to the area located in the river - channel system of Cai Lon - Xa No canal - Can Tho River - Hau River, floodwaters should not greatly affect areas: flood water level in the 2011-2015 period is about 0.6 ÷ 0.8 m, the highest level appeared in 2000, Hmax = 0.9 m; the highest flooding level in the field is 0.4 m; on the other hand, this is the place bordering between the West and the East sea tide so flood will be later and flooding time is longer than the surrounding areas along Hau and Can Tho River about 2 months.

## **2.5. NATURAL AND SOCIAL CONDITIONS OF THE PROJECT AREAS**

Vi Thanh City Upgrading Sub-project will be implemented in Ward 1, Ward 2, Ward 3, Ward 5, and Vi Tan Commune of the city. Core areas of the city mostly consists of centralized

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residential areas in alternation with gardens and fields. There are 4 canals: Cai Nhuc, 62, Muong Lo, and Than Hoang Shrine, with water flowing into Xang Xa No Canal, adding water for a branch of Hau River as well as for a network of canals in the core areas. Existing environment of the project area is within the overall base environment of Vi Thanh City as already analyzed in section 2.3, yet will be analyzed in more detail here as basis for analysis of environmental impacts arising from the sub-project's activities.

### **2.5.1. Existing conditions of Component 1 locations – Low-income areas (LIAs)**

Upgrading infrastructure systems of the four LIAs with total area of 75ha and total population of 7,732 people, with the following key investment items: (i) Upgrading, rehabilitating, expanding existing alley roads of soil/stone or damaged concrete structure into new asphaltic/cement concrete roads; (ii) Installing water supply pipelines and stand-by water supply connectionpoints; (iii) Constructing new public light systems along the alley roads in the LIAs; and (iv) Providing trash bins nearby alley roads of the LIAs. With investment funded by Government of Denmark, HH WW will be connected directly to Vi Thanh City's common drainage and WW treatment system.

**Upgrading LIA 1:** LIA 1 is about 10.5 ha, in Ward 2, near Tran Hung Dao Road. This is a densely populated area (population density of about 4,323 people/km<sup>2</sup>), with relatively complete infrastructure system (concrete roads, power/water supply systems, sewer system, etc.) However, existing roads are still narrow, are degrading and have not had light system.

Land in LIA 1 is mostly homestead land and garden land. Total affected land area of LIA1 is 12,669 m<sup>2</sup>, of which 3,093 m<sup>2</sup> is homestead land; 4,306 m<sup>2</sup> is agricultural land; the rest land area is 5,270 of other types of non-agricultural land. 20 HHs have affected trees (56 trees: 24 fruit trees and 32 wood trees).

Disposal route of LIA 1 may run through Nguyen Thai Hoc Road → Tran Hung Dao Road → NR61 → Landfill in Hiep My Hamlet, Tan Tien Commune. Total route length is about 8.5km;

PCRs and sensitive locations in LIA 1 are: Hoa Van Kindergarten, Vi Thanh Market (Please refer to section 2.6).

**Upgrading LIA 2:** LIA 2 is about 4.7 ha, in Ward 2. This area has medium population density (about 2,276 people/km<sup>2</sup>).

Available infrastructure items are concrete roads, power/water supply systems, etc. Area nearby Luu Huu Phuoc and Do Chieu roads already has sewer system. Area nearby Quan De Shrine Canal has not had sewer system, with HH WW all discharged into this canal. Roads here are all narrow and without light system.

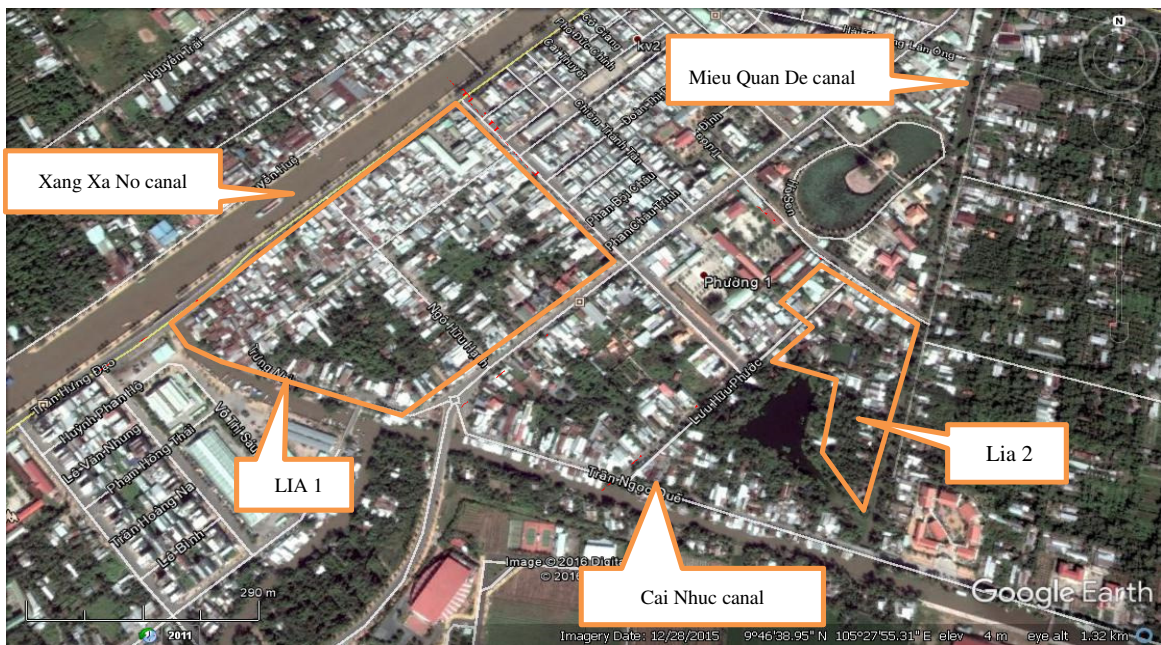
Land of this LIA is mostly homestead land and garden land. Total affected land area of LIA 2 is 2,952 m<sup>2</sup>: 554 m<sup>2</sup> of homestead land; 1,386 m<sup>2</sup> of agricultural land; 1,012 m<sup>2</sup> of other types of non-agricultural land. 15 HHs have affected trees (192 trees: 50 fruit trees and 142 wood trees).

Disposal route of LIA 2 may run through Luu Huu Phuoc Road → Nguyen Thai Hoc Road, then through the rest roads like disposal route of LIA 1. Total route length is about 9 km;

LIA 1 and LIA 2 have good air environment. However, surface water environment is currently subject to organic pollution, with COD and BOD5 contents exceeding allowable levels (please refer to Section 2.2).

Sensitive locations of LIA 2 are: Hoa Van Kindergarten, Vi Thanh Church, Vi Thanh Special High School (please refer section 2.6).

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**Chart 2.2: Existing LIA 1 and LIA 2**



Alley road in LIA 1

Main road in KIA 1

Mieu Quan De Canal in LIA 2

**Chart 2.3: Some photos of LIA 1 and LIA 2**

### Upgrading LIA 3

LIA 3 is about 22.5ha, in Ward 2, with low population density (about 1,666 people/km<sup>2</sup>). Residents reside densely along back-lanes and canals. Existing infrastructure items include concrete roads, power/water supply systems. However, concrete road system is already old and degrading, in lack of light system. Sewer lines are only available in the area nearby Nguyen An Ninh Road. The rest areas in LIA 3 all use small canals as their common drainage system. WW from these canals will enter Canal 62.

Land of this LIA is mostly homestead land and garden land. Besides, there's also canal land area. Total affected land area of LIA 3 is 112,284 m<sup>2</sup>: 250 m<sup>2</sup> of homestead land; 7,424 m<sup>2</sup> of agricultural land; 3,610 m<sup>2</sup> of other types of non-agricultural land.

105 HHs have affected trees (732 trees: 355 fruit trees and 368 wood trees).

Disposal route of LIA 3 may run through Le Hong Phong Road → Tran Hung Dao Road → NR 61 → Landfill in Hiep My Hamlet, Tan Tien Commune. Total route length is about 10m.

LIA 3 has good air environment. WW by the HHs in the project area, at NT3 location (in LIA 3) is within allowable limit (refer to Section 2.2).

Sensitive areas are: Hoa Mai Orphanage, Chau Van Liem Primary School (Please refer to section 2.6).





**Chart 2.4: Existing LIA 3**



Alley road

Main road

Residential area

**Chart 2.5: Some photos of LIA 3**

### Upgrading LIA 7

LIA 7 is about 30ha, in Ward 5, with relatively dense population (about 3,620 people/km<sup>2</sup>) mostly residing along the back-lanes and canals in the central area of the city.

Concrete road system is degrading. There're power supply system, clean water supply system, but not light system yet. Domestic WW drainage system is the drainage canal system. WW in these canals enters Quan De Shrine Canal, Than Hoang Canal Shrine Canal, Muong Lo Canal and Cai Nhuc Canal.

Land of this LIA is mostly homestead land and garden land. Besides, there's also canal land area. Total affected land area of LIA 7 is 24,456 m<sup>2</sup>: 953 m<sup>2</sup> of homestead land; 97,566 m<sup>2</sup> of agricultural land; 75,235 m<sup>2</sup> of other types of non-agricultural land.

256 HHs have affected trees (730 trees: 444 fruit trees and 268 wood trees).

Disposal route of LIA 7 may run through 03 February Road → Tran Hung Dao Road → NR 61 → Landfill in Hiep My Hamlet, Tan Tien Commune. Total route length is about 9.5 km;

LIA 7 has good air quality environment. WW of the HHs in LIA 7 is within allowable limit (Please refer to section 2.2).

PCRs and sensitive locations are: Pink Lotus Kindergarten; Vi Thanh – Hoa Luu Agrovillage; Hung Thanh Temple; Quan De Shrine; Vi Thanh Church (please refer to section 2.6).



**Chart 2.6: Existing LIA 7**



Drainage canal



Canal-crossing bridge



Road and residential area

**Chart 2.7: Some photos of LIA 7**

### ***2.5.2. Existing conditions of items of Component 2 – Primary, secondary infrastructure upgrading***

This component supports improvement of the key connective infrastructure network prioritized for compliance with resilient urban development and green growth program, consisting of key investment items as follows: (a) Upgrading existing roads supporting infrastructure connection amongst the areas of the city; (b) Constructing roads as planned to help connection and expansion of the city’s urban areas; (c) Constructing, completing drainage, sewer systems; (d) River/canal bank protection embankments.

#### **Subcomponent 2.1: Upgrading Nguyen Hue Road**

Nguyen Hue Road runs along northern side of Xang Xa No Canal, connecting Vi Thanh City’s central area with the communes of Vi Tan and Vi ong with total length of 12km. Nguyen Hue Road section in Ward 4 of Vi Thanh City is 4.4km long, divided into 5 sections, of which sections I, II, V will be under SUUP, and sections II and IV were already invested under other projects:

+ **Section I:** Beginning point of this section connects with Diem Tua Canal bridge and Vi Dong inter-commune road, and the end point connects with Xa No Bridge (on Vo Nguyen Giap Road). This road section (4m wide, concrete road) is 1.5km long, on the side of Xa No Canal and already have embankment combined with park 8m wide. Existing roadbed width is

about 3m (crushed-stone surface) very narrow and difficult for people to travel on. Left-side area of the road section has medium population density because the HHs here have large roadside areas and gardens in alternation with their houses. About 540m to 620m away from Vo Nguyen Giap Revenue is the graveyard of Vi Hung Church. To serve construction of this section I of Nguyen Hue Road, 87 graves of this graveyard will have to be displaced. In terms of traffic, this road section has relatively low traffic density.

+ **Section II:** From Xa No Bridge to the end of Hau Giang Provincial Party Committee HQ, with total length of 0.8km. This section was invested in 2013 by Hau Giang Province in accordance with general plan – total road width of 23m (roadbed 15m wide and sidewalk on residential house 8m wide), already having Xa No Canal embankment running along and sidewalk on canal side 8-12m wide.

+ **Section III:** From Hau Giang Provincial Party Committee to Canal 62, 0.45 km long. This section is to be connected with the road in front of Hau Giang Provincial Party Committee, with road-bed 15m wide, sidewalk 8m wide including stormwater collection sewer system and light system. Site clearance was already carried out for this section (23m from Xa No Canal sidewalk), yet has not been invested in terms of road-bed and accompanying infrastructure items. This road section is short, with area on the left side having medium population density, and has very low traffic density.

+ **Section IV:** From Canal 62 to Tac Huyen Phuong Canal, 1.2km long passing through densely populated residential areas of Ward 4 and already having roadbed 7m wide and sidewalk 2-3m wide;

+ **Section V:** From Tac Huyen Phuong Canal to Ba Huyen Canal 0.45km long, passing through densely populated areas in Ward 4. This road section is connected with the road 3km long behind Xa No Canal embankment invested under WB 6 project: “Xa No Canal Embankment”, funded by WB and with MOARD as Client. This section also has embankment and sidewalk 8m wide, yet current road-bed is only 3-4m wide and high traffic density, causing traffic congestion.

**Section I, Section III and Section V** of Nguyen Hue Road are constructed to: (i) connect sections of Nguyen Hue Road in the city’s central area, facilitating smooth travelling of people along the northern embankment line of Xa No Canal; (ii) act as another main road for the city and (iii) rehabilitate and improve living condition for the HHs along Xa No Canal as well as people in northern area of Vi Thanh City.

Total affected land area of Nguyen Hue Road item is 44,426m<sup>2</sup>, of which 12,782m<sup>2</sup> is homestead land and 23,141m<sup>2</sup> is agricultural land. The rest 8,503 m<sup>2</sup> is other types of non-agricultural land.

92 HHs have affected trees (1,154 trees: 920 fruit trees and 234 wood trees).

Disposal route of sections I and II of Nguyen Hue Road may run through Vo Nguyen Giap Road → Nguyen An Ninh Road → Le Hong Phong Road → Tran Hung Dao Road → NR 61 → Landfill in Hiep My Hamlet, Tan Tien Commune. Total route length is about 11.5km.

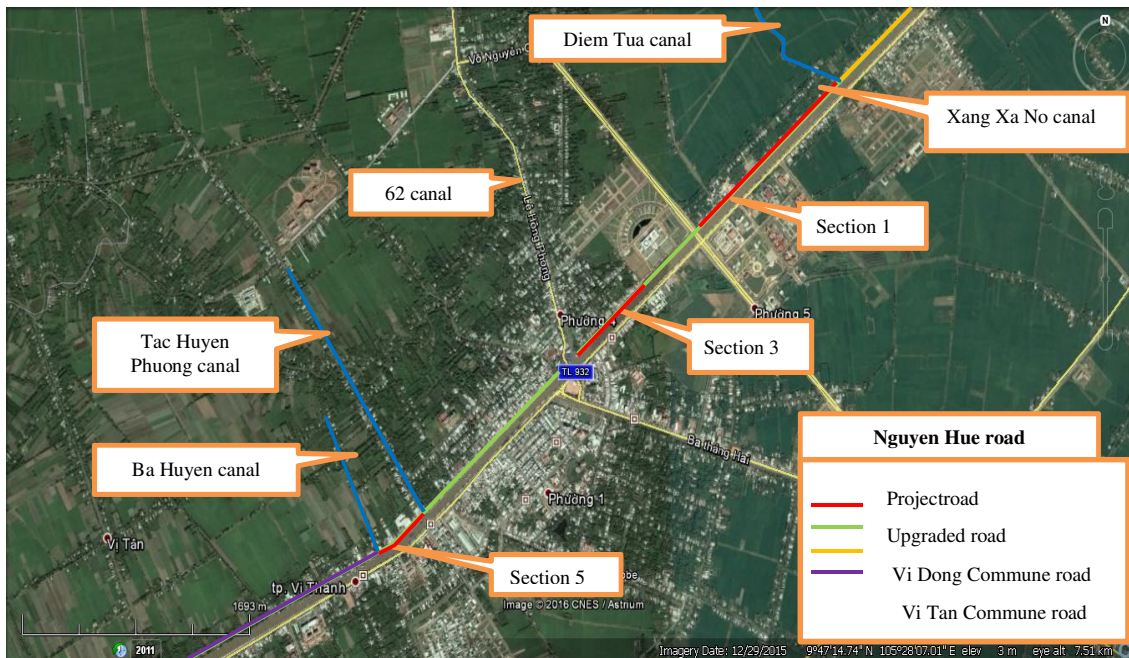
Disposal route of Section III of Nguyen Hue Road may run through Ly Thuong Kiet Road → Nguyen Trai Road → Le Hong Phong Road → Tran Hung Dao Road → NR 61 → Landfill in Hiep My Hamlet, Tan Tien Commune. Total route length is about 11.5km.

Nguyen Hue Road area has good air environment. Soil environment observation results show that contents of heavy metals (Cd, As, Zn, Hg, Cr (VI), Fe, Pb, Cu) in the project area are all lower than respective allowable levels (Please refer to Item 2.2).

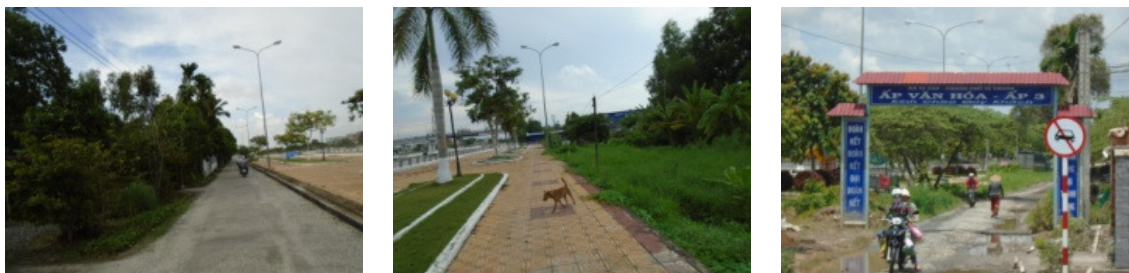
Sensitive locations are: Vi Hung Church; Graveyard of Vi Hung Church; Tran Quang Dieu Primary School.

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Nguyen Hue Road will be constructed section by section (7-15m each, width sidewalk of each side 3-8m wide), with total length of 2.3 km and technical infrastructure system including light system, green trees, RC D600 storm-water drainage lines on two side (2.3km long), and WW collection pipeline on one side (UPVC 220, 2.3km long).



**Chart 2.8: Existing Nguyen Hue Road**



Nguyen Hue Road – Section 1      Nguyen Hue Road - Section 3      Nguyen Hue Road – Section 5

**Chart 2.9: Some photos of Nguyen Hue Road**

**Subcomponent 2.2 : Construction of 1/5 Road**

01/05 Road is on southern side of Muong Lo Canal, from Quan De Shrine to NR 61C, with total length of about 2.6km. There many small bridges on this road section which will connect residential areas in Ward 5 with central area of Vi Thanh City.

The existing 01/05 Road is concrete road with average width of 3m, currently degrading, making travelling and connection of the HHs with the central area very difficult. This road has not had sewer system and light system. People mostly reside in the south of this road section; more densely at about 250 beginning meters of the road (Quan De Shrine area) and about 300 ending meters of the road (NR 61 intersection area). Areas nearby the middle section of the road are less densely populated because the HHs have large roadside areas and gardens in alternation with the houses. Traffic density of the road is low. In the north of the road, there’s Muong Lo Canal being the drainage channel for the HHs living around. However, canal-bed fill-up has been limiting this canal’s drainage capacity. There’s almost no

waterway traffic on this canal, yet in the middle section, there are a few number of small boats used to fish water-ferns or catch shrimps, fish in the canal.

Total affected land area of 01/05 Road item is 41,501 m<sup>2</sup>, of which 1,408 m<sup>2</sup> is homestead land and 36,494 m<sup>2</sup> is agricultural land. The rest 3,599 m<sup>2</sup> is other types of non-agricultural land.

150 HHs have affected trees (2,881 trees: 1,500 fruit trees and 1,381 wood trees).

Disposal route of 01/05 Road may run through 03 February Road → Tran Hung Dao Road → NR 61 → Landfill in Hiep My Hamlet, Tan Tien Commune. Total route length is about 9.5km.

01/05 Road area has good air environment, yet surface water environment (NM9, NM10, NM11) has COD and BOD<sub>5</sub> contents both 1.4 – 1.6 times higher than allowable levels (Please refer to section 2.2).

Sensitive locations are: Hung Thanh Temple, Quan De Shrine.

01/05 Road will be constructed with total width of 13.5m (roadbed 7.5m wide and sidewalk of each side 3m wide), with total length of 2.6 km and technical infrastructure system including light system, green trees, RC D600 storm-water drainage lines on two side (5.2km long), and WW collection pipeline on one side (UPVC 220, 2.6km long).

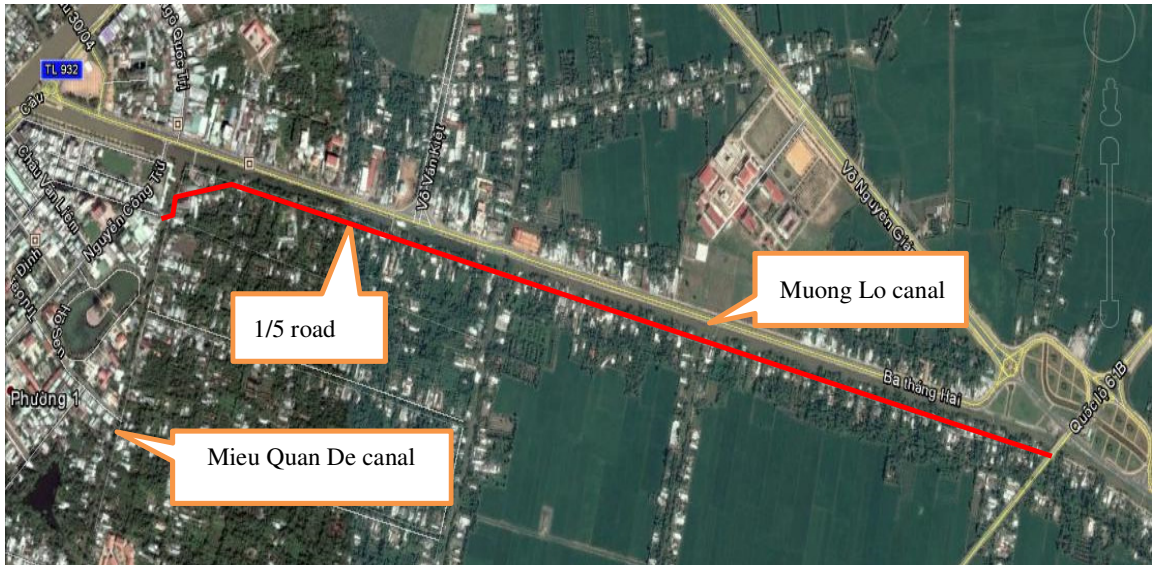
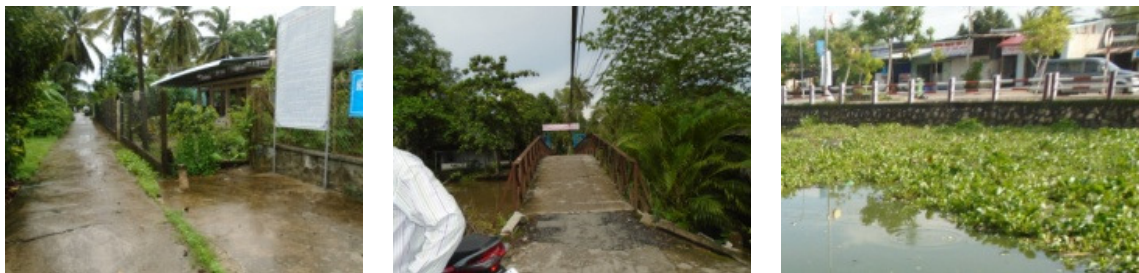


Chart 2.10: Existing 01/05 Road



Road and residential area

Small bridge of the road

Muong Lo Canal

Chart 2.11: Some photos of 1/5 Road

### **Subcomponent 2.3: Rehabilitating Cai Nhuc Canal**

Cai Nhuc Canal is a secondary canal 2km long and 18-20m wide on southern bank side of Xang Xa No Canal. This canal is in inner-city area, being a key drainage channel of the central areas of the city. Like Canal 62, people are encroaching this canal for living and doing business. Waste and WW are being discharged directly into the canal everyday polluting the environment and making people in the area very uncomfortable.

Within distance of 1km from from the beginning point of the canal being the intersection between Cai Nhuc Canal and Xang Xa No Cannal, on two sides there are may HHs living and encroaching the canal's surface. For the next 400m, there're almost no HHs encroaching the canal. For the last 600m of the canal: In the northern area of the canal there're almost no HHs encroaching the canal, meanwhile the southern area is relatively densely populated.

Along the canal, there's almost no waterway traffic, yet along the beginning 400m section there's a number of small boats mostly to serve trading of the residents on two sides of the canal with the boats, ships on Xang Xa No Canal and to transport goods to Vi Thanh Market via Xang Xa No Canal.

Total affected land area of Cai Nhuc Canal rehabilitation item is 32,538 m<sup>2</sup>, of which 2,074 m<sup>2</sup> is homestead land and 12,814 m<sup>2</sup> is agricultural land. The rest 17,650 m<sup>2</sup> is other types of non-agricultural land.

103 HHs have affected trees (652 trees: 320 fruit trees and 332 wood trees).

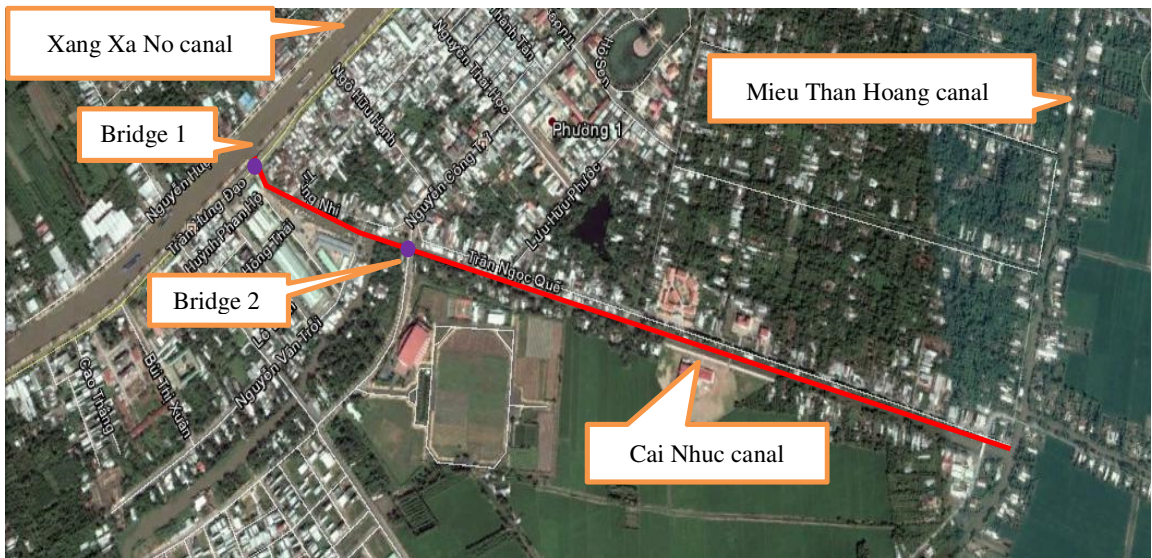
Disposal route of Cai Nhuc Canal item may go through Nguyen Cong Tru Road → Le Quy Don Road → Tran Hung Dao Road → NR 61 → Landfill in Hiep My Hamlet, Tan Tien Commune. Total route length is about 8.5 km.

Cai Nhuc Canal area has good air environment. Surface water observation results (NM12 – NM14) show that surface water environment of the project area is currently subject to organic pollution. COD and BOD<sub>5</sub> contents are all higher than respective allowable levels about 1.5 – 2.0 times because all canals in the project areas are receiving domestic waste and wastewater from the HHs living on their two sides. Moreover, because the wastewater collection and treatment system of Vi Thanh City has not been complete, WW overflows down the two sides of the canal and into the canal's water and making this water more and more polluted (please refer to item 2.2).

Sensitive locations are: Hoa Sen Kindergarten; Vi Thanh Market.

Cai Nhuc Canal will be dredged from existing depth of 0.4m to design depth of 2.5m with existing width of 18-20m and length of 2.4km; The canal will be embanked on two sides (soft eco-canal) (Please refer to Table 1.2)

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**Chart 2.12: Existing Cai Nhuc Canal embankment area**



**Chart 2.13: Some photos of Cai Nhuc Canal embankment area**

#### **Subcomponent 2.4: Canal 62 rehabilitation**

Canal 62 is about 2.3km long, in Ward IV, from Xang Xa No Canal to the end point as intersection point with Vo Nguyen Giap Road. Canal 62’s main function is to drain and regulate water for the residential area in northern area of the city. Canal bed width is about 30 – 60m.

Areas on two side of Canal 62 are relatively densely populated. For the ending section of about 800m of Canal 62 (to intersection point with Vo Nguyen Giap Road), population density gets lower and lower. Most of the houses on two sides of the canal are of semi-permanent type, with WW of the HHs directly discharged into the canal affecting landscape and polluting the canal’s water. There’s Le Hong Phong Road (PR 933) nearby on the left of the canal. This is the key axis road connecting Vi Thanh City with suburb districts and some districts of Kien Giang Province. This road also serves a great number of vehicles of the city’s universities, high schools and vocational training schools, leading to traffic overload and congestion because of narrow road-bed (BN = 7m).

There’re almost no waterway traffic on this canal, yet on the section of 250m from the intersection of Canal 62 and Xang Xa No Canal, there are some small boats mostly for exchanging goods with boats/ships getting through Xang Xa No Canal.

Besides, there're some small bridges crossing this canal, mostly being public welfare ones to serve travelling by motorbike/bicycle, on foot of the residents in the area and two big bridges able to serve travelling by car – Nguyen An Ninh Bridge and Vo Nguyen Giap Bridge. There's a tide lock culvert about 220m from the beginning point of the canal to prevent saltwater intrusion.

Total affected land area of Canal 62 rehabilitation item is 42,595 m<sup>2</sup>, of which 1,795 m<sup>2</sup> is homestead land and 17,800 m<sup>2</sup> is agricultural land. The rest 23,000 m<sup>2</sup> is other types of non-agricultural land.

125 HHs have affected trees (1,700 trees: 800 fruit trees and 900 wood trees).

Disposal route of Canal 62 item may go through Le Hong Phong Road → Tran Hung Dao Road → NR 61 → Landfill in Hiep My Hamlet, Tan Tien Commune. Total route length is about 10km.

Canal 62 area has good air environment. Surface water observation results show that the project area is currently subject to organic pollution. COD and BOD<sub>5</sub> contents are all higher than respective allowable levels about 1.5 – 1.9 times because all canals in the project areas are receiving domestic waste and wastewater from the HHs living on their two sides. Moreover, because the wastewater collection and treatment system of Vi Thanh City has not been complete, WW overflows down the two sides of the canal and into the canal's water and making this water more and more polluted (please refer to item 2.2).

Sensitive locations are: Hoa Mai Orphanage; Chau Van Liem Secondary School; Hoang Dieu Secondary School; market in Vi Tan Commune.

Canal 62 will be dredged from existing depth of 1.7m to design depth of 2.5m with existing width of 22m. The canal will be embanked on two sides (soft eco-canal, with total length of 2.3km) (Please refer to Table 1.2).

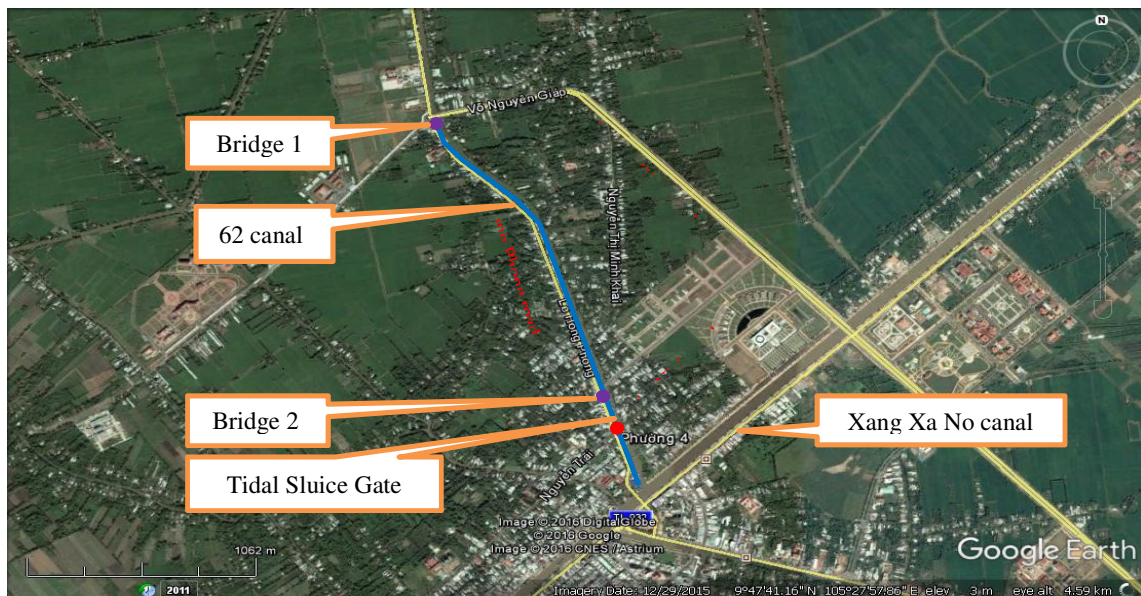


Chart 2.14: Existing Canal 62





Residential area

Tide-lock

Big bridge 1

Small bridge

**Chart 2.15: Some photos of Canal 62 area**

**Item 2.5: Upgrading Tam Giac lake**

**Tam Giac** Lake is surrounded by the residential area of Ward 1 about 3ha. Most of the residents do not reside near the lake, yet there are many restaurants around it. This lake connects with Quan De Shrine Canal and Cai Nhuc Canal currently acting as the main water storage sources of the area. At present, 100m of lake edge is rubble-embanked, and the rest is pure earth edge.

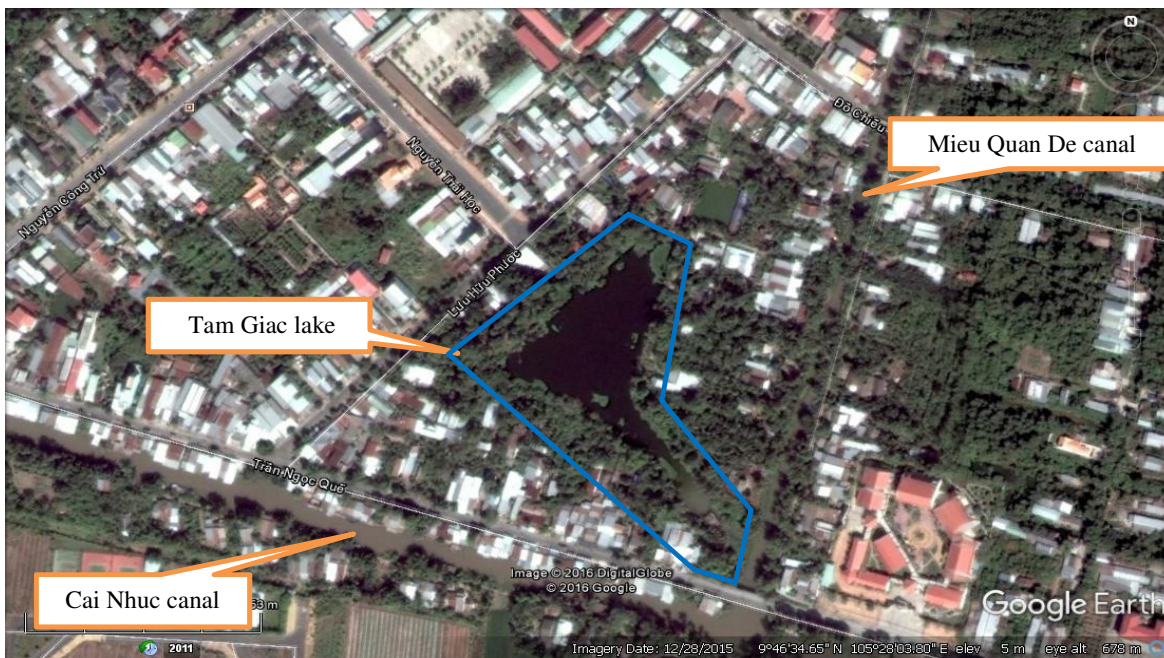
Total affected land area of **Tam Giac** Lake item is 30,000 m<sup>2</sup>, of which 200 m<sup>2</sup> is homestead land and 7,317 m<sup>2</sup> is agricultural land. The rest 22,483 m<sup>2</sup> is other types of non-agricultural land.

103 HHs have affected trees (652 trees: 320 fruit trees and 332 wood trees).

Disposal route of Tam Giac Lake item may go through Luu Huu Phuoc Road → Nguyen Thai Hoc Road → Tran Hung Dao Road → NR 61 → Landfill in Hiep My Hamlet, Tan Tien Commune. Total route length is about 9km.

Tam Giac Lake area has good air environment. Groundwater observation results show that contents of pollutants are all within respective limits (Please refer to item 2.2).

Tam Giac Lake will be dredged from existing depth of 1.4m to design depth of 2.5m. Lake edge will be embanked (combination of solid embankment and soft embankment), with total length of 0.76 km (Please refer to Table 1.2 in Chapter 1).



**Chart 2.16: Existing Tam Giac Lake**

### **2.5.3. Existing conditions of items of Component 3 – Resettlement area in Ward 4 and Vi Tan Commune**

The project will purchase the base resettlement area of Ward 4 and Vi Tan Commune. The resettlement area of Ward 4 and Vi Tan Commune already has complete infrastructure systems including road system, light system, water supply system and wastewater collection and treatment system.

## **2.6. PHYSICAL CULTURE RESOURCES AND SENSITIVE POINTS**

### **2.6.1. Physical culture resources**

Vi Thanh City has 1 historical site classified as special national historical site: “Chuong Thien Victory” historical site in Ward 5 and 3 national-level cultural sites: (i) “Vi Thanh Town Party Committee” Historical – Cultural Site; (ii) “Cai Sinh Victory” historical site; and (iii) Vi Thanh – Hoa Luu agroville.

“Chuong Thien Victory” historical site has total area of more than 144,000 square meters with total investment of 133 billion dong to memorize the victory over 75 battalion times of Republic of Vietnam Military of Zone 9’s militants and residents. This is the first historical site of Hau Giang Province and the only one of the 4th-time of Mekong Delta to be recognized as special national historical site. This site is outside of the project area, about 150m away from Nguyen Hue Road construction area.

“Vi Thanh Town Party Committee” (now Vi Thanh City Party Committee) historical – cultural site was seriously in Ward II of Vi Thanh Town, Can Tho Province (now Hamlet 2 of Vi Tan Commune, Vi Thanh City, Hau Giang Province). This site is about 500m away from the resettlement area in Vi Tan Commune.

“Cai Sinh Victory” historical site was already recognized by Ministry of Culture, Sport and Travel (MOCST) as national-level historical-cultural site in 2007. Hau Giang PPC also already approved “Cai Sinh Victory” Historical Site Embellishment and Development Project to be implemented on a total area of 20,322 square meters at Cai Sinh Rivulet Mouth in Area 2 of Ward VII, Vi Thanh City. This site is outside of the project area, on the disposal route about 30m away from the road;





“Vi Thanh - Hoa Lu Agroville” historical site has total length of about 7km, with breadth taking Xa No Canal as the centerline, 2km wide each side, divided into 4 key areas: Vi Thanh area, Hoa Luu area, Middle area, North Xa No area. In the war time, Xang Xa No Canal was “the military route” of both two sides: our side and enemy side. This historical site is outside of the project area, about 30m away from LIA 7 construction location.



All the historical/cultural sites mentioned above have already been recognized by MOCST as national-level historical/cultural heritages of great spiritual value for the people of Vi Thanh City. Survey results show that all construction locations of the project are of safe distance from these historical/cultural sites (30m - 500m). Construction activities will not directly affect these national historical/cultural heritages.

For implementation of the sub-project, 87 graves nearby Nguyen Hue Road will have to be displaced.

Several temples, pagodas, sensitive points may be affected by dust and noise during construction phase and may face difficulties in terms of access to these structures. The PCRs and sensitive locations in the subproject area are presented in Table 2.14:

**Table 2.14: Physical and sensitive locations of “LIA 1 Upgrading” item**

No.	Name/Photo	Location	Distance to construction location	Description
1	 Vi Thanh – Hoa Luu agroville	Lia 7	30m	About 30m away from LIA 7; medium traffic density
2	 Vi Thanh Church	Lia 2	15 m	Having 2 gates (1 gate looks towards Lotus Lake Road and 1 gate looks towards Do Chieu Road), about 15m away from LIA 2; medium traffic density
3	 Quan De Shrine	Lia 7	30	In LIA7, Quan De Shrine looks towards Quan De Shrine Canal, and Southern Herbology looks towards 03 February Canal. These two sites are about 30m away from 01/05 Road
4	 Hung Thanh Temple	Lia 7	20	Within LIA7, looking towards 01/05 Road and about 20m away from 01/05 Road; low traffic density


5	 <p style="text-align: center;">Vi Hung Church</p>	Nguyen Hue Road	Section 1 (5m)	On the side of Nguyen Hue Road – Section 1; low population density; low traffic density
6	 <p style="text-align: center;">Graveyard</p>	Nguyen Hue Road	Section 1 (3m)	On the side of Nguyen Hue Road - Section 1; low population density and low traffic density






### 2.6.2. Sensitive structures






The project does not have any direct impacts on local schools, health establishments during the course of land acquisition. However, in construction phase material transportation/construction activities may affect sensitive structures.

Many schools (kindergarten, secondary school, high school) and markets may be affected by dust and noise in construction phase, and it may be very difficult to enter these structures. Some sensitive structures are only 5 – 20m away from transportation routes: Tran Quang Dieu Primary School and Hoa Van Kindergarten. However, material transportation is not on regular basis (uncontinuous emission source), and careful coverage is always ensured for transportation. Hence, transportation work's negative impacts on surrounding environment are very minor, and there're no impacts on sensitive structures on the transportation routes.

**Table 2.15: Sensitive locations in the project area**

No.	Name/Photo	Location	Distance to construction location	Description
1	 <p style="text-align: center;">Hoa Van Kindergarten</p>	Lia 1	30 m	Within LIA 1, deep in Alley 25 of Trieu Thi Trinh Road; about 30m away from Trieu Thi Trinh Road; travellers are mostly residents of LIA 1

2	 <p>Vi Thanh Market</p>	Lia 1	60m	Vi Thanh Market looks towards Tran Hung Dao Road, about 60m away from LIA 1. This area has high traffic and is a great hub of trading activities.
3	 <p>Vi Thanh Special High School</p>	Lia 2	50 m	Having two gates (1 gate looks towards Nguyen Cong Tru Road and 1 gate looks towards Do Chieu Road); about 50m away from LIA 2; medium traffic density
4	 <p>Hoa Mai Vi Thanh Orphanage</p>	Lia 3	100m	On the side of Le Hong Phong, looking towards LIA 3; about 100m away from LIA 3; medium traffic density
5	 <p>Chau Van Liem Secondary School</p>	Lia 3	170m	On the side of Le Hong Phong Road, looking towards LIA 3, about 170m away from LIA 3; medium traffic density
6	 <p>Pink Lotus Kindergarten</p>	Lia 7	20 m	Within LIA 7, looking towards Tran Ngoc Que Road and Cai Nhuc Canal; low traffic density

8	 <p>Tran Quang Dieu Primary School</p>	Nguyen Hue Road	5m (Section 3)	On the side of Nguyen Hue Road – Section 3; low population density and medium traffic density
9	 <p>Hoa Mai Vi Thanh Orphanage</p>	Canal 62	20m	On the side of Le Hong Phong Road looking towards Canal 62, about 20m away from construction location; medium traffic density
10	 <p>Chau Van Liem Secondary School</p>	Canal 62	20m	On the side of Le Hong Phong Road looking towards Canal 62, about 20m away from construction location; medium traffic density
11	 <p>Hoang Dieu Secondary School</p>	Canal 62	20m	On the side of Le Hong Phong Road, looking towards Canal 62, about 20m away from construction location; medium traffic density
12	 <p>Vi Tan Commune market</p>	Canal 62	80m	On the side of Le Hong Phong Road, about 80m away from the ending point of Canal 62 Embankment item; This area has high traffic and is a great hub of trading activities.

<p>13</p>	 <p>Vi Thanh Market</p>	<p>Cai Nhuc Canal</p>	<p>20m</p>	<p>Looking towards Tran Hung Dao Road, about 20m away from Cai Nhuc Canal item location; This area has high traffic and is a great hub of trading activities</p>
<p>14</p>	 <p>Pink Lotus Kindergarten</p>	<p>Cai Nhuc Canal</p>	<p>30 m</p>	<p>On the side of Tran Ngoc Que Road; low traffic density; about 30m away from construction location</p>

### **CHAPTER 3. ANALYSIS OF ALTERNATIVES**

The young and dynamic Vi Thanh is currently class III city and aims to leapfrog to class II city by 2020. This Vi Thanh subproject is prepared in line with the national and regional master planning and policies, including: (i) the National Urban Upgrading Program for the period 2009-2020 as promulgated by the Prime Minister in Decision 758/QD-TTg; (ii) The National Urban Development Program as detailed in the Decision 1659/QD-TTg dated November 7, 2012 by the Prime Minister; (iii) Approval of the amendment to the Orientation of the Master Planning for the development of urban system in Vietnam as in Decision 445/QD-TTg on April 7, 2009; (iv) Proposal for Climate Change adapted Urban Development Program in Vietnam, governed under Decision 2623/QD-TTg in 2013; (v) The Vietnam Green Growth Strategy and Action Plan in 2014 as specified in the Decision 403/QDD-Ttg in 2014; (vi) Vi Thanh City Socio-Economic Development Plan for the period 2015-2020; (vii) Vi Thanh City’s Master Planning towards 2020, including sub-planning on spatial infrastructure, water supply and drainage, transport and flood control.

Standard EIA practice includes for an evaluation of feasible project alternatives or alternative design options, in addition to a ‘without project’ alternative. The identification, description, evaluation and comparison of alternatives are important for ensuring the objectivity of the assessment process. The aim is to ensure that the selected activity has the fewest negative impacts, while meeting the identified need.

During the impact assessment of the project, the analysis of alternatives is an important stage in identifying the investment’s location, scope, design, and technology applicable for a particular project component in order to minimize the negative impacts, while at the same time maximize the positive impacts. The analysis of alternatives has been conducted in consultation with relevant stakeholders in the city for each project’s component.

#### **3.1. “WITHOUT PROJECT” ALTERNATIVE**

If the project is not implemented, Vi Thanh City continues to face the challenges of a small city, namely the lack of adequate urban infrastructure and vulnerability to climate change and sea level rise. The situation is worsening due also to the rapid growth of population and labor force migrating from rural to urban areas. Challenges include:

- Degradation of roads, embankments, water supply and sewage system
- Increase of different types of waste
- Increase localized floods during flooding seasons

The consideration of the “with” and “without” scenario is presented in Table 3.1 for each of the project component, highlighting the component’s key investments.



**Table 3.1: Alternatives analysis of “with” and “without project” scenario**

Investment Item	With Project	Without Project
Upgrading the LIAs	<ul style="list-style-type: none"> <li>- Improve the commuting conditions for the people living in the LIAs.</li> <li>- Give access to local houses for evacuation, emergency and fire safety purposes</li> <li>- Improved sanitation and environment conditions via waste water collection and treatment</li> <li>- Improve significantly living conditions of residents</li> <li>- Reduce localized floods within the LIAs</li> <li>- Land value within LIAs is increased</li> <li>- 273 households are affected by land acquisition, of which 21 household will be resettled</li> </ul>	<ul style="list-style-type: none"> <li>- Commuting conditions of people in LIAs remain difficult.</li> <li>- Difficult access for evacuation, emergency, funerals and fire safety.</li> <li>- Issues on environmental sanitation and pollution are not addressed and will increase over time</li> <li>- Living conditions of residents are not improved</li> <li>- Local flooding issue remains.</li> <li>- Land value is not increased</li> <li>- No issue on land acquisition and resettlement</li> </ul>
Road construction and upgrading	<ul style="list-style-type: none"> <li>- Improve the commuting conditions for local people, reduce traffic jam and promoting the development of the residential area</li> <li>- Increase land value at the area along the road sides</li> <li>- Issue on land acquisition, resettlement and social impacts to local people (132 households are affected by land acquisition, of which 55 households will be resettled)</li> </ul>	<ul style="list-style-type: none"> <li>- Traffic pressure on existing route remains and will increase over time</li> <li>- Land value is not increased</li> <li>- No resettlement issues</li> </ul>
Canal upgrading work	<ul style="list-style-type: none"> <li>- Preventing the bank erosion</li> <li>- Stabilize the life of local residents and removing the encroachment status of canals.</li> <li>- Improve environmental and sanitation via wastewater collection and treatment</li> <li>- Better landscape and increasing green space; facilitate tourism development on river</li> <li>- Issues on land acquisition, resettlements and livelihood restoration to affected people during subproject implementation (98 households are affected by land acquisition, of which 199 households will be resettled)</li> </ul>	<ul style="list-style-type: none"> <li>- High risk on property loss and safety of local people living along the canal due to erosion</li> <li>- Ability for drainage in flooding restricted by the encroachment and pollution.</li> <li>- Landscape situation is not improved</li> <li>- No cost for resettlement.</li> </ul>

### 3.2. “WITH PROJECT” ALTERNATIVES

In this scenario, the alternatives analysis addresses the options of widening the alleys in the LIAs and different technical designs of Cai Nhuc, 62 and Tam Giac lake. The construction of roads mostly follows the existing planning and therefore no alternatives are proposed. The alternatives analyses are conducted considering a combination of technical, economic, environmental, and social criteria.

#### 3.2.1. Component 1 – Upgrading level-3 infrastructure

The proposed options for upgrading the LIAs are:

- (i) Upgrading with extension of all alleys within the LIA to the minimal width. The alley’s centerline would stay unchanged
- (ii) Upgrade the current alleys to concrete ones, without extension
- (iii) A mix of option 1 and 2 in which big and heavily trafficed alleys would be widened to at least 4 m; small alleys are upgraded and expanded to minimal width of 2 m

The detailed analysis of alternatives is presented in table 3.3 below.

**Table 3.2: Alternatives for widening alleys in LIAs**

Criteria	Option 1	Option 2	Option 3 (selected)
Technical	<ul style="list-style-type: none"> <li>- Sufficient road width for installation of basic infrastructures and evacuation purposes</li> <li>- Construction work might be delayed due to big resettlement work arrangement.</li> </ul>	<ul style="list-style-type: none"> <li>- Easy for construction and operation</li> <li>- Difficult for installation of basic infrastructure (sewage)</li> </ul>	<ul style="list-style-type: none"> <li>- Main alleys with sufficient width for installing basic infrastructure</li> <li>- Upgraded small alleys would easily be connected to the main alleys</li> </ul>
Social	<ul style="list-style-type: none"> <li>- Living conditions and traffic safety would be significantly improved</li> <li>- Daily life/ livelihoods of residents would be impacted during construction and resettlement process</li> <li>- Involve highest scale of land acquisition and resettlement</li> </ul>	<ul style="list-style-type: none"> <li>- Not much improved traffic and living conditions</li> <li>- Daily life/ livelihoods of residents would only be impacted during construction.</li> <li>- No land acquisition and resettlement is required</li> </ul>	<ul style="list-style-type: none"> <li>- Improve traffic and living conditions</li> <li>- Daily life/ livelihoods of residents would be impacted during construction and resettlement process</li> <li>- Involve moderate scale of land acquisition and resettlement</li> </ul>
Environmental	<ul style="list-style-type: none"> <li>- Environmental sanitation conditions would be improved.</li> <li>- Prevent local flooding</li> <li>- Better landscape and waste management</li> <li>- Noise, dust, vibration and waste would be expected during construction</li> <li>- Accessibility will be greatly enhanced</li> </ul>	<ul style="list-style-type: none"> <li>- Environmental sanitation conditions would be improved.</li> <li>- Prevent local flooding</li> <li>- Landscape and environmental management would not be improved much.</li> <li>- Less impact from noise, dust and vibration.</li> <li>- Accessibility would be difficult for emergency, fire safety, evacuation or waste collection purposes.</li> </ul>	<ul style="list-style-type: none"> <li>- Environmental sanitation conditions would be improved.</li> <li>- Prevent local flooding</li> <li>- Better landscape and waste management</li> <li>- Noise, dust, vibration and waste would be expected during construction</li> <li>- Evacuation or emergency could be feasible</li> </ul>
Investment cost	<ul style="list-style-type: none"> <li>- Increase value of land</li> <li>- Highest cost for compensation</li> <li>- Highest construction cost</li> </ul>	<ul style="list-style-type: none"> <li>- Value of land would not be much improved</li> <li>- Compensation cost would be the lowest</li> <li>- Cost of construction would be the lowest.</li> </ul>	<ul style="list-style-type: none"> <li>- Value of land would increase along the main alleys.</li> <li>- Moderate compensation cost.</li> <li>- High construction cost.</li> </ul>

Conclusion: Among the three analyzed options, option 1 will significantly enhance the commuting conditions and accessibility within LIAs. However, it will result in highest cost for resettlement and construction. Option 2, on the another hand, will cause minimal social impacts and lowest construction cost, however, the accessibility and commuting conditions within LIAs would not be much enhanced. Option 3 could be considered as the balance among options 1 and 2. It causes moderate environmental social and environmental impacts, moderate cost value while the local travel and accessibility is enhanced. In addition, this option received high consensus from the community (greater than 90% people voted for during the community consultation), therefore, option 3 is selected.

### ***3.2.2. Alternatives of embankment designs***

Cai Nhuc, 62 canals are connected therefore technical designs of embankment are applied the same for these two canals. Four technical designs are proposed as follows:

Option 1: Combined hard and soft structure, i.e. gravity concrete piles below the normal water level and earth revetment with trees on the surface.

Option 2: Combined soft and hard structure, i.e. pre-stressed concrete piles below normal water level and earth revetment with trees on the surface.

Option 3: Hard structure i.e. stone revetment

Option 4: Soft structure, i.e. earth revetment and with trees on the surface

**Table 3.3: Alternatives for the structure of embankment for Cai Nhuc and 62 canals**

Criteria	Option 1	Option 2	Option 3	Option 4 (selected)
<b>Description</b>	- Combined hard and soft structure, i.e. gravity concrete piles below the normal water level and earth revetment, with grass and trees on the surface.	- Combined soft and hard structure, pre-stressed concrete piles below normal water level and earth revetment with grass and trees on the surface.	- Hard structure, i.e. stone revetment	- Soft structure, soil revetment, with grass and trees on the surface
<b>Technical</b>	- Highest stability as it includes the gravity concrete pile  - Difficult to construct, includes high amount of construction work and long construction period.	- High stability as it includes the concrete pile  - Relatively difficult construction, relatively high amount of construction work and long construction period	- Stability is moderate, but is ensured as the two canals are not eroded and do not have waterway traffic activity.  - Easy to construction, moderate amount of construction work, short construction period	- Stability is moderate, but is ensured as the two canals are not eroded and do not have waterway traffic activity.  - Most easy to construct, least construction work and shortest construction period.
<b>Social</b>	- Land acquisition and resettlement is low.  On average, about 0.8 m-1.0 m of land along canal sides is acquired for the soft revetment section.	- Land acquisition and resettlement is low.  On average, about 0.8 m-1.0 m of land along canal sides is acquired for the soft revetment section.	- Land acquisition and resettlement is higher.  On average, about 2.5 m of land along canal sides is acquired for the construction of slope revetment	- Land acquisition and resettlement is higher.  On average, about 2.5 m of land along canal sides is acquired for the construction of slope revetment
<b>Environmental</b>	- Aesthetic is moderately pleasing. The embankment will look nice during flooding season, and less nice during the dry season as the concrete part is revealed.  - Highest construction related	- Aesthetic is moderately pleasing. The embankment will look nice during flooding season, and less nice during the dry season as the concrete part is revealed.  - Moderate construction related	- Not aesthetically pleasing as it is wholly comprised of stone  - Low construction related impacts as most of the	- Most aesthetically pleasing as it comprises totally of reinforced earth with green area during the dry and flood season.  - Lowest construction related impacts as most of the construction work is manual,

Criteria	Option 1	Option 2	Option 3	Option 4 (selected)
	impacts due to high amount of work i.e. piling and concrete work	impacts due to moderate amount of construction work i.e. piling	construction work is manual, not require the mobilisation of many machines	not require the mobilisation of many machines
<b>Cost</b>	- Medium construction cost	- Highest construction cost	- Low construction cost	- Lowest construction cost

Conclusion: For the technical aspect, all 04 alternatives meet in terms of stability and sustainability in the project. The option 4 requires more land acquisition land than option 1 and 2, and similar land acquisition compared to the option 3. Thus option 4 is selected as it results in lowest construction cost, easiest construction method, least environmental construction related impacts, and most beautiful landscape.

### 3.2.3. Alternatives of Tam Giac lake’s designs

3 technical options are proposed for Green Park item, combining with Tam Giac Lake’s landscape as follows:

Option 1: Combined soft and hard structure i.e. stone revetment, with the green area above

Option 2: Combined soft and hard structure, i.e. reinforced concrete retaining wall; with the green area above

Option 3: Soft revetment i.e., with the green surface

**Table 3.4: Alternatives for technical designs for green park item, combining with Tam Giac lake’s landscape**

Item	Option 1 (selected)	Option 2	Option 3
	Combined soft and hard structure i.e. stone revetment, with the green area above	Combined soft and hard structure, i.e. reinforced concrete retaining wall; with the green area above	Soft revetment i.e., with the green surface
<b>Technical</b>	<ul style="list-style-type: none"> <li>- Ensure lake bank stability</li> <li>- Construction method is moderately difficult</li> <li>- Ensure harmonization with the existing stone embankment section around Tam Giac lake</li> </ul>	<ul style="list-style-type: none"> <li>- Ensure lake bank stability</li> <li>- Most difficult construction method</li> <li>- Not ensure the harmonization with the existing stone embankment section around Tam Giac lake</li> </ul>	<ul style="list-style-type: none"> <li>- Ensure lake bank stability</li> <li>- Construction method is easy</li> <li>- Not ensure the harmonization with the existing stone embankment section around Tam Giac lake</li> </ul>

Item	Option 1 (selected)	Option 2	Option 3
<b>Social</b>	- Land acquisition and resettlement is higher	- Land acquisition and resettlement is lower	- Land acquisition and resettlement is higher
<b>Environment</b>	- Aesthetic is moderately pleasing as embankment still includes the stone section - Moderately environmental construction related impacts due to moderate amount of work	- Aesthetic is moderately pleasing as embankment still include the concrete section - Highest environmental construction related impacts due to high amount of work	- Aesthetic is most pleasing - Lowest environmental construction related impacts due to low amount of work.
<b>Cost</b>	- Medium construction cost	- High construction cost	- Low construction cost

Among the 03 options, option 1 results in high land acquisition and resettlements. In addition, it will cause moderate construction related impacts and is moderately pleasing aesthetic. Option 1 is selected as it ensures the harmonization with the existing embankment section surrounding Ao Quan while ensuring the stability.

## **CHAPTER 4. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT**

Chapter 4 will analyze the specific environmental impacts induced by the project activities of (i) Tertiary infrastructure upgrading in Low Income Areas; (ii) Priority Primary and Secondary Infrastructures; (iii) Resettlement sites. Component 4, which is implementation support and capacity building does not involve any physical construction thus will not cause any environmental impacts. The considered environmental impacts including both positive and negative impacts in which the latter will be given special attention in order to come up with necessary and obligatory mitigation measures to be implemented during the project's preparation, implementation and operation. Besides, the accumulation impacts and impacts to the physical culture and resources will also be assessed in this chapter. The method used in this chapter is based on the analysis of the baseline environmental information, field survey and discussion and consultation with local authority and people and other stakeholders

### **4.1. ENVIRONMENTAL IMPACT ASSESSMENT**

#### ***4.1.1. Positive impacts:***

The positive environmental impacts are of the following:-Improve environment and sanitation in LIAs from alley upgrading, sewage and stormwater collection and domestic waste collection.

- Improved environmental conditions and urban landscape in many public and residential areas;
- Enhancing the living conditions of the local people
- Reduce local flooding and enhance the drainage in the LIAs and along the newly constructed and/or upgrading road
- Address the environmental pollution in the main drainage network of the city (Cai Nhuc, 62 canals);
- Eliminate the encroachment of the canal bank and thus prevent the direct discharge of waste and waste water into the canals
- reduction of public health risks associated with water-borne diseases and related healthcare cost;
- The construction of linear parks along improved embankments will bring about additional economic, social, environment and aesthetic values.
- reduction of traffic jam; via increased the accessibility of local people to nearby areas via road and bridge construction activities
- Increase climate resilience by improving drainage/ flood retention capacity, strengthening the weak soil foundation and applying the construction standards and designs adapted to climate change.

#### ***4.1.2. Negative impacts***

##### **4.1.2.1. Type and scope of impacts**

Potential negative impacts are identified and screened at each project component for the preparation, construction to operation phase and categorized by the nature of the construction works. Most of the negative impacts are temporal, localized and reversible due to the medium sized construction works and they can be mitigated by applying appropriate technologies and construction management measures together with close supervision by the contractor and consultation with local community. Potential environmental impacts are classified and identified in Table 4.1 below, of which:

None (N): No impacts; Low (L): Small work, small impacts, localized, reversible, temporary; Medium (M): Small works in sensitive/urban areas, medium-scale with medium impacts, reversible, temporary; High (H): Major works in sensitive/urban areas, large-scaled works with significant impacts (social and/or environmental), irreversible, and compulsory compensation.

**Table 4.1: Level of potential negative impacts of Vi Thanh subproject**

Component	Physical elements			Biological elements		Social elements				Others	
	Air, noise, vibration	Soil, water	Solid waste	Forest, natural ecosystem	Fish, aquatic species	Land acquisition and resettlement	ethnic group	PCR	Livelihood, local disturbance	Local flooding traffic, safety	Off-site impacts
<p><b>Component 1: Tertiary infrastructure upgrading area in 4 LIAs.</b>                      - <b>Resettlement:</b> 135 affected households, of which 115 affected partly, 22 households are affected fully; 21 households reallocated. Affected agriculture land: 22,549 m<sup>2</sup>; residential land: 4,850 m<sup>2</sup>. <b>Technical infrastructure works:</b> Upgrading main alleys to 4m line, branch alleys to at least 2m line, installation of sewage pipes and alleys’ lighting system, upgrading small canals in LIA 03, 07. <b>Sensitive locations:</b> Hoa Van kindergarten, Vi Thanh Church, Clinic center in Ward 1, Vi Thanh Market; Hoa Mai Orphanage; Chau Van Liem High school; Memorial place; Sen Hong Kindergarten; Hung Thanh Tu pagoda; Cultural house and Clinic center of ward 5.</p>											
Preparation	N	N	N	N	N	M	N	N	N	N	N
Construction	M	M	M	N	N	N	N	L	M	M	M
Operation	L	N	L	N	N	N	N	N	N	N	N
<p><b>Note in construction:</b> (i) Local flooding; (ii) Interruption to people’s life and traffic accident risks due to high population density and narrow, small roads; (iii) Impacts on PCRs and sensitive locations; (iv) Odor and management of 35,236 m<sup>3</sup> of arising dredged sludge of LIA 3 and LIA 7;</p>											
<p><b>Component 2: Upgrading priority primary and secondary infrastructure, including 05 subcomponents:</b> (i) Upgrading Nguyen Hue Road; (ii) Constructing of 1/5 Road ; (iii) Upgrading Cai Nhuc Canal; (iv) Upgrading No62 Canal; (v) Upgrading Tam Giac lake. <b>Land acquisition and Resettlement:</b> There will be 595 affected households, of which 122 affected partly, 473 households affected fully. 254 households reallocated. Affected agriculture land: 97,624 m<sup>2</sup>; residential land: 15,624 m<sup>2</sup>.</p>											
<p><b>Component 2.1: Constructing of Nguyen Hue street with a length of 3 km, 3 parts:</b> (i) part 1: from Điểm Tựa canal to Xà No bridge with a length of 1.0 km; (ii) section 2: from the office of Hau Giang Provincial Party committee to Canal 65 with a length of 0.45 km; and (iii) section 3: from Tac Huyen Phuong canal to Muoi Thuoc canal with a length of 2.35 km. <b>Technical infrastructure:</b> construction of sidewalk, water supply system, road’s lighting system, greenery in road sides, sewage systems. <b>Resettlement:</b> There will be 138 affected households, of which 65 partly affected; 73 fully affected. <b>Sensitive location:</b> Mai Hoa orphanage, Chau Van Liem High school; Hoang Dieu High school</p>											
Preparation	L	L	M	L	N	H	N	M	M	M	L
Construction	M	M	M	N	N	N	N	M	M	M	M
Operation	L	N	L	N	N	N	N	N	N	L	N
<p><b>Note in construction:</b> (i) Interruption to people’s life and traffic accident risks; (ii) Surface water quality may be affected; (iii) Impacts on PCRs and sensitive points</p>											



Component	Physical elements			Biological elements		Social elements				Others	
	Air, noise, vibration	Soil, water	Solid waste	Forest, natural ecosystem	Fish, aquatic species	Land acquisition and resettlement	ethnic group	PCR	Livelihood, local disturbance	Local flooding traffic, safety	Off-site impacts
<p><b>Component 2.2: 01/05 Road construction and Muong Lo Canal dredging.</b> There will be 100 affected households, of which 30 households affected partly; 70 households affected fully. And 30 reallocated households. <b>Technical infrastructure:</b> sidewalk, sewage systems, public lighting system, greenery with a length of the street at both sides. <b>Sensitive points:</b> Residential areas within a radius of 10-50 0m from construction work; Vi Thanh Memorial monument, Sen Hong Kindergarten; Hung Thanh Tu Pagoda; Quan De temple;</p>											
Preparation	N	N	N	N	N	H	N	N	M	N	N
Construction	M	M	M	N	N	N	N	M	M	M	M
Operation	L	N	L	N	N	N	N	L	N	L	N
<p><b>Note in construction:</b> (i) Odor and management of 51,750 m3 of arising dredged sludge; (ii) Damage risk to small bridges on Muong Lo Canal; (iii) Impacts on PCRs</p>											
<p><b>Subproject Component 2.3. Upgrading Cai Nhuc canal with a length of 2 km .</b> <b>Technical infrastructure:</b> dredging, constructing 2-side of embankments, construction works on and behind embankments. There will be 112 affected households, of which 12 households affected partly, 100 households affected fully. 40 reallocated households. - <b>Sensitive points:</b> Hoa Văn Kindergarten, health care center, Vi Thanh church is at 30-100m of a distance to construction work.</p>											
Preparation	L	M	L	L	L	H	N	L	M	L	L
Construction	M	M	M	M	M	N	N	L	M	L	M
Operation	L	L	L	N	N	N	N	N	N	L	N
<p><b>Note in construction:</b> (i) Drainage and flow diversion s during construction; (ii) Odor and management of 60,000 m3 of arising dredged sludge; (iii) Temporary impacts on PCRs and sensitive locations; (iv) Impacts on waterway traffic</p>											
<p><b>Subproject component 2.4: upgrading Canal No. 62 with a length of 2.3 km.</b> <b>Technical infrastructure:</b> Dredging and embankment, construction of operational road from 3-4 m, sewage system that connect to the city’s system. - There will be 238 affected households, of which 15 households affected partly; 233 households affected fully; and 155 reallocated households. <b>Sensitive points:</b> Residential areas within a radius of 10-500m from construction work; Mai Hoa orphanage; Châu Văn Liêm High school; Hoàng Diệu High school and Vi Thanh market</p>											
Preparation	L	M	L	L	L	H	N	L	M	L	L
Construction	M	M	M	M	M	N	N	L	M	L	M
Operation	L	L	L	N	N	N	N	N	N	L	N
<p><b>Note in construction:</b> (i) Impacts on sensitive locations; (ii) Local flooding, drainage and flow diversion issue; (iii) Interruption to people’s life and traffic; (iv) Accident risks; (v) Odor and management of 135,000 m3 of arising dredged sludge; (vi) Impacts on structures on the canal → small bridges;</p>											

Component	Physical elements			Biological elements		Social elements				Others	
	Air, noise, vibration	Soil, water	Solid waste	Forest, natural ecosystem	Fish, aquatic species	Land acquisition and resettlement	ethnic group	PCR	Livelihood, local disturbance	Local flooding traffic, safety	Off-site impacts
<b>Subproject Component 2.5: upgrading Tam Giac lake with a total area of 3.0 ha</b>											
- Technical infrastructure: Dredging and embankment, construction of operational road and installation of greenery systems around the lake											
- There will be 7 affected households, of which 0 household affected partly, and 7 households affected fully.											
Preparation	L	M	L	L	L	L	N	L	M	L	L
Construction	M	M	M	M	M	N	N	L	M	L	M
Operation	N	L	N	N	N	N	N	N	N	N	N
<b>Note in construction:</b> Odor and management of 20,000 m3 of arising dredged sediment											
<b>Component 3: Construction of resettlement area:</b>											
Support constructing resettlement site for affected households and reallocation of the project, including supports improvement of technical infrastructures: road, water supply, power supply, drainage system and public lighting system. Other social infrastructures like cultural houses, health center, kindergarten. These facilities will avoid disrupting living conditions of affected people and helping them to recover in new place and access to the best living conditions once the project is implemented.											
Resettlement area will be located in ward 4, Vi Tan commune. The project purchase land with basic infrastructure											
Operation	L	L	L	L	L	N	N	N	M	L	N
<b>Notes:</b>											
1. The following criteria are used to assess the level of impacts: None (N) – No impacts; Low (L) – Small work, small impacts, localized, reversible, temporary; Medium (M) – Small works in sensitive/urban areas, medium-scale with medium impacts, reversible, able to be mitigated and managed, localized, temporary; High (H) – Medium-scale works in small sensitive/urban areas, large-scale works with significant impacts (social and/or environmental), many of which are irreversible and require compensation. Both M and H require monitoring and implementation of mitigation measures as well as an appropriate institutional capacity in terms of safety.											
2. Most impacts of small and medium scale works are localized and temporary and can be mitigated through the application of technical solutions and good construction management practice with strict supervision, inspection and consultation with the local community.											
Affected households: Project affected households (AHs) including compulsory land acquisition, leading to: (a) Displacement or loss of houses; (b) Loss of assets or loss of access to these assets; (c) Loss of income sources or livelihood means, regardless affected households or not-displaced households; (d) Restricted legal access to parks or protected areas, causing adverse impact on their livelihoods; €Vulnerable groups: Those are affected differently by the project’s adverse impacts and/or having difficulty in access to the benefits of the project and compensation, including livelihood restoration and compensation for assets, when compared with the rest of APs. Vulnerable people include people, regardless of gender, ethnicity, age, physical or mental disability, disadvantaged economic or social status, may be more severely affected by relocation in terms of economic or material regards compared to others and who may be more limited than other in capacity to claim compensation or resettlement assistance and related development benefits.											

#### **4.1.3. Impact assessments for Component 1 – upgrading tertiary infrastructure**

The investments under component 1 includes activities on upgrading of alleys with extension, alley surface concreting, dredging small canals within LIAs, installation drainage system, provision of lighting and trash bin . Detailed assessment on the potential adverse impacts during preparation, construction and operation of investments under component 1 are described below.

##### **4.1.3.1. Component 1: Impacts during Preparation**

Major activities in this phase include land acquisition- resettlement and UXO risk

###### *a) Land acquisition and Resettlement*

Land acquisition, relocation and resettlement has potential to affect the physical and spiritual life of the affected households, may result in social problems and even litigation, if not undertaken successfully. Relocating to a new place may cause some disturbances and people do need time to be settled and some households may be seriously affected by a new living environment. Local people need time to integrate into new circumstances, especially creating new relationships and adapting to new jobs, if necessary.

Whilst the project has designed the works to limit the number of relocated households, about 20 households are required to be resettled to a new place.

Component 1 will impact about 22,549 m<sup>2</sup> of production land (agriculture land), taken from 719 households. Therefore, one household will be acquired at 31m<sup>2</sup>. This size of land loss during construction is very small in comparison to the average arable land size per capita in the Mekong Delta (0.75 ha). Thus, impacts on loss of agricultural land in component 1 is relatively LOW. Beyond that, the project will support local people to reduce any livelihood effects by providing training for those have lost income; and will ensure that vulnerable groups or households are supported accordingly.

###### *b) Impacts from Unexploded ordnance (UXO)*

Because the city was bombed in war time, there is risk of UXOs which may be potential threats to the work items and safety of local residents and laborers. The subproject construction sites have been greatly affected by human activities including extensive urban development, and UXOs have already been cleared. However, there could be UXOs remaining, which may be encountered during excavation. The consequences can be serious, causing injuries, losses of human life and assets in the subproject areas. Therefore, UXO detection and clearance must be carried out before commencement of any construction work.

##### **4.1.3.2. Component 1: Impact Assessment during Construction**

The construction phase will have different activities in the 4 LIAs, including:

- Upgrading main alleys
- Constructing water supply systems
- Constructing sewage systems and connection points
- Reinforcing concrete drainage culvert systems (D400-600, including manhole system)
- Installing lighting system with power-saving LED bulbs, wires and lamppost and lighting poles)
- Upgrading small canal in LIA 3 and 7.
- Rebuilding water supply systems including connection points
- Operation of transportation vehicles and machines by workers

**4.1.3.2.1. Component 1: Generic Impacts during construction**

The construction phase will involve the use of a range of vehicles and machines/equipment, which will result in production of solid waste, emissions, wastewater, noise and vibration. However, these impacts are temporary, intermittent and will occur over a short time.

**1. Impacts from Dust and Exhaust Gases Emission:**

Dust will be generated from: i) demolition of structures; ii) backfilling and dredging; iii) loading and unloading construction materials; iv) transportation of materials and disposal; v) constructing alleys; vi) exhaust emissions from operating machines and vehicles; which will also emit , CO, SO2, NOx and hydrocarbons...However, the project will be implemented over a 5 year period from 2017 until 2021; and the construction will be divided into several contracts implemented at different times.

**a) Dust emission from demolition, excavation, backfilling and cleaning ground activity**

Most of the construction activity in the narrow alleys will use only man-power with simple equipment (crowbars, hoes, shovels, small concrete mixer, concrete driller and cutter). This will produce some dust that may affect workers in the construction site and people living nearby the project area, but is likely to be very limited.

Dust emission coefficient is determined in accordance with guidelines of environmental assessment sourcebook (World Bank, 1991) and AP 42 for Stationary Point and Area Sources (US EPA, 1995) as follows:

$$E = k \times 0.0016 \times (U/2.2)^{1.4} \div (M/2)^{1.3}, \text{ kg/ ton} \quad [1]$$

Where: E: Emission coefficient (kg/ton)

k: Particle structure with average value (k = 0.35 with particle size <10µm – particle structure table (k) page 13.2.4-4 AP 42 (US EPA, 1995);

U: average wind speed (m/s) (selected speed is 3.5 m/s);

M: The average moisture content of debris (%) (Selected average moisture is 11% - Table 13.2.4-1 AP 42, US EPA, 1995)

→  $E_d = 0.03071 \text{ kg/t}$

According to [1], the volume of dust generated by each construction item is presented in table below:

**Table 4.2: Volume of demolition, excavation, backfilling activity in LIAs in component 1**

Construction work	Demolition volume	Excavation volume	Backfilling	Total
	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>
LIA 01	1.182	1.942	4.372	7.496
LIA 02	238	485	16.545	17.268
LIA 03	834	10.022	25.712	47.120
LIA 07	3.020	6.000	10.000	43.704

Based on the above algorithms to determine the amount of dust generated from demolition of existing structures for each. Summary of generated dust for areas in LIA 01, 02, 03 and 07 is listed in in table below:

**Table 4.3: Dust emission from demolition, excavation, backfilling activity**

Construction work	Emission load (kg)	Duration of excavation and backfilling (month)	Dust emission (kg/day)	Dust emission (mg/s)
LIA 01	414	12	1,15	40
LIA 02	955	12	2,65	92
LIA 03	2.021	15	4,49	156
LIA 07	1.051	15	2,34	81

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 2.4 m/s and a distance of 10-150 m from generating sources, height 1.5-18 m, the concentration of pollutants created by demolition can be calculated as follows:

For LIA 1: Dust concentrations vary between 0.19-1.21 mg/m<sup>3</sup> (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>).

For LIA 2: Dust concentrations vary between 0.17 - 2.52 mg/m<sup>3</sup>.

For LIA 3: Dust concentrations vary between 0.21 - 4.19 mg/m<sup>3</sup>.

For LIA 7: Dust concentrations vary between 0.17 - 2.24 mg/m<sup>3</sup>.

In general, the dust emission concentration depends on many factors such as structure of materials, size of work, and humidity and weather conditions in dry or wet season. The above calculated results in the dry season show the dust emission from the demolition, excavation, backfilling activities exceeds acceptable limits under QCVN 05:2013/BTNMT from 4 – 14 times varying for each LIA. Dust from demolition work is often at coarse size thus will be quickly deposited.

The dust emission will last 12-15 months during demolition, excavation and backfilling process thus the impacts are temporary and can be mitigated. By experiences, in the wet season, dust emission is less of about 1.5 – 2 times compared with that of the dry season. Therefore, impact from dust is at LOW level and can be minimized.

**b) Dust emission from transporting materials activities**

Dust emissions occur whenever vehicles travel and direct emission is from the loaded construction materials to locations inside construction site. The dust emission concentration from vehicle transportation can be determined by the following formula (US Environmental Bureau, 1995):

$$L = 1,7 \times k \cdot \left[ \frac{s}{12} \right] \times \left[ \frac{S}{48} \right] \times \left[ \frac{W}{2,7} \right] \times \left[ \frac{w}{4} \right] \times 0,5 \quad [2]$$

- In which:
- L – Dust emission factor (kg/km/trip);
  - k – Particle size, k = 0.2;
  - s – road silt loading, s = 5.7%;
  - S – Mean vehicle speed, S = 40km/h;
  - W – Mean vehicle weight (tons), W = 15 tons;
  - w – Number of tires, w = 10 → **L = 0.7068 kg/km/trip.**

Applying formula [2] with input parameters such as the volume of materials, debris, transportation time, dust emission loads due to vehicle transportation are calculated and reported in table below:

**Table 4.4: Load of dust regeneration from transportation of demolition materials, backfilling, excavation activities in LIA areas**

Construction work	Transport duration (month)	Number of transport vehicles (trip/day)	Distance (km)	Load of dust generation (kg/km/day)	Load of dust generation (mg/m/s)
LIA 01	12	8	8.5	5,65	0,196
LIA 02	12	6	9	4,24	0,147
LIA 03	15	8	10	5,65	0,196
LIA 07	15	21	9.5	14,84	0,515

From the above pollution loads from dust by applying Sutton model with a wind speed of 2.4 m/s and a distance of 5-25 m from generating sources, height 1-5 m, the concentration of pollutants created by transportation operations can be calculated as follows:

For LIA 1: Dust concentrations vary between 0.185-0.241 mg/m<sup>3</sup>

For LIA 2: Dust concentrations vary between 0.184-0.213 mg/m<sup>3</sup>.

For LIA 3: Dust concentrations vary between 0.185-0.241 mg/m<sup>3</sup>.

For LIA 5: Dust concentrations vary between 0.19-0.69 mg/m<sup>3</sup>.

For LIA 6: Dust concentrations vary between 0.187-0.335 mg/m<sup>3</sup> (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>).

The results show that dust emission concentration from transportation of demolition materials, excavation and backfilling activities in construction sites of LIA areas limits are SMALLER than the acceptable limits according to QCVN 05:2013/BTNMT- - National technical regulation on ambient air quality. There is an exception in LIA 07, at a distance of 5m, the concentration of dust exceeds the acceptable limit at 1.1 times and this exceedance is very small. Thus, thus the level of dust emission impact from transportation of demolition materials, backfilling, dredging activities in construction sites is at LOW and can be mitigated.

*c) Exhaust gases generated by transportation of demolition, excavation, dredging materials*

Transportation vehicles as well as construction equipment/machineries mostly use diesel oil as their fuel, so there will be exhaust gases from engines such as NO<sub>x</sub>, SO<sub>2</sub>, CO. These exhaust gases are mobile pollution sources, so they will potentially directly affect the workers and people near construction locations. According to obtained documents: filling/waste soil transportation vehicles have average capacity of load of 10m<sup>3</sup> and fuel consumption rate of 0.4 liters of oil/vehicle.km. (1 liter of diesel oil = 0.832 kg). Information about number of transportation vehicles, transportation distances, consumed fuel volumes is provided as follows:

From the above pollution loads from exhaust gases, by applying Sutton model with a wind speed of 2.4 m/s, and a distance of 1-5 m from generating sources, the concentration of pollutants created by transportation operations can be calculated as follows:

For LIA 1: CO contents 2.54 mg/m<sup>3</sup> (compared with 30 mg/m<sup>3</sup>); SO<sub>2</sub> contents 0.049 mg/m<sup>3</sup> (compared with 0.35 mg/m<sup>3</sup>); and NO<sub>x</sub> contents 0.058 mg/m<sup>3</sup> (compared with 0,20 mg/m<sup>3</sup>).

For LIA 2: CO contents 2.54 mg/m<sup>3</sup> (compared with 30 mg/m<sup>3</sup>); SO<sub>2</sub> contents 0.049 mg/m<sup>3</sup> (compared with 0.35 mg/m<sup>3</sup>); and NO<sub>x</sub> contents 0.058 mg/m<sup>3</sup> (compared with 0,20 mg/m<sup>3</sup>).

For LIA 3: CO contents 2.54 mg/m<sup>3</sup> (compared with 30 mg/m<sup>3</sup>); SO<sub>2</sub> contents 0.049 mg/m<sup>3</sup> (compared with 0.35 mg/m<sup>3</sup>); and NO<sub>x</sub> contents 0.058 mg/m<sup>3</sup> (compared with 0,20 mg/m<sup>3</sup>).

For LIA 7: CO contents 2.54 mg/m<sup>3</sup> (compared with 30 mg/m<sup>3</sup>); SO<sub>2</sub> contents 0.049 mg/m<sup>3</sup> (compared with 0.35 mg/m<sup>3</sup>); and NO<sub>x</sub> contents 0.058 mg/m<sup>3</sup> (compared with 0,20 mg/m<sup>3</sup>).

The concentration of exhaust gases generated from transport activities meets QCVN 05:2013/BTNMT - National technical regulation on ambient air quality. The calculation is applied with the quantity of vehicles is 18 – 38 trips/day and all material is transported once, whereas the quantity of vehicles is much fewer since the task is divided into many packages. Thus, level of impact is low.

The main transport routes for materials transportation would be Tran Hung Dao street, Nguyen Thai Hoc street, Luu Huu Phuoc street, Nguyen Cong Tru street, Le Quy Don street, Ly Thuong Kiet street, Nguyen Trai street, Le Hong Phong street, Vo An Ninh street, Vo Nguyen Giap streer, Highway 61 and some other internal transport of the city. These are also main transport routes through the city. The results of air quality analysis in Chapter 2 shows that the air quality in these areas is currently fairly good. Therefore, the subproject impacts of dust would be visible. The receptors affected by dust would be the residents living along the routes. Dust pollution would hinder businesses and services located along the routes leading to a drop in the number of customers. However, these impacts can be fully controlled and minimized if all necessary mitigation measures would be carried out during construction. The impact level of dust during transportation is there by assessed as being medium. Table 4.5 presents subjects and impact scale of dust emission from excavation and backfilling activity in LIAs

**Table 4.5: Subjects and impact scale of dust emission from excavation and backfilling activity in LIAs**

STT	Construction work	Affected subjects	Distance to construction site
1	LIA 01	Hoa Văn Kindergarten	Inside construction areas
		Vị Thanh market	100 m
2	LIA 02	Health care station ward 1	Inside construction areas
		Vị Thanh church	15 m
3	LIA 03	Hoa Mai Vị Thanh Orphanage	150 m
		Châu Văn Liêm Secondary school	150 m
4	LIA 07	Sen Hong Kindergarten; Hung Thanh Tự monastery, Quan Đe temple, Traditional medicine shop	Inside construction areas
		Memorial site	30 m
		Vị Thanh church	60 m

## 2. Noise and vibration impacts

Noise uring construction is mostly created by transportation vehicles, bulldozers, excavators, air compressors, etc. Noise levels of some types of vehicles/ machineries are shown in table below:

**Table 4.6: Noise levels of some types of transportation vehicles and construction machineries**

No.	Motorized transportation vehicles and construction equipment	Noise levels 1m from source	
		Range (dBA)	Average (dBA)

No.	Motorized transportation vehicles and construction equipment	Noise levels 1m from source	
		Range (dBA)	Average (dBA)
1	Bulldozer		93
2	Digger	80.0-93.0	86.5
3	Truck	82.0-94.0	88.0
4	Concrete mixer	75.0-88.0	81.5
5	Air compressor	75.0-87.0	81
6	Roller	72.0 – 74.0	73
7	Front-hoe excavator	72.0 – 84.0	78.0
8	Tractor	77.0 – 96.0	86.5
9	Road paver	87.0 – 88.5	87.7
10	Movable crane	76.0 – 87.0	81.5
11	Power generator	72.0 – 82.5	77.2
12	Pile driver	95.0 – 106.0	100.5

Source: Mackernize 1985

Based on standard noise levels of different types of vehicles, machineries as mentioned in Table 1.3 and regarding the number of vehicles, machineries mobilized for construction of LIA1, LIA 2, LIA 3 and LIA 7, the combined generated noise level generated by waste removal/transportation machineries and vehicles and by technical infrastructure structure demolition/displacement activities using the formula of Phạm Ngọc Đăng Air pollution - 1997 , following results:

**Day time: QCVN26:2010/BTNMT (6h-21h) – Normal area 75 dbA**

- LIA 01: From construction point to 15m away, calculated noise level is 71 dBA (1 dBA more than allowable level) .
- LIA 02: From construction point to 15m away, calculated noise level is 71 dBA (1 dBA more than allowable level).
- LIA 03: From construction point to 15m away, calculated noise level is 72 dBA (2 dBA more than allowable level).
- LIA 07: From construction point to 15m away, calculated noise level is 73 dBA (3 dBA more than allowable level).

**Night: QCVN26:2010/BTNMT (21h-6h) – Normal area 55 dbA**

- LIA 01: From construction point to 60m away, calculated noise level is 58 dBA (3 dBA more than allowable level).
- LIA 02: From construction point to 60m away, calculated noise level is 58 dBA (3 dBA more than allowable level).
- LIA 03: From construction point to 90m away, calculated noise level is equal to allowable level.
- LIA 07: From construction point to 90m away, calculated noise level is 56 dBA, 1 dBA more than allowable level.



So, affected subjects are mostly the workers and residents in the project area, within radius of 15m from construction point during daytime, and on greater scale at night: 60 – 90. Subjects and scope of impacts by construction noises are presented in the following table:

**Table 4.7: Subjects and scope of impacts by noises of construction vehicles/machineries of Component 1**

No.	Project item	Affected subject	Distance from construction location	Dust impact	Noise impact	
					Daytime	Night
1	LIA 01	Hoa Van Kindergarten	Within construction area	x	x	x
		Vi Thanh Market	100 m	x		
2	LIA 02	Ward 1’s medical station	Within construction area	x	x	
		Vi Thanh Church	15 m	x	x	x
3	LIA 03	Hoa Mai Orphanage	150 m	x		
		Chau Van Liem Secondary School	150 m	x		
4	LIA 07	Sen Hong Kindergaten, Hung Thanh Temple, Quan De Shrine, Southern Herbology store	Within construction area	x	x	x
		Memorial area	30 m	x		x
		Vi Thanh Church	60 m	x		x

### 3) Impacts on water quality

Sources of impact on water environment included (i) personal activities of the workers, (ii) construction wastewater, (iii) storm-water overflow in the project area. Poor wastewater management may pollute water environment of the project area and may cause spread of water-related diseases.

#### a) Pollution by workers’ wastewater:

Personal wastewater of the workers: Estimated total number of workers for this project is about 70 – 80 people. Required water volume for each worker as mentioned clearly in QCXDVN 01:2008/BXD is 45 liters/person/day (for washing, cooking and drinking). Daily generated wastewater volume is taken as **100%** of daily used water volume. So, total daily generated WW volume is about **3.2 – 3.6m<sup>3</sup>/day/work item**. In the wastewater, there are suspended particles, oil/grease, high Concentration of organic substances, sediments, dissolved organic substances (such as BOD, COD), nutrients (N, P) and micro-organisms. Using the WHO’s pollutant emission factors for developing countries, the pollution factors and volumes of pollutants in wastewater before treatment by septic tanks are tabulated as follows:

**Table 4.8: Pollution factors and volumes of pollutant in wastewater (before treatment) of the LIAs**

No.	Pollutant	Pollution factor (g/person/day)	Volume (kg/day)				Pollution factor (mg/l)	
			Lia 1	Lia 2	Lia 3	Lia 7	Before treatment	QCVN 14:2008 Column B
1	Number of workers		70	80	80	80		
2	BOD5	45 – 54	3,15 – 3,78	3,6 – 4,32	3,6 – 4,32	3,6 – 4,32	1000 - 1200	50
3	COD	72 – 102	5,04 – 7,14	5,76 – 8,16	5,76 – 8,16	5,76 – 8,16	1600 – 2666	-
4	Total suspended solids	70 – 145	4,9 – 10,15	5,6 – 11,6	5,6 – 11,6	5,6 – 11,6	1555 – 3222	100
5	Oil/grease	10 – 30	0,7 – 2,1	0,8 – 2,4	0,8 – 2,4	0,8 – 2,4	222 - 666	20
6	Total N	6 – 12	0,42 – 0,84	0,48 – 0,96	0,48 – 0,96	0,48 – 0,96	133 - 266	50
7	N-NH4	2.4 – 4.8	0,17 – 0,34	0,19 – 0,38	0,19 – 0,38	0,19 – 0,38	53 - 107	10
8	P	0.8 – 4.0	0,06 – 0,28	0,06 – 0,32	0,06 – 0,32	0,06 – 0,32	17,8 – 88,9	10
9	Total Coliforms	10 <sup>6</sup> - 10 <sup>9</sup>	70x10 <sup>3</sup> – 70x10 <sup>6</sup>	80x10 <sup>3</sup> - 80x10 <sup>6</sup>	80x10 <sup>3</sup> - 80x10 <sup>6</sup>	80x10 <sup>3</sup> - 80x10 <sup>6</sup>	22x10 <sup>6</sup> – 22x10 <sup>9</sup>	5000 (MNP/100ml)

(Source: WHO, 1993)

The above calculation results show that the untreated wastewater has pollutant contents much higher than QCVN 14: 2008/BTNMT (Column B). If there was no collection and treatment system available, everyday there would be a considerable amount of pollutant discharged to the environment. This would potentially affect the environment of the workers and people in the project area, causing water-related diseases and directly affecting the water environment. The water of Cai Nhuc, Than Hoang Shrine, Quan De Shrine canals is currently subject to organic pollution (see 2.5). COD and BOD5 contents are higher than allowable levels of QCVN 08:2015/BTNMT (Type B1, for irrigation or other purposes of same requirement, at low level – about 1.2 times and 1.5 times). Therefore, wastewater generated by the workers and project owner’s staff needs to be treated properly (by proper treatment measures).

*b) Pollution by construction wastewater:*

This is the wastewater generated by typical construction activities (cleaning materials, equipment, machineries, etc.), having high Concentration of TSS and organic substances:

**Table 4.9: Concentration of pollutants in construction wastewater**

No.	Parameter	Unit	Construction WW	QCVN 40:2011/BTNMT
1	pH	-	6,99	5,5 - 9
2	SS	mg/l	663,0	100
3	COD	mg/l	640,9	100
4	BOD <sub>5</sub>	mg/l	429,26	50
5	NH <sub>4</sub> <sup>+</sup>	mg/l	9,6	10
6	Total N	mg/l	49,27	30
7	Total P	mg/l	4,25	6

No.	Parameter	Unit	Construction WW	QCVN 40:2011/BTNMT
8	Fe	mg/l	0,72	5
9	Zn	mg/l	0,004	3
10	Pb	mg/l	0,055	0,5
11	As	μ mg/l	0,305	100
12	Oil/grease	mg/l	0,02	5
13	Coliform	MPN/100ml	53 x 10 <sup>4</sup>	5.000

Source: Center for Environmental Engineering of Towns and Industrial Areas - National University of Civil Engineering

The table above shows that some WW quality parameters are within allowable limits of QCVN 40:2011/BTNMT. Some other parameters are higher than respective allowable levels, such as TSS (6.6 times), COD (8 times), BOD<sub>5</sub>(8.6 times) and Coliform (106 times). This type of WW is not of great volume, yet if it is not collected and treated properly but discharged directly to the environment, it will pollute surface water, groundwater as well as health of the workers.

c) Pollution by storm-water overflow:

Normally, surface storm-water quality depends on air quality and the volume of washed-away substances from the project area. However, during construction the quality of storm-water in the construction areas will depend on site conditions. Thus if there is poor housekeeping on site, there is a greater potential to wash debris, sediment, waste, oils and grease off the construction sites. To limit overflow storm-water pollution, construction sites need to maintain good housekeeping, storing oils and fuels within properly bunded areas, store all waste in controlled areas, and managed loose materials well to minimize wash-out during heavy rains. This impact is not likely to be significant. Total volume of storm-water in the project area during construction phase has been estimated using the following formula:

$$Q = \varphi \times q \times S$$

Where:

S : Total area of the project area (m<sup>2</sup>).

φ : Flow factor of cover surface (if cover area is mostly soil, φ = 0.2; mostly crushed-stones, without binding material - φ = 0.4; mostly asphaltic, cement concrete - φ = 0.6).

q : Rainfall intensity (l/s.ha), q = 166.7 x i

166.7: is the switching module, from water layer-wise rainfall intensity to volume-wise rainfall intensity.

q: rainfall intensity = 166.7 x i, with I being the highest water layer of the area in the month with highest rainfall (Hoang Hue – 1996). According to the area’s hydrological data, highest rainfall in October is 247 mm (Chapter 2) with total number of rainy days being 17 days, each of which with 3 hours of raining (presumed), so i = 0.053 mm/minute → q = 8.835 (l/s.ha).

**Table 4.10: Total volume of overflow storm - water at construction locations of Component-1**

Work item	Storm-water drainage area (m <sup>2</sup> )	Flow factor	Storm-water flow rate (l/s)
Lia 1	7,500	0.6	3,98

Work item	Storm-water drainage area (m <sup>2</sup> )	Flow factor	Storm-water flow rate (l/s)
Lia 2	7,500	0.6	3,98
Lia 3	135,500	0.6	71,83
Lia 7	79,100	0.6	41,93

According to calculation results of Table 4.19, overflow storm-water flow rates of LIA 1, LIA 2, LIA 3 and LIA 7 are 3.98 l/s, 3.98 l/s, 71.83 l/s, and 41.93 l/s respectively. Moreover, there's frequent flooding occurrence at the LIAs. Overflow storm-water will wash away with it the construction material (soil/stone waste, etc.) to drainage culvert lines causing blockage, and even environmental pollution, because storm-water washes away surface waste into nearby water sources.

*c) WW generated by the HHs in the project area*

During construction the WW from the residents in the project area will still be discharged directly to the environment, affecting receiving water sources and their ecosystems. These impacts have been ongoing for a long time and the project will help mitigate this as works progress.

*d) Oil-containing WW*

- Construction equipment/machinery maintenance water: Construction equipment/machinery maintenance activities at the machinery gathering locations at construction areas also generate 11m<sup>3</sup> of oil-containing WW each day (Table 4.22). Oil contents are within allowable limit of QCVN 40/2011/BTNMT, Column B upon entering the canals in the project area ( $C_{max}$  of canals in the project area =  $C \times Kq \times Kf = 10 \times 0.6 \times 1.2 = 7.2\text{mg/l}$ ). TSS contents are higher than allowable limit (Column B) upon entering the canals around the project area ( $C_{max}$  TSS of the canals in the project area =  $100 \times 0.6 \times 1.2 = 72$ ).

**Table 4.11: Volume of and Concentration of pollutants in WW generated by machinery maintenance**

WW type	WW volume (m <sup>3</sup> / day)	Concentration of pollutants		
		COD (mg/l)	Oil (mg/l)	SS (mg/l)
By maintenance	2	20 ÷ 30	–	50 ÷ 80
By cleaning	5	50 ÷ 80	1,0 ÷ 2,0	150 ÷ 200
By cooling	4	10 ÷ 20	0,5 ÷ 1,0	10 ÷ 50
Total	11	30 ÷ 49	0,6 ÷ 1,3	81 ÷ 124
<b>QCVN 40:2011/BTNMT, Column A</b>		<b>C=50</b>	<b>C=5</b>	<b>C=50</b>
QCVN 40:2011/BTNMT, Column B		C=100	C=10	C=100

*Remark: Column A is with value C of pollutants of industrial WW upon discharge in to receiving targets being water sources used for domestic water supply; Column B is with value C of pollutants in industrial WW upon discharge into receiving target being water sources not used for domestic water supply.*

Impact level: MEDIUM

**4) Solid waste impact**

Solid waste generated by construction activities of Component 1 consists of construction solid waste and daily-life solid waste. Table 4.22 below presents solid waste volumes generated by

construction activities at the LIAs.

**Table 4.12: Generated solid waste volume of each work item**

Work item	Construction solid waste (m <sup>3</sup> )		Daily-life solid waste (kg/day)
	Demolition volume	Excavation volume	
LIA 1 rehabilitation	1,182.400	1,942.30	35
LIA 2 rehabilitation	237.825	485.03	40
LIA 3 rehabilitation	833.600	10,021.96	40
LIA 7 rehabilitation	3,019.950	6,000	40

*a) Construction solid waste:*

Construction solid waste includes: cement containing bags, dropped cement mortar, brick/stone chips, waste iron, steel, excavated soil, etc. According to table 4.21, the excavated soil volumes to be disposed of LIA 1, bLIA 2, LIA 3 and LIA 7 are about 1,942.30; 485.03, 10,021.96 and 6,000m<sup>3</sup>. Structure demolition volumes of LIA 1, LIA 2, LIA 3 and LIA 7 are about 1,182.400; 237.825, 833.600 and 3,019.950 m<sup>3</sup> respectively. These excavation, demolition volumes do not contain normal solid waste types and therefore will not cause serious environmental pollution. However, storage and transportation may affect the residents in the project area:

- Dust dissemination by storage, transportation activities;
- Overflowing, erosion at storage locations near residential areas and existing roads affecting people and traffic convenience;
- Increase of TSS contents in case of disposal into water; And, these LIAs have many surrounding canals, so the waste materials if not collected quickly and treated properly will pollute surface water environment of the project area.

*b) Personal solid waste:*

During construction phase, the personal solid waste generated by the workers mostly includes plastic bags, waste paper, waste food, etc. This type of waste contains 60 – 70% of organic substances and 30 – 40% of other substances, and may contain many bacteria and germs.

It is estimated that each worker working at the project area generates about **0.5 kg** of personal waste per day. At intensive construction times, estimated number of workers working at the construction sites are 70 – 80 each day. So, total volume of daily personal waste is estimated at **35-40 kg/day**. This waste volume, if not collected and treated properly, will affect surface water, groundwater sources, creating odors due to decomposition and washout of storm-water. So, the solid waste impacts are at medium level, in a short period of time, and can be controlled.

**5) Hazardous waste**

Hazardous waste generated by project activities include waste oil/grease, oil-stained duster cloth, oil/grease containers. Waste oil/grease, according to hazardous waste management regulations, is classified as hazardous waste. Waste oil/grease of transportation/construction vehicles and machineries maintenance, repairing activities is unavoidable, with volume depending on the following factors:

- Number of transportation/construction vehicles and machineries at construction site;
- Volume of waste oil/grease of the transportation/construction vehicles and machineries;
- Oil change and maintenance frequency;

Average waste oil/grease volume of the transportation/construction vehicles and machineries is 7 liters per change time. Maximum oil change/maintenance frequency is one time per 3 months. So, generated waste oil/grease volumes at construction sites of LIA 01, LIA 02, LIA 03 an LIA 07 are as follows:

**Table 4.13: Generated Hazardous waste**

No.	Construction item	Number of construction vehicles/machineries at site	Waste oil/grease volume per month
1	LIA 01	14	33
2	LIA 02	14	33
3	LIA 03	15	35
4	LIA 07	19	44

Average generated waste oil/grease volumes of LIA 01, LIA 02, LIA 03 and LIA 07 are 30; 30; 42 and 42 kg/month. These oil/grease volumes will be collected to 150-200 l bins placed at the maintenance, repairing locations at the construction sites, with hired specialized units to collect and recycle. Besides, the project also generates oil/grease-stained cloths and oil/grease containers – about 50kg per month. Waste oil/grease can enter environment by spill or washout by storm-water. Volume of spilled or washed-away waste oil/grease depends on storage location and management capacity factors. Because the project areas are near Quan De Shrine, Than Hoang Shrine, Cai Nhuc canals, etc., the waste oil/grease can enter and pollute surface water sources at the project areas. These waste oil/grease needs to be well managed, not letting the workers dispose them rashly, polluting surrounding surface water sources. This type of impact is at medium level (in construction phase).

### **5. Impacts from risks and incidents**

#### *Labor accidents*

In general, traffic accidents may happen at any stage during the construction of the subproject for which the causes include:

- Environmental pollution may cause fatigue, dizziness or fainting for workers during their work.
- The installation, construction and transport of materials with a lack of focus can cause labor accidents, traffic accidents, etc.
- Accidents due to negligence in work, lack of labor protection, or due to lack of awareness of strictly complying with the labor safety rules for construction workers.

Given the nature and scale of the construction activities under the component, this risk is assessed as moderate. The Subproject Owner will pay attention to the application of safety measures for workers.

#### *Fire, explosion and leakage of fuel*

Fire and explosion may occur in the case of transport and storage of fuel, or lack of safety of the temporary power supply system, causing the loss of life and damage to property during the construction process. The specific causes are identified as follows:

- The temporary fuel and material warehouse (gas, DO oil, FO oil, welding gas, etc.) are the source of fire and explosion. The occurrence of such incidents can cause serious damage to people, society, economy and the environment.
- Temporary power supply system for machines and equipment during construction can cause problems of shortcircuit, fire, explosion, electric shock, etc leading to economic

and labor accidents for workers.

- The subproject owner will implement the fire prevention and strictly comply with measures to prevent leakage, fire or explosion. The fire prevention shall be done regularly to minimize the possibility of incidents and the levels of impact.

#### **4.1.3.2.2. Component 1: Site –specific impacts during construction**

Most of the impacts during the construction of component 1 are generic and could be mitigated via application of ECOPs. There are however, certain site-specific which are discussed below:

##### *a) Local flooding*

The existing alley in the LIAs are relatively small, narrow and without drainage system. Wastewater and stormwater currently run off freely and discharge into adjacent canals, which are subject to semi-diurnal tidal conditions. Without subproject implementation, people in the LIAs will continue to be affected by local flooding due to inadequate drainage and tidal effect.

The upgrading of alley roads includes activities of materials and machineries gathering, excavation, installation of drainage pipes, concreting surface of the alley roads. These may obstruct the water flow and thereby worsen the local flooding issue in the LIAs and affect the local traffic and daily activities of people living in LIAs. This impact will be over upon completion of the drainage system. The construction and upgrading of alleys are carried out in successive manner including many small packages scattered within LIAs, could be carried out at different points of time, and in a relative short period (07-10 days for one alley). The impact is assessed as moderate, temporary, and could be managed via applying good construction practices.

##### *b) Traffic obstruction and disturbance to daily activities of the local residents in LIAs*

The investments on LIA upgrading are of small scale, do not require the mobilization of heavy machine and work force; and would create minor construction related impacts on dust, noise, vibration, solid waste generation. Nevertheless, these activities are carried out in relatively highly populated area (especially for LIA 1, LIA 7) with the very small narrow road. Therefore, the internal traffic and daily activities of the local residents are easily affected. The impacts are assessed as temporary during construction period and could be mitigated by applying good management practices.

##### *c) Odor and management of sediments generated from small canal dredging in LIAs 3 and 7*

LIAs 03 and LIA 07 have dense networks of small canals running through over the residential areas. The key functions of these canal systems are to drain stormwater and domestic wastewater of the households nearby. After a long time being used as a sewer system, there's a layer of sediment formed at the bed of these canals.

The small canal dredging from LIA 3 and 7 will generate about 35,000 m<sup>3</sup> of sediment. According to the analyses, these sediments are not contaminated with heavy metals, yet they could contain organic substances, dissolved organic substances (BOD5, COD), nutrients (N, P), pathogenic bacteria (*E. coli*, *Coliform*, etc.) Besides, there are also compounds causing noxious odors such as H<sub>2</sub>S with odor of rotten eggs; other compounds such as indole, skatole, cadaverine and mercaptan created under anaerobic condition which can cause odor even more noxious than H<sub>2</sub>S. During the dredging process, sediment will only be kept at the construction area for about 24-48 hours.

The dredging, temporary storage, and transportation of the sludge could cause bad odor, nuisance, leakage and unsanitary conditions to the local resident nearby and along the transportation routes. As the dredging will be carried out in a short period of time, the amount of generated sediment is not high, so this type of impact is merely temporary and low.

*d) Impacts on PCRs and sensitive locations*

Within the project area of investments under component 1, there are several PCRs and sensitives points could be impacted by the construction activities. The impact assessment is described in details below:

- Impacts on Vi Thanh church (15 m from LIA 2) and Vi Thanh – Hoa Luu agroville memorial are Quan De shrine (30 m from LIA 7), Hung Thanh temple ( 20 m from LIA 7):

The alley upgrading in LIA 2 and LIA 7 and canal dredging dredging in LIA 3 and LIA 7 would have the potential to have adverse impacts on the church, agroville memorial area and temple due to: i) hindrance to access to the church/temple/ agroville memorial area; ii) increased dust, exhaust gases, noise, vibration, solid waste, and wastewater due to construction activities; (iii) traffic congestion and accident risk and community safety due to construction and transportation; (iv) interference with religious events at the temples and churches due to construction activities.

- Impacts on Hoa Van Kindergarten (30 m from LIA 1), Vi Thanh Special High School ( 50 m from LIA 2), Hoa Mai Orphanage, Chau Van Liem Secondary School (100-170 m from LIA 3), Pink Lotus Kindergarten ( 20 m from LIA 7):

The upgrading of alley roads and canal dredging in LIA1, LIA 3 and LIA 7 would have the potential to have adverse impacts on the schools due to: i) hindrance to access to school, especially by the ; (ii) increased dust, exhaust gases, noise, vibration, solid waste, and wastewater due to construction activities; (iii) Safety risks during construction to the pupils and teachers; (iv) increased traffic congestion at school opening and dismissal hour.

*Vibration Impact on PCRs and sensitives points*

Most of the PCRs in the project area are more than 30 m distant from the construction site. Within the project area, there are some PCRs and sensitives points located within the radius of 30 m of the construction site, including: Vi Thanh Church (15 m distant); Hung Thanh Temple (20 m); and Pink Lotus Kindergarten (20 m). The construction work under component 1 is of small cale, only requires small earth work with the mobilization of small machinaries, thus the generated vibration would not be high. With that distance and this type of work, vibration impact to these PCRs and sensitives points are assessed as negligible, and the risk on infrastructures collapse is not likely to occur.

- Impacts on Vi Thanh market’ activities (LIA 1):

The upgrading of alley roads in LIA 1 would have the potential to have adverse impacts on Vi Thanh market activities due to: (i) risks of construction accidents to traders and customers and (ii) disturbance of business activities; (iii) increased dust and exhaust gases, affecting market activities and goods; (iv) conflicts between workers and traders and customers; (v) traffic congestion at the market peak hour.

**4.1.3.3. Component 1: Impacts during Operation**

*Local flooding due to inadequate O&M*

During the operation, solid waste from illegal littering on the road could block the drains on the sides of the alley, thereby affecting the drainage. In addition, there will arise waste sludge accumulated in the culverts at manholes. Therefore without proper periodical maintenance each year, the drainage system will be congested and not ensure drainage efficiency during the rainy season. This is the long term impact, and could be mitigated through good management and maintenance measures.



#### **4.1.4. Impacts of Component 2 – Prioritized primary and secondary infrastructure items**

The investments under component 1 include: (i) Upgrading Nguyen Hue Road; (4.3 km long) (ii) Constructing of 1/5 Road (2.3 km) ; (iii) Upgrading Cai Nhuc Canal (2.0 km); (iv) Upgrading No 62 Canal (3.0 km); (v) Upgrading Tam Giac Lake (3.0 ha). The impacts during the implementation of investments under component 2 are described below:

##### **4.1.4.1. Component 2: Impacts during Preparation**

###### *a) Land acquisition and resettlement*

The number of HHs affected by upgrading of primary and secondary infrastructure items under Component 2 is summarized in Table 4.22: 962 HHs, 489 of them are partly affected and 473 of them are fully affected. 371 HHs lose agricultural land and 54 HHs are seriously affected due to loss of more than 20% of their agricultural land. 77 HHs have acquired homestead land.

- Land acquisition and resettlement will impact physically and mentally to the affected people, and even may cause long-lasting social issues and litigation. Relocating to a new place may cause some disturbances and people will need time to be settled and some households may be seriously affected by new living environment. Life of the resettled HHs will go through significant changes, creating potentially difficult times for them to establish social relationships with neighboring villages, to approach new social utilities, and even good employment opportunities. It will cost them a fair amount of time to adapt in the new place of residence.

- Impacts on HHs losing production land (agricultural land): Total acquired agricultural land area under Component 2 is 97,566 m<sup>2</sup> (of 371 HHs). So, on average each of these affected HH loses 293 m<sup>2</sup>. Compared with per capita average cultivation area of Mekong Delta region: 0.75 ha/person, this average land area is relatively small. The project will also provide livelihood recovery and training support for people losing their current income source(s), especially vulnerable ones.

###### *b) Impacts of relocation of 87 graves*

Component 2 will require displacement of totally 87 graves of Catholics living along Nguyen Hue Road in Area 3 of Ward 4 of Vi Thanh City. To the Vietnamese, grave is the religious and spiritual matters that should be respected carefully. Because the graves to be displaced are relatively scattered, it is proposed that the relatives of these graves will move the graves by themselves to a proper new location in a local graveyard, with funding of the project owner. This is also compliant with the desire of these people. Compensation for grave relocation will be based on account of transportation, ceremonial offerings costs, and even cost by waiting for a good day. The graves to be displaced of each construction item are not of great number, so impacts of grave displacement is moderate and localized.

Impacts on land acquisition, resettlement and grave relocation is described in more details in section 4.2

###### *Unexploded ordnance (UXO)*

The same component 1

##### **4.1.4.2. Component 2: Impacts during Construction**

###### **4.1.4.2.1. Component 2: Generic impacts during construction**

###### ***1. Impacts on air quality***

Air environment will be affected during construction due to dust, gases, noise, etc. from the housing demolition, earthwork, transportation, material handling, operation of construction machinery, etc. However, these effects are not continuous and take place in a short time, most of the impacts are temporary.

*a) Dust dissemination from demolition, excavation, filling activities:*

According to Feasible study report of Vi Thanh city, volume of demolition, excavation and backfilling work in component 2, is presented in the table 4.14 below:

**Table 4.14: Volume of demolition, excavation, backfilling of Component 2**

Work item	Demolition volume	Excavation volume	Filling volume	Total volume
	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>
Nguyen Hue Road	2.322	51.705	53.124	107.151
01/05 Road	-	99.712	40.287	191.749
Embankment for Canal 62	2.500	30.326	44.083	211.908
Embankment for Cai Nhuc Canal	1.500	34.733	51.549	147.782
Tam Giac Lake	100	11.633	10.315	42.048

Dust generated by demolition, excavation and backfilling activities under Component 2 is calculated in the same way as component 1. The loads of dispersed dust generated by demolition and earthworks can be forecasted as follows (Table 4.15).

**Table 4.15: Dust emission by demolition, excavation and filling activities of Component 2**

Work item	Total generated dust volume (kg)	Estimated duration (month)	Dust emission (kg/ngày)	Dust emission (mg/s)
Nguyen Hue Road	5.923	18	10,97	381
01/05 Road	7.739	18	14,33	498
Embankment for Canal 62	4.251	11	12,88	447
Cai Nhuc Canal	4.853	11	14,70	511
Tam Giac Lake	1.219	11	3,69	128

From the above pollution loads from dust by applying Sutton model with a wind speed of 2.4 m/s and a distance of 10-250 m from generating sources, height of 1.5-18 m, the concentration of pollutants created by transportation operations can be calculated as follows:

For Nguyen Hue street: Dust concentrations vary between 0.23-9.96 mg/m<sup>3</sup> (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>).

For 1/5 street: Dust concentrations vary between 0.27-12.98 mg/m<sup>3</sup>.

For 62 canal: Dust concentrations vary between 0.2-11.63 mg/m<sup>3</sup>.

For Cai Nhuc canal: Dust concentrations vary between 0.22-13.27 mg/m<sup>3</sup>.

For Tam Giac lake: Dust concentrations vary between 0.16-3.44 mg/m<sup>3</sup>.

Table above show that within radius of 10m from construction locations, generated dust contents are 33 – 44 times higher than allowable levels. These dust volumes are mostly heavy dust and can quickly settle down onto the ground. Within radius of 50m from with construction locations, generated dust contents are only about 7 – 9 times higher than respective allowable levels (QCVN 05:2013/BTNMT).

Specifically for each construction item:

- For Nguyen Hue and 01/05 roads, nearby population density is at medium level, with most of the HHs about 7 – 20m away from the road and mostly have garden in front of their house. For Canal 62 area: people mostly resident, business households and travel on Le Hong Phong Road side. For Cai Nhuc Canal: population and traffic density are at medium level, mostly on Tran Ngoc Que Road side. Most of the HHs here do not have to displace, having house about more than 15m away from construction locations. For Tam Giac Lake construction item, generated dust contents within radius of **50m** from construction locations is merely about 2.6 times higher than allowable level. Therefore, dust impact of these locations is at medium level. However, construction contractors must strictly practise mitigational measures included in the ECOPs of the report. Some sensitive points in and nearby the project areas can be subject to impacts of dust generated by excavation, levelling, filling activities at Nguyen Hue Road, 01/05 Road, Canal 62, Cai Nhuc Canal areas:

**Table 4.16: Location/area of sensitivity to generated dust of excavation, filling activities under Component 2**

No.	Project item	Affected subject	Distance from construction location
1	Nguyen Hue Road	Vi Hung Church, Vi Hung Graveyard, Tran Quang Dieu Primary School	Adjacent to construction location
2	01/05 Road	Hung Thanh Temple	20 m
		Quan De Shrine, Southern Herbology store	30 m
3	Canal 62 embankment	Hoa Mai Orphanage, Chau Van Liem Secondary School, Hoang Dieu Secondary School	20 m
		Market in Vi Tan Commune	80 m
4	Cai Nhuc Canal embankment	Vi Thanh Market	20 m
		Pink Lotus Kindergarten	30 m
		Ward 1’s health station	120 m
5	Tam Giac Lake	Ward 1’s health station	80 m

*b) Dust generated by transportation of demolition, excavation, filling, dredging materials*

By applying the formula of Air Chief, EPA, 1995 [2], with average generated dust volume of a transportation trip being  $L=0.7068\text{kg/km/trip}$ , the generated dust volumes generated by transportation of waste materials of Component 2’s items are calculated as follows:

**Table 4.17: Dust emission generated by transportation of excavation, levelling, demolition and dredging materials of Component 2**

Work item	Transportation period (months)	Number of transporting vehicles (trip/day)	Distance (km)	Dust emission (kg/km.day)	Dust emission (mg/m.s)
Nguyen Hue Road	18	24	11,5	16,96	0,589
01/05 Road	18	43	9,5	30,39	1,055
Canal 62 embankment	11	78	10	55,13	1,914
Cai Nhuc Canal embankment	11	32	8,5	22,62	0,785
Tam Giac Lake	11	16	9	11,31	0,393

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 2.4 m/s, and a distance of 5-25 m from generating sources, the concentration of pollutants created by transportation operations can be calculated as follows:

For Nguyen Hue street: Dust concentrations vary between  $0.247\text{-}0.356\text{ mg/m}^3$  (compared with permissible standard limits of  $0.3\text{ mg/m}^3$ ).

For 1/5 street: Dust concentrations vary between  $0.298\text{-}0.494\text{ mg/m}^3$ .

For 62 canal: Dust concentrations vary between  $0.391\text{-}0.746\text{ mg/m}^3$ .

For Cai Nhuc canal: Dust concentrations vary between  $0.268\text{-}0.414\text{ mg/m}^3$ .

For Tam Giac lake: Dust concentrations vary between 0.226-0.229 mg/m<sup>3</sup>.

Concentration of dust generated by transportation of excavation, demolition, dredging materials include concentration of the base environment, which are mostly within allowable limit of QCVN 05:2013/BTNMT – National Technical Regulations about ambient air quality. Although dust contents at areas such as Canal 62, 01/05 Road are 1.1 – 2.5 times higher than respective allowable levels, the degree of excessiveness is insignificant and only lasts for a short period of time. Therefore, impacts on surrounding air environment are insignificant and can be mitigated. To control these impacts, construction contractors will have to strictly apply the mitigational measures included in the ECOPs of the report.

*c) Exhaust gases generated by transportation of demolition, excavation, dredging materials*

Transportation vehicles as well as construction equipment/machineries mostly use diesel oil as their fuel, so there will arise exhaust gases of internal combustion engine’s fuel burning process, such as NO<sub>x</sub>, SO<sub>2</sub>, CO. These exhaust gases are mobile pollution sources, so they will directly affect the workers and people near construction locations. According to obtained documents: filling/waste soil transportation vehicles have average capacity of load of 10m<sup>3</sup> and fuel consumption rate of 0.4 liters of oil/vehicle.km. (1 liter of diesel oil = 0.832 kg). Information about number of transportation vehicles, transportation distances, consumed fuel volumes is provided in **Table 4.10**:

**Table 4.18: Fuel consumption rates and exhaust gas volumes of demolition, excavation, filling and dredging activities of Component 2**

Work item	Fuel consumption rate (kg/day)	Generated SO <sub>2</sub> volume (mg/m.s)	Generated NO <sub>2</sub> volume (mg/m.s)	Generated CO volume (mg/m.s)
Nguyen Hue Road	91,85	0,000777	0,003411	0,000014
01/05 Road	135,95	0,001391	0,006112	0,000025
Canal 62 embankment	259,58	0,002524	0,011086	0,000045
Cai Nhuc Canal embankment	90,52	0,001035	0,004548	0,000018
Tam Giac Lake	47,92	0,000518	0,002274	0,000009

From the above pollution loads from exhaust gases, by applying Sutton model with a wind speed of 2.4 m/s, and a distance of 5-25 m from generating sources, the concentration of pollutants created by transportation operations can be calculated as follows:

For Nguyen Hue street: SO<sub>2</sub> contents 0.049 mg/m<sup>3</sup> (compared with 0.35 mg/m<sup>3</sup>), NO<sub>x</sub> contents 0.059 mg/m<sup>3</sup> (compared with 0.2 mg/m<sup>3</sup>) and CO contents 2.54 mg/m<sup>3</sup> (compared with 30 mg/m<sup>3</sup>);

For 1/5 street: SO<sub>2</sub> contents 0.049 mg/m<sup>3</sup>, NO<sub>x</sub> contents 0.059 mg/m<sup>3</sup> and CO contents 2.54 mg/m<sup>3</sup>.

For 62 canal: SO<sub>2</sub> contents 0.050 mg/m<sup>3</sup>, NO<sub>x</sub> contents 0.061 mg/m<sup>3</sup> and CO contents 2.54 mg/m<sup>3</sup>

For Cai Nhuc canal: SO<sub>2</sub> contents 0.049 mg/m<sup>3</sup>, NO<sub>x</sub> contents 0.059 mg/m<sup>3</sup> and CO contents 2.54 mg/m<sup>3</sup>

For Tam Giac lake: SO<sub>2</sub> contents 0.049 mg/m<sup>3</sup>, NO<sub>x</sub> contents 0.059 mg/m<sup>3</sup> and CO contents 2.54 mg/m<sup>3</sup>.

Concentration of SO<sub>2</sub>, NO<sub>2</sub>, CO<sub>2</sub> generated by transportation including concentration of base environment are all within respective limits of QCVN 05:2013/BTNMT – National technical regulations about surrounding air quality. Therefore, these impacts are at LOW level.

*d) Dust, exhaust gas by concrete mixer stations*

At present, the project has not had plan to provide concrete mixer stations at construction sites. Concrete can be taken from two main sources: i) purchased from a commercial concrete mixer station nearby and ii) using an on-the-spot concrete mixer station. Surrounding environment issues depend on the station's location, operation and capacity. For the scope of the project activities, 30 m<sup>3</sup>/h station type is proposed for used at construction sites, and their key operation is to mix materials into concrete. These stations will not include material production function. Based on obtained experience, the key impacts of a 30 m<sup>3</sup>/h concrete mixer station can be listed as follows:

Within the range of 20m from such a station under operation, generated dust volume is higher than allowable level as per QCVN 05:2013/BTNMT.

Generated noise level may exceed allowable level within 45m range during daytime and 90m range at night.

Scope of impact depends on the sensitiveness of likely affected people.

So, impacts of the project on air environment are of medium level because the environment's bearing capacity is relatively high. However, construction activities are to be implemented at existing residential areas or on existing roads. Construction contractor needs to strictly apply mitigational measures to minimize possible arising impacts.

Impact level: AVERAGE

## **2. Noise and vibration impacts**

Noises in preparation phase are mostly by operation of transportation vehicles and construction machineries. Upon operation together at the same time, these vehicles and machineries will generated a combined noise impact. Based on standard noise levels of different types of vehicles, machineries as mentioned in Table 1.3 and regarding the number of vehicles, machineries mobilized for construction of Nguyen Hue Road, 01/05 Road, Canal 62 embankment, Cai Nhuc Canal embankment, Tam Giac Lake, the combined generated noise level generated by waste removal/transportation machineries and vehicles and by technical infrastructure structure demolition/displacement activities using the formula of Phạm Ngọc Đăng Air pollution - 1997 , following results:

Day time:

- Nguyen Hue Road: Within a radius of 30m from construction point, calculated noise level is 71 dBA (1 dBA higher than allowable level).
- 01/05 Road: Within a radius of 30m from construction point, calculated noise level is 73 dBA (3 dBA higher than allowable level).
- Canal 62 embankment: Within a radius of 30m from construction point, calculated noise level is 71 dBA (3 dBA higher than allowable level).
- Cai Nhuc Canal embankment: Within a radius of 15m from construction point, calculated noise level is 73 dBA (3 dBA higher than allowable level).
- Tam Giac Lake: Within a radius of 15m from construction point, calculated noise level is 75 dBA (5 dBA higher than allowable level).

Night:

- Nguyen Hue Road: Within a radius of 150m from construction point, calculated noise level is 57 dBA (2 dBA higher than allowable level).
- 01/05 Road: Within a radius of 150m from construction point, calculated noise level is 57 dBA (2 dBA higher than allowable level).
- Canal 62 embankment: Within a radius of 150m from construction point, calculated noise level is 56 dBA (1 dBA higher than allowable level).
- Cai Nhuc Canal embankment: Within a radius of 90m from construction point, calculated noise level is 56 dBA (1 dBA higher than allowable level).
- Tam Giac Lake: Within a radius of 120m from construction point, calculated noise level is equal to allowable level.

So, affected subjects are mostly the workers and residents nearby construction locations, within radius of 15 – 30m during daytime, and on greater scale at night: 90 – 150m. Scope and subjects of impacts of Component 2’s construction activities are presented in Table 4.20. Affected people are mostly the workers and residents nearby construction points, within distance of 15 - 30m during daytime, and on greater scale at night: 90 – 150m.

**Table 4.20: Locations/areas of sensitivity to generated noises of Component’s construction vehicles/machineries**

No.	Work item	Locations/areas of sensitivity	Distance from work item location	Dust impacts	Noise impact	
					Daytime	Night
1	Nguyen Hue Road	Vi Hung Church, Vi Hung Graveyard, Tran Quang Dieu Primary School	Nearby construction location	x	x	x
2	01/05 Road	Hung Thanh Temple	20 m	x	x	x
		Quan De Shrine, Southern Herbology store	30 m	x	x	x
3	Canal 62 embankment	Hoa Mai Orphanage, Chau Van Liem Secondary School, Hoang Dieu Secondary School	20 m	x	x	x
		Market in Vi Tan Commune	80 m	x		x
4	Cai Nhuc Canal embankment	Vi Thanh Market	20 m	x		x
		Pink Lotus Kindergarten	30 m	x		x
		Ward 1’s health station	120 m	x		
5	Tam Giac Lake	Ward 1’s health station	80 m	x		x

### 3) Impacts on water quality

Sources of impact on water environment included personal activities of the workers, construction wastewater, storm-water overflow and material transportation by barges.

#### a) Pollution by workers’ personal wastewater:

Personal wastewater of the workers: Estimated total number of workers for this project is about 70 – 80 people. Needed water volume of each worker as mentioned clearly in QCXDVN 01:2008/BXD is 45 liters/person/day (for washing, cooking and drinking). Daily generated wastewater volume is taken as **100%** of daily used water volume. So, total daily generated WW volume is about **3.2 – 3.6m<sup>3</sup>/day/work item**.

**Table 21. Generated domestic wastewater**

No.	Item	Number of workers (person)	Wastewater volume generated (m <sup>3</sup> /day)
1	Nguyen Hue Road	80	3,6
2	01/05 Road	80	3,6
3	Canal 62	80	3,6
4	Cai Nhuc Canal	70	3,15
5	Tam Giac Lake	50	2,25
<b>Total</b>		<b>360</b>	<b>16,2</b>



In the wastewater, there're suspended particles, oil/grease, high Concentration of organic substances, sediments, dissolved organic substances (such as BOD, COD), nutrients (N, P) and micro-organisms. With account of WHO's pollutant emission factors for developing countries, the pollution factors and volumes of pollutants in wastewater before treated by septic tanks are tabulated as follows:

**Table 4.22: Concentration of pollutants in domestic WW (before treatment)**

No.	Pollutant	Pollution factor (g/person/day)	Pollution factor (mg/l)	
			Before treatment	QCVN 4:2008 Column B
2	BOD5	45 – 54	1000 - 1200	50
3	COD	72 – 102	1600 – 2666	-
4	Total suspended solids	70 – 145	1555 – 3222	100
5	Oi/grease	10 – 30	222 - 666	20
6	Total N	6 – 12	133 - 266	50
7	N-NH4	2.4 – 4.8	53 - 107	10
8	P	0.8 – 4.0	17,8 – 88,9	10
9	Total Coliform	$10^6 - 10^9$	$22 \times 10^6 - 22 \times 10^9$	5000 (MNP/100ml)

(Source: WHO, 1993)

The above calculation results show that the untreated wastewater has pollutant contents much higher than QCVN 14: 2008/BTNMT (Column B). If there's no collection and treatment system developed, everyday there will be a considerable amount of pollutant emitted to the environment. This is a considerable pollution source directly affecting living environment of the workers and people in the project area, causing water-related diseases and directly affecting water environment. Moreover, water of canals in/nearby the construction areas are currently subject to organic pollution (please refer to item 2.4 and table 4.41). Therefore, the project owner need to allow application of proper treatment measures for this type of wastewater.

***b) Pollution by construction wastewater:***

Construction activities will generate a volume of WW (cleaning materials, equipment, machineries, etc.) This type of WW has high Concentration of TSS and organic substances. Information about pollutants in this type of waste are provided in the table 4.9 under the component 1. Some other parameters are higher than respective allowable levels, such as TSS (6.6 times), COD (8 times), BOD<sub>5</sub>(8.6 times) and Coliform (106 times). This type of WW is not of great volume, yet if it is not collected and treated properly but discharged directly to the environment, it will pollute surface water, groundwater as well as health of the workers. (Tôỉ bảỉng 4.23)

***c) Pollution by storm-water overflow:***

Volume of overflow storm-water at construction sites depends on local climatic condition. Theoretically, storm-water is a slight-pollution WW type (cleanliness code). Standard Concentration of pollutants in overflow storm-water as per World Health Organization are as follows:

**Table 4.24: Concentration of pollutants in storm-water**

No.	Parameter	Content (mg/l)
1	N	0,05 – 1,5
2	P	0,004 – 0,03
3	COD	10 – 20
4	TSS	10 – 20

*Source: WHO, 1993*

With account of the total project area, flow coefficients, rainfall intensities as mentioned in Chapter 2, volumes of overflow storm-water at construction sites of Component 2 are calculated as shown in the table below:

**Table 4.25: Total volumes of overflow storm-water at construction sites of Component 2**

Work item	Storm-water drainage area (m <sup>2</sup> )	Flow factor	Storm-water flow (l/s)
Nguyen Hue Road	79,400	0.2	14,03
01/05 Road	79,100	0.2	13,98
Cai Nhuc Canal	79,400	0.2	14,03
Canal 62	79,400	0.2	14,03
Tam Giac Lake	79,100	0.2	13,98

Overflow storm-water flow rates are already calculated in construction preparation phase: Normally, overflow storm-water quality depends on air cleanness and volume of washed-away substances in the project area. However, during construction phase, quality of overflow storm-water at the construction areas only depends on the cleanness of construction areas’ premise, because air environment of the project area is relatively good and do not contribute to pollution of storm-water in the area. Overflow storm-water in construction phase of the project area contains mostly TSS, oil, grease washed away by the storm-water itself. Especially in this phase,

premise of construction items have not been completed and is easily subject to washout. To limit overflow storm-water pollution, construction units need to collect as much as possible all waste materials and waste oil/grease of construction vehicles and machineries. Storm-water then will not wash much of pollution substances to surrounding water sources. So, this impact is not significant.

**d) Wastewater of barges**

This project also uses barges to transport rocks from An Giang and Dong Nai from Cai Nhuc River, Xang Xa No Canal into the project areas. It is estimated that there’s need for transportation of about 10,631 m<sup>3</sup> of rocks. Therefore, if the rock transportation period is about 6 months (estimated) with use of 70-ton barges, then averagely 1 barge will be used each day to transport maerial. Hence, surface water of Cai Nhuc River, Xang Xa No Canal and Canal 62 may be polluted by kentledge and cleaning WW. Kentledge is taken from the river and canals themselves, so its impact on the environment is insignificant.

Barge cleaning WW volume is estimated at about 8 -10 m<sup>3</sup>/day (4 types of barge: 70T, 200T, 250T, 400T). Pollutants include oil/grease, suspended solids, organic substances, nutrients (N, P) and micro-organisms. So, WW discharge directly into the river and canals may affect water sources in the project areas. However, barges mobilized in this phase is of small number. Hence, impact on quality of surface water of Cai Nhuc River, Xang Xa No Canal and Canal 62 is insignificant (low impact level).

Construction contractors need to strictly apply necessary mitigational measures to minimize impacts on the environment. Table below summerize quality of water at areas that are susceptible to impacts of construction WW.

**Table 4.26: Locations/areas susceptible to impacts of WW**

No.	Location	Current water quality
1	At Cai Nhuc Canal, underneath Nguyen Cong Tru Bridge (NM12)	COD, BOD5 contents are about <b>1.5 times</b> higher than <b>QCVN08:2015/BTNMT (B1 Type)</b>
2	At ending location of Cai Nhuc Canal (intersection with Than Hoang Shrine Canal)	COD, BOD5 contents are about <b>1.6 times</b> higher than allowable levels of <b>QCVN 08:2015/BTNMT (Type B1)</b>
3	At intersection between Cai Nhuc Canal and Xa No Canal	COD, BOD5 contents are 1.9 and 2 times higher than <b>QCVN 08:2015/BTNMT ( B1 Type)</b>
4	At entrance area to Tam Giac Lake (intersection with Cai Nhuc Canal)	COD, BOD5 contents are 1.7 and 1.6 times higher than <b>QCVN 08:2015/BTNMT (B1 Type)</b>
5	At Canal 62 (intersection with Xa No Canal)	COD, BOD5 contents are about 1.9 times higher than <b>QCVN 08:2015/BTNMT (B1 Type)</b>
6	At Canal 62, underneath Le Thi Hong Gam Bridge (LIA 3);	COD, BOD5 contents are 1.9 and times higher than <b>QCVN 08:2015/BTNMT (B1 Type)</b>
7	At Canal 62, underneath Nguyen An Ninh Bridge (LIA3)	COD, BOD5 contents are about 1.5 times higher than <b>QCVN 08:2015/BTNMT (B1 Type)</b>
8	At Canal 62 (intersection with a public bridge)	COD, BOD5 contents are about 1.6 times higher than <b>QCVN 08:2015/BTNMT (B1 Type)</b>
9	At ending point of Canal 62 (intersection with Vo Nguyen Giap Road)	COD, BOD5 contents are about 1.6 and 1.5 times higher than <b>QCVN 08:2015/BTNMT (B1 Type)</b>

At present Cai Nhuc Canal and Canal 62 are receiving domestic waste and WW from the HHs living on there two sides. Moreover, because currently Vi Thanh City has not had complete, standard-meeting WW collection and treatment system, WW overflows into these two canals, making water quality even poorer. Therefore, management of project activities that may cause water pollution is highly necessary, and reasonable, feasible, in order to mitigate decrease of water at upstream areas because it may affect water quality at downstream areas. Impacts of the project areas on water quality of the project areas are considered to be at medium level during construction time.

*Impact level: MEDIUM*

#### 4) Impacts by solid waste

**There are two types of solid waste: domestic solid waste and construction solid waste**

##### a) Domestic solid waste:

During construction phase, the personal solid waste generated by the workers mostly includes plastic bags, waste paper, waste food, etc. This type of waste contains 60 – 70% of organic substances and 30 – 40% of other substances, and may contain many bacteria and germs.

It is estimated that each worker working at the project area generates about **0.5 kg** of personal waste per day. At intensive construction times, estimated number of workers working at the construction sites are **70-80** each day. So, total volume of daily personal waste is estimated at **35-40 kg/day** (please refer to table 4.42 below). This waste volume, if not collected and treated properly, will affect surface water, groundwater sources, creating odors due to decomposition and washout of storm-water. Persistent inorganic waste such as bottles, plastic bags in water may affect the area’s landscape, water quality and limit diffusion of oxygen into water, affecting aquatic life, etc.

##### b) Construction solid waste

Solidwaste generated by construction activities are of many types such as empty cement bags, waste cement mortar, debris, steel scrap, yet mostly excavated soil. Spoil volume of Component 2 ranges from 9,000 to 236,500 m<sup>3</sup> (over 79,500 m<sup>3</sup> averagely). Besides, the roads have may canal sections running in parallel or crossing them, and the embankments are to be constructed directly at the sides of Cai Nhuc and 62 canals. Hence, this type of waste if not quickly collected and properly treated will cause water pollution in case of overflow into the water.

**Table 4.27: Generated solid waste volume of each work item**

Work item	Construction solid waste (m <sup>3</sup> )		Personal WW (kg/day)
	Demolition volume (m <sup>3</sup> )	Excavation volume	
+ Extended Nguyen Hue Road	2.322,000	236,500	40
+ 01/05 Road	0,000	92,000	40
+ Canal 62 rehabilitation	2.500,000	36,000	40
+ Cai Nhuc Canal rehabilitation	1.500,000	24,000	40
+ Tam Giac Lake	100,000	9,000	35

Therefore, impacts of generated solid waste is considered to be at medium level, in short period of time and can be controlled.

## 5) Hazardous solid waste

Oil/grease volume generated during construction phase depends on the following factors:

- Number of transportation/construction vehicles and machineries at construction site;
- Volume of waste oil/grease of the transportation/construction vehicles and machineries;
- Oil change and maintenance frequency;

Average waste oil/grease volume of the transportation/construction vehicles and machineries is 7 liters per change time. Maximum oil change/maintenance frequency is one time per 3 months. So, generated waste oil/grease volumes at construction sites of Component 2 are as follows:

**Table 4.28: Hazardous solid waste of Component 2’s items**

No.	Work item	Number of construction vehicles/equipment at construction site	Monthly waste oil
1	+ Extended Nguyen Hue Road	42	98
2	+ 01/05 Road	46	107
3	+ Canal 62 rehabilitation	30	70
4	+ Cai Nhuc Canal rehabilitation	18	42
5	+ Tam Giac Lake	26	61

These oil/grease volumes will be collected to 150-200l bins placed at the maintenance, repairing locations at the construction sites, with hired specialized units to collect and recycle. Besides, the project also generates oil/grease-stained cloths and oil/grease containers – about 50kg per month. Waste oil/grease can enter environment by spill or washout by storm-water. Volume of spilled or washed-away waste oil/grease depends on storage location and management capacity factors. Because the project areas are near canals such as Cai Nhuc Canal, Canal 62, Xang Xa No Canal, the waste oil/grease can enter and pollute surface water sources at the project areas if not well controlled. Impact level is considered to be at medium level.

## 6. Impact on City Landscape

The rehabilitation/construction activities would require excavation on 02 roads and pavement for the construction and rehabilitation, installation of the combined sewers, setting up of wall fences for the construction sites. These operations would temporarily change the landscapes in these areas. Besides, construction materials would also be transported and gathered at construction sites. Without proper management, indiscriminate gathering of materials would take place, especially in narrow construction sites for the tertiary culverts, stormwater, and wastewater drainage systems, affecting the area landscape..

The rehabilitation / construction of 02 roads and Cai Nhuc canal and Cannal 62 would cause small impacts on the general landscape of the city. Conversely, this is an opportunity to create a general harmonious and beautiful landscape in the city. The level of impact on urban beauty and landscape in these areas is assessed to be insignificant level.

## 7. Impacts from risks and incidents

*As the mentioned under the component 1*

#### **4.1.4.2.2. Component 2: Site-specific Impacts during Construction**

##### **Site –specific impacts due to construction of Nguyen Hue Road (subcomponent 2.1) and construction of 01/05 Road and Muong Lo canal (subcomponent 2.2)**

These two work items have very similar activities (upgrading, expanding the road and accompanying technical infrastructure items such as sewer, lighting and greenery systems). Site-specific impacts during the construction of these investment include: (i) traffic safety and local disturbance; (ii) impacts to PCRs and sensitive points; (iii) odor and management of sediment generated from Muong Lo canal dredged work; (iv) impacts to surface water quality of the local canals across the Nguyen Hue road; (iv) Impacts to small bridges across the Muong Lo canal. The detailed impact assessment is presented below:

##### *a) Traffic safety and social disturbance*

Construction of Nguyen Hue Road will require about 24 vehicle trips per day and construction of 01/05 Road will require about 43 vehicle trips per day to transport excavated soil and demolition materials, over a one year construction period. These vehicles will travel through many key roads of Vi Thanh City such as Vo Nguyen Giap, Nguyen An Ninh, Le Hong Phong, Tran Hung Dao, 03 February Road, NR 61.

The construction and upgrading of Nguyen Hue and 01/05 roads includes activities of materials and machineries storage, excavation, installation of drainage pipes, concreting surface of the roads. Without project implementation, the commuting of local residents in the subproject area is already difficult as the existing roads are small and degraded. Road construction activities will lead to increased traffic congestion and cause disturbance to the daily activities of the local people. The receptors would be the households living nearby and along the transportation routes and along road alignments, especially at the section V of Nguyen Hue road and the first 250 m section of 1/5 road which are highly populated areas. These impacts are assessed as moderate, temporary during construction period and could be mitigated via the application of good management practices.

##### *b) Odor and management of 51,750 m<sup>3</sup> of dredged materials from the upgrading of Muong Lo cannal and construction of 01/05 road*

Muong Lo Canal, is located in the north of 01/05 road, and is the key drainage for the residential area here. The dredging work on Muong Lo canal will generate about 51,750m<sup>3</sup> of sediment. According to the analyses as presented in section 2.2.6, this sediment is not contaminated with heavy metals, yet it could contain organic substances, dissolved organic substances (BOD<sub>5</sub>, COD), nutrients (N, P), pathogenic bacteria (*E. coli*, *Coliform*, etc.) Besides, the sediment also causes irritating odors such as H<sub>2</sub>S with odor of rotten eggs; other compounds such as indole, skatole, cadaverine and mercaptan created under anaerobic condition. During the dredging process, sediment will only be kept at the construction area for about 24-48 hours.

The dredging, temporary storage, and transportation of the sludge could cause bad odor, nuisance, leakage and and unsanitary conditions to the local resident nearby and along the transportation routes. As the density of local residents around Muong Lo canal is sparse, the amount of generated sediment is not high while the dredging process is to be carried out in a short period of time, the magnitude of impact is assessed as temporary and moderate.

##### *c) Impacts on PCRs and sensitive locations*

As indicated in the Section 2.5, there are some sensitive receptors that could be impacted during the construction and upgrading of Nguyen Hue and 01/05 road

- Impacts on Vi Hung Church, Vi Hung Graveyard (3 m from Nguyen Hue Road), Hung Thanh Temple (20 m), Quan De Shrine (30 m from 01/05 Road).

The construction and upgrading of Nguyen Hue and 01/05 road would have the potential to have adverse impacts on the nearby church, temple and shrine due to: (i) hindrance to access to the church/temple and shrine; ii) increased dust, exhaust gases, noise, vibration, solid waste, and wastewater due to construction activities; (iii) traffic congestion and accident risk and community safety due to construction and transportation; (iv) interference with religious events at the temples and churches due to construction activities.

Impact on vibrations to sensitives PCRs.

Nguyen Hue section 1 include 8m wide sidewalk (green line along the river bank), 7.5 m pavement section (between the red lines) and the 3m wide sidewalk (at the church side). Thus, it can be seen in the picture Nguyen Hue road section 1 will occupy approximately 3-4 m width adjacent land of Cathedral Road. Therefore, gate, fence, part of the land and auxiliary building of the Church will be affected directly by the project. Besides, the main area of the Church is 25-28 m and the auxiliary building of the left side of the Church is 13-16 m distant from the project road will only be affected marginally from construction activities. However, according to technical calculation, the vibration impact of construction takes place in a short time and at a distance greater than 10 m, the vibration impacts are negligible and collapse risk is not likely happened. For precautionary, the mitigation measures to prevent, avoid or compensate for this risk on infrastructure collapse will be included in the ESMP as the requirements for the contractors during the construction process.



**Vi Hung Church**

- Impacts on Tran Quang Dieu Primary School (5 m from Nguyen Hue Road):

Construction of Nguyen Hue road would have the potential to have adverse impacts on the schools due to: i) increased dust, exhaust gases, noise, vibration, solid waste, and wastewater due to construction activities; ii) Safety risks during construction to the pupils and teachers; iii) increased traffic congestion at school opening and dismissal hour.

Nguyen Hue section 3 passes through the gate of Tran Quang Dieu Primary School, 5m away from school gate and 10m away from the main building. Road construction will mobilise especially the rolling machines and excavation activities which will cause vibration effects. At the distance of 10 m, the main building would not be affected by the construction activities. There are might be some potential collapse risk to the gate and fence of the school during the excavation process. Also the gate and the fence around the playground was built quite simply, iron gates and cement fences with low value and easily recovered. During construction, contractors need to take measures to reduce and avoid compensation and remedy if problem occurs.



**Tran Quang Dieu Primary School**

As the distance from the PCRs and sensitive points is not very large (from 3-20 m), and the investments are of moderate scale. Thus, the impacts to PCRs and sensitive points are assessed as medium. The impacts are temporary and could be mitigated by applying good construction and management practices.

*d) Impacts to small bridges across the Muong Lo canal*

Across the Muong Lo Canal (01 May Road) there are many small bridges crossing (mostly residential bridges) to serve travelling by motorbike, bicycle and on foot for local residents. Canal dredging, embankment and road construction activities could cause damage or create the risk of collapse of these structures, and thus disrupt the access of local people. In case of breakage, an efficient traffic flow must be ensured by establishing temporary bridges and reinstatement of original bridges after construction finishes. The impact is likely to occur to some degree and could be mitigated by the use of appropriate construction method.

*e) Impacts to surface water quality of the irrigation canals across the Nguyen Hue road*

Nguyen Hue Street has a width of about 8m towards Xang Xa No canal. Section I and Section V intersect with Diem Tua canal, Tac Huyen Phuong, and Ba Huyen canals. Construction of Nguyen Hue road will potentially affect the irrigation canals in this area. The road work may block the canals, deposit soil in the irrigation canal and vegetable fields, if there is no strict erosion and sedimentation management measures. The impacts would only occur during construction period and therefore is assessed as moderate and temporary, and could be mitigated.



### **Site Specific Impacts due to the upgrading of Cai Nhuc and No 62 Canals (subcomponents 2.3 and 2.4)**

Canal Cai Nhuc and Canal 62 rehabilitation tasks include: canal-bed dredging, canal embankment construction, construction of management roads on two canal sides, with accompanying technical infrastructure items (drainage, light, tree planting). These two canal items will generate impacts such as: (i) Temporary impacts on sensitive locations; (ii) local security and order interruption; (iii) impact on canal water quality; (iv) Localized subsidence risk during construction due to weak soils; (v) Odor and management of dredged sludge, etc.

Detailed assessment about particular impacts is presented below:

#### *a) Impacts on PCRs and sensitive locations*

Some key sensitive locations to be noted during implementation of these items are: Hoa Mai Vi Thanh Orphanage, Chau Van Liem Secondary School, Hoang Dieu Secondary School, Vi Tan Commune Market (Canal 62), Pink Lotus Kindergarten, and Vi Thanh Market (Cai Nhuc Canal). Therefore, proper traffic management plan for construction phase needs to be well developed and approved by the PMU, avoiding construction during rush-hours. Besides, the mobilized vehicles may cause damages to the roads they move on. In this case, after construction finishes, construction contractors need to reinstate the damaged locations to their original condition. This type of impact is of high level and can be mitigated by proper regulation of construction vehicles and machineries.

- Impacts on Hoa Mai Vi Thanh Orphanage, Chau Van Liem Secondary School, Hoang Dieu Secondary School (30m from Canal 62) and Pink Lotus Kindergarten (20m from Cai Nhuc canal):

Dredging and embankment of Canal 62 and Cai Nhuc canal would have the potential to have adverse impacts on the schools due to: i) hindrance to access to school, especially by: (ii) increased dust, exhaust gases, noise, vibration, solid waste, and wastewater due to construction activities; (iii) Safety risks during construction to the pupils and teachers; (iv) increased traffic congestion at school opening and dismissal hour

- Impacts on Vi Tan Commune Market (50m from Canal 62) and Vi Thanh market' activities (20 m from Cai Nhuc canal):

Dredging and embankment activities of No 62 and Cai Nhuc Canals would have the potential to have adverse impacts on Vi Thanh market activities due to: (i) risks of construction accidents to traders and customers, (ii) interruption of business activities; (iii) increased dust and exhaust gases, affecting market activities and goods; (iv) conflicts between workers and traders and customers, and (v) traffic congestion at the market peak hour.

#### *b) Traffic safety and social disturbance to the residents living along the canals*

The Cai Nhuc canal is located in ward 4, while No 62 canal is located in wards 1 and 3 of Vi Thanh city. Areas on two side of Canal 62 are relatively densely populated. Within a distance of 1km from from the beginning point of the canal being the intersection between Cai Nhuc Canal and Xang Xa No Canal, on two sides there are HHs living and encroaching the canal's margins.

The construction activities during the dredging and embankment process will cause disturbance to the traffic and daily activities of the local residents living in the wards 1, 3 (No 62 canal) and ward 4 (Cai Nhuc canal), especially those living in the highly populated area surrounding the canal as described above. For example, mobilized workers generally come from different localities of the country, and therefore will have many differences in terms of life style, personal opinion, income and culture. Bad behaviors and attitudes in daily life may easily give rise to

conflicts between the workers and local residents, and social evils such as gambling, prostitution, alcohol drinking, etc. may also easily affect local security and order, creating pressure for local order maintenance units. The impacts will only exist during the construction period and will cease during operation. In addition, the investments are of moderate scale. The impact is therefore assessed as localized, temporary, and moderate level.

*c) Impact on water quality of No 62 Canal and Cai Nhuc Canals*

The dredging process for No 62 and Cai Nhuc Canals will be wet dredging method, using the excavator to directly remove the sediments from the bed of the canals. Thus, during dredging, water quality of these canals could be impacted, through increasing water turbidity, degrading the water quality in the localised area.

The dredged sludge will be deposited along the canal banks to drain and reduce the volume and water content before transportation to the disposal site. From experience of similar projects, sludge leachate has a total SS content of about 800-1400 mg/l and F. Colifom content of 90-200 MPN/100ml. The direct discharge of the leachate to the water course would cause degraded water quality, and therefore needs to be well managed.

It should be noted that the canals currently receive unregulated, untreated effluents and are consequently relatively polluted, but this could be exacerbated during dredging by remobilization of sediments. In the long term, the water quality will be enhanced during operation and the impact is therefore assessed as small, temporary and reversible.

*d) Risk of shore erosion and embankment subsidence during the construction process*

Existing banks of Canal Cai Nhuc and Canal 62 are natural earth banks, so there's high risk of shore erosion and embankment subsidence during dredging and excavation process. The main reasons include:

- Weak soil structure;
- No bank reinforcement plan;
- For construction in the rainy season, large floods combined with high tide peak could cause fall-in of canal bank soil, affecting construction work;
- Flow blockage during dredging time may reduce flow cross-section making flow speed even higher, especially upon heavy raining leading to fall-in of bank soil even in downstream areas;
- Placement of too many heavy machines and equipment on canal banks;

In case of shore erosion and embankment subsidence, the workers and residents along two sides of Canal Cai Nhuc and Canal 62 may be affected. Impacts are in terms of human and asset losses.

Shore erosion and embankment subsidence would be mostly due to poor geotechnical surveying, poor detailed design or poor construction. These activities are to be implemented correctly from the start and are to be approved by relevant authorities and are therefore controllable. The works are to be carried out section by section, so the scope of impact is not too great. Therefore, this impact is considered to be at low level.

Canal Cai Nhuc and Canal 62 are very important for drainage in the project area.

*e) Impact on waterway traffic activities on the Cai Nhuc canal (at the 400 m starting section) and on No 62 Canal (section 250 m from the intersection with Xang Xa No canal)*

As indicated above, the dredging process of the canals will be carried out in wet conditions, with the use of excavator placed over a barge to dredge sludge. The setting up of fences to determine construction boundary as well as construction equipment will occupy a certain water surface

area, and thus, obstructing travelling of boats, ships on these canals. Boats, ships entering canal sections currently under dredging process will have to turn back, causing waste of time and money for the boat, ship owners. Within the beginning section of about 400m (for Cai Nhuc Canal) and about 200m (for Canal 62) there are many small boats, mostly serving trading of people on two canal sides with the ships and boats on Xang Xa No Canal. Besides, on Cai Nhuc Canal there's also transportation of goods to Vi Thanh Market via Xang Xa No Canal. Therefore if construction contractors has good notification plan, establishing regulation stations to notify ships, boats to move to another canal in the area, then this impact will be well controlled.

*f) Structures i.e. bridges on Cai Nhuc canal; bridges and tidal gate of No 62 canal*

There are big bridges to connect big canals (Canal 62, Canal Cai Nhuc) such as the bridges on Nguyen An Ninh Road and Vo Nguyen Giap Road (Canal 62 area), the bridges on Tran Hung Dao Road and Nguyen Cong Tru Road (Cai Nhuc Canal area) which can serve travelling by car. Besides, on the canals of 62 and Cai Nhuc, there are also many small bridges crossing (mostly residential bridges) to serve travelling by motorbike, bicycle and on foot of local residents. Canal dredging, embankment and road construction activities always have the risks of collapse of the existing bridges connecting two canal sides. So, during construction, construction contractors need to take care not to cause damage to these bridges. In case of breakage, traffic convenience of the residents must be ensured by establishing temporary bridges and reinstatement of original bridges after construction finishes.

Besides, about 220m away from Xang Xa No Canal, on Canal 62 there is a tide-gate to prevent saltwater intrusion for the area. So, during construction phase, there's a need for suitable measures to avoid damages to the tidal gate.

*g. Odor and management of sediments from dredging of Canal Cai Nhuc and No 62 Canal dredging*

Total estimated dredged sediments volumes of Canal 62 and Canal Cai Nhuc are 135,000 m<sup>3</sup> and 60,000 m<sup>3</sup> respectively. For Cai Nhuc Canal, sludge excavators will be mobilized for work on linked buoys. Dredged sludge will then be taken onto canal banks for temporary storage before being transported by trucks to the waste sludge treatment in Tan Tien Commune. Dredged sludge of these two canals is of the organic deposit layer accumulated at the canals' bottom for a long time under flooding condition. Decomposition of organic substances will generate odor and toxic gases such as CH<sub>4</sub>, H<sub>2</sub>S which could be very uncomfortable for people living nearby when released.

For Canal 62, because this canal is relatively wide (about 20 – 30m), excavator and barges will be used to dredge the canal sediment. The dredged sediment is excavated and put on these barges to be transported to the waste sludge treatment area in Tan Tien Commune. For Canal Cai Nhuc item, because barges can enter, sediment will be dredged and transported by waterway for disposal.

According to the analyses, these sediments are not contaminated with heavy metals, yet they could contain organic substances, dissolved organic substances (BOD<sub>5</sub>, COD), nutrients (N, P), pathogenic bacteria (*E. coli*, *Coliform*, etc.) Besides, there are also compounds causing uncomfortable odors releasing from compounds such as H<sub>2</sub>S indole, skatole, cadaverine and mercaptan created under anaerobic condition. As there is no temporary storage, the dredging and transportation of sludge could cause bad odor, leakage and unsanitary conditions mostly to workers and roads used for transport the sludge. As the dredging will be carried out in a short period of time, the amount of generated sediment is medium, so this type of impact is assessed as temporary and moderate.

Planned routes for transportation of waste sludge to the landfill in Tan Tien Commune are as follows:

Construction area	Estimated length (km)	Slated material/spoil transportation route
Canal Cai Nhuc rehabilitation	8,5	Nguyen Cong Tru → Le Quy Don → Tran Hung Dao → NR 61 → Landfill in Tan Tien Commune
Canal 62 rehabilitation	10	Le Hong Phong → Tran Hung Dao → NR 61 → Landfill in Tan Tien Commune

#### **Site -specific impacts by rehabilitation of Tam Giac Lake (subcomponent 2.5)**

The Tam Giac lake has a total area of 3.0 ha. The residents surrounding the lake are quite sparse. However, there are some restaurants around the lake. The work of upgrading Tam Giac lake include dredging, embankment and construction of operational road surrounding the lake.

The dredging process will be carried out in dry conditions, with the lake divided into sections; each of which will be and drained and dredged subsequently. The sediment will be stockpiled temporarily within the lake bed until dry and then transported to the disposal site. By dredging in dry condition, impact to water quality is not expected

*Odor and management of sediment generated from Tam Giac Lake dredging activities:*

Total volume of dredged sediment of Tam Giac Lake is about 20,000 m<sup>3</sup>. Dredged sludge will be taken to the bank temporarily to dry within 24-48 hours before being transported to the waste sludge treatment area in Tan Tien Commune. As indicated above, the dredged process will cause the irritating odors and toxic gases. (Site -specific impacts the same Cai Nhuc and 62 Canals)

As the dredging will be carried out in a short period of time, the amount of generated sediment is small, so this type of impact is assessed as temporary and low.

*Impact to water environment of Tam Giac lake during dredging process*

The impacts on water environment during the construction process in upgrading Tam Giac Lake is mainly the impacts on aquatic ecosystems. These impacts may include temporary impacts during the construction stage but there are short-term impacts as well.

During the dredging process for aquatic ecosystem, all the species include: tilapia, grass carp, common carp, shrimp, crab, goby fish,... will be affected. The magnitude of impacts on the aquatic ecosystem in the lake depends on the dredging construction methods to be applied. Aquatic ecosystems can change completely if measures dredging is conducted simultaneously across the entire 3,0ha lake. All the species found in the lake are absolutely not on the list of species in need of protection under the Vietnam Red Book or IUCN and most fish are raised by human.

The dredging process will worsen water quality of the lake during the construction. But in the long term, the water quality would be enhanced when the subproject goes into operation. The impacts are therefore assessed as small, temporary and reversible.

#### **4.1.4.3. Component 2: Impacts during Operation**

Impacts in operation are assessed to be mostly positive ones, well meeting the project’s established objectives: drainage capacity enhancement; environmental sanitation and urban landscape improvement; transport network completion; and efficient climate change resilience.

Besides positive impacts, when the project enters operation phase, without proper mitigation/control measures there're still some potential and typical impacts which include embankment subsidence; blockage of the sewer system due to inadequate maintenance; impacts on traffic safety; flooding risks. Detailed assessment is presented below:

**Potential Impacts during Operation of Nguyen Hue Road and 01/05 Road (Subcomponents 1.1 and 1.2)**

*a) Traffic safety issues:*

Traffic safety is probably the key impacts during the first years of introduction into operation of Nguyen Hue and 01/05 Road, with increase in the number of cars, motorbikes, trucks, etc. travelling on these roads and increase in the number of traffic accidents accordingly. In order to mitigate this impact, there's need for raising people's awareness about road regulations and practices and good control of drivers' speed and behavior.

In the long run, when traffic volume is relatively high, noise and vibration may be another issue to be solved, yet this impact can be mitigated through a long-term plan.

*b) Local flooding on the roads due to inadequate maintenance*

The invested facilities if not well maintained will be subject to negative impacts such as local flooding, due to inadequate maintenance. Solid waste management i.e. domestic waste from local people blocking the drains may also lead to congestion of the sewer system, which in turn may easily cause flooding during the rainy season, and affect the urban landscape.

*c) Embankment subsidence risk during operation of Muong Lo canal*

01/05 Road upgrading item includes dredging and embankment of Muong Lo Canal, so in operation phase there must be measures to cope such risks as: (i) Heavy rain, great flood, weak foundation causing embankment erosion; (ii) Embankment cracking, falling during operation phase due to natural reasons or design parameter excess; (iii) Erosion also affecting embankment quality and landscape.

Failure to maintain trees and/or vegetation on the soft embankments could result in soil erosion leading to collapse of the embankments, leading to increased flood risk.

Any incidents of damage to embankments will directly affect the quality of works, reduce the capacities of flood prevention and disaster mitigation of the embankment system. Incidents of embankment erosion also affect work quality and environmental landscape in the area.

Any incidents of damage to embankments will directly affect the life of people living near the embankment system, affect the quality of houses, buildings and structures that located in the area protected by the embankment system.

*d) Garbage throwing causing pollution and decreased aesthetic value of the canals*

During operation there are risks of canal pollution, flow congestion and decrease in aesthetic quality because of uncontrolled disposal of waste into the canals from local residents due to the following reasons:

- HHs unable to change living habits formed a long time ago;
- Re-encroachment of canal surface;
- Lack of close management of local government in urban civilization maintenance;

However, all the canals have operation road, so re-encroachment is almost impossible. Local government needs to apply necessary information measures to raise people's environmental awareness and fine those dumping waste into the canals.

### **Potential Impacts during operation of Canal Cai Nhuc and Canal No 62**

Similar to Muong Lo canal, the operation of Cai Nhuc and No 62 canals also have the potential risk on embankment subsidence causing loss of life/asset and damaged infrastructure; and waste littering into the canal from local resident causing pollution and decreased urban landscape as described above.

### **Potential Impacts during operation of Tam Giac Lake**

Similar to Muong Lo canal, the operation of Tam Giac lake has the potential risk on waste littering into the canal from local resident causing pollution and decreased urban landscape.

#### **4.1.5. Impacts of Component 3 – Resettlement area**

The project will purchase the resettlement area (RA) in Ward 4 of Vi Tan Commune. This resettlement area has already been completed, with a complete infrastructure system. So, in this phase assessment will be on the impacts when the resettlement is put under operation.

##### *a) Domestic waste*

If we assume that each person generates about 0.5 kg of domestic waste per day, there will be an increase of 550kg/day for the resettlement area. This volume of waste, if not well managed and collected, will affect surface water, groundwater and cause uncomfortable odors at the resettlement area. Persistent inorganic waste such as bottles, plastic bags and other items present in the water will affect the area's landscape.

##### *b) Wastewater:*

With average total number of members of a HH being 4 people, 275 resettlement HHs will total 1,100 HH members. Total daily needed water volume as per QCXDVN 01:2008/BXD is 45 liters/person/day (washing, cooking, and drinking water). Generated domestic water volume is taken as **100%** of daily used water volume. So, total generated domestic WW volume is about **46.62m<sup>3</sup>/day**.

Pollutants in the WW include suspended sediment, oil, grease, dissolved organic substances (BOD, COD), nutrients (N, P) and micro-organisms. The untreated wastewater has pollutant contents much higher than the allowable standard (QCVN 14: 2008/BTNMT (Column B)). If there is no collection and treatment system developed, everyday there will be an amount of pollutant emitted to the environment. This is a considerable pollution source directly affecting living environment of and people in the project area, causing water-related diseases and directly affecting surface water and groundwater environments. Moreover, water of canals in/nearby the construction areas are currently subject to organic pollution. Therefore, the project owner needs to allow application of proper treatment measures for this type of wastewater.

## **4.2. SOCIAL IMPACT ASSESSMENT**

The project is expected to have significant positive social impacts in Vi Thanh City for people living in the project area especially people in LIAs by upgrading urban infrastructure (roads, drainage, water supply and sanitation, public facilities, and power supply) based on community priorities. Total number of beneficiaries is 36,473 people (in which 7,732 direct beneficiaries and 28,741 indirect beneficiaries).

Adverse impacts of the project will be caused by unavoidable land acquisition, by loss of livelihoods, health issues etc...

#### **4.2.1. Positive Impacts**

*The SUUP Project – Vi Thanh city subproject, Hau Giang province* will be invested in form of new-construction and application of new design standards on transportation, urban water supply and sewerage, wastewater treatment, waste treatment...in compliance with technical specification requirements for urban development. The subproject will bring many positive effects on the socio-economic and environmental condition in the area as follows:

**Table 4.29: Positive Social Impacts in the Project Area**

Component	Description of Impacts	Beneficiaries	Measures to maximize project benefits
<b>General Impacts for all Components</b>			
All components	Employment opportunities during the construction phase for unskilled workers	For all unskilled workers in project area.	Agreement with local authorities (ward level) to ensure benefits for job opportunities during the project period for unskilled workers in the project area (i.e. prepare list of workers to give to contractors). Opportunity to be employed for both men and women.
	Quality of life of the people is improved through upgrading infrastructure (roads, drainage system, lighting system) and development of public spaces (green park, walkside along the road and Tam Giac lake).	For all people in project areas.	Closely monitoring and managing of the construction to ensure quality of the structure.
<b>Specific impacts for each Component</b>			
<b>Component 1</b> Upgrading tertiary infrastructure in LIAs	Infrastructure upgrading in LIAs will improve living conditions for all HH in LIAs. Especially: (1) Wastewater shall be treated, (2) flooding shall be reduced considerably, environment and health shall be improved remarkably, (3) access improvement(4) lighting system shall be provided at alleys.	1.718 Households in LIAs (7.732 persons) including 76 poor HHs	Design and implementation of the subproject with participation of the whole community; proposed changes integrated into implementation plan. Civil works in component 1 shall prioritize job opportunities for poor people in LIAs to increase their income.
	Alleys and lanes are expanded and equipped with lightning system; transport conditions are improved (so that ambulances and fire trucks can access to residential areas). Security of persons and assets are enhanced. Mobility will also be enhanced.	People living in LIAs, particularly people living along street/lane front houses.	Raising people’s awareness on the danger of encroaching on public land and streets through development of awareness programs
	By improving infrastructure and access in the LIAs, value of land and house will increase accordingly.	People living in LIAs, particularly people living along street/lane front houses.	Regularize HH without LURC after the civil works.
<b>Component 2: Upgrading primary and secondary infrastructure</b>			



Component	Description of Impacts	Beneficiaries	Measures to maximize project benefits
Upgrading and widening Nguyen Hue street and road 1/5	Nguyen Hue street and road 1/5 are the main roads of the city with high traffic density connecting the inner area of the city. The expansion of these two roads (total length of 6.9 km) helps: (i) the traveling more convenient; (ii) improved traffic safety due to better quality of the road and water drainage system and lighting system; (iii) urban landscape more beautiful thanks to Greenland and walkside	All citizen in Vi Thanh city	Closely monitoring and managing of the construction to ensure quality of the structure. To select suitable trees, consider design and selection to improve the typical beauty for each road.
Improving canal 62 and Cai Nhuc canal	Improving drainage capacity, welfare, environmental sanitation in the area via dredging canal and constructing embankment for the canal; Improving road along the canal (Le Hong Phong and Tran Ngoc Que streets) for convenient circulation; Building landscape for urban areas by investing in sidewalks and green trees; Quality of life of the people is improved thanks to the creation of more green spaces in the area.	All people in the urban area, especially households living along the two canals.	To closely supervise construction to ensure quality ; To select suitable trees, consider design and selection to improve the typical beauty for each road.
Improving Tam Giac lake	Environmental condition is improved via dredging the lake Ensuring safety for people by constructing embankment and barrier around the lake Improving life of people thanks to green spaces in the area.	People living around Tam Giac lake	To closely supervise construction to ensure quality ;

#### 4.2.2. Negative Impacts

**Table 4.30: Positive Social Impacts in the Project Area**

Negative Impacts	Description of Impacts
Land Acquisition	<b>General Impacts for all Components</b>
	Land acquisition and involuntary resettlement are unavoidable in the project. This impact is mostly in component 2 of the project.
	<b>Component 1</b>
	The investment in upgrading roads in the LIAs affects residential land of 273 households with total area of 4,850 m <sup>2</sup> ; 685 HHs being affected agricultural land with total area of 22,549 m <sup>2</sup> (most of which being affected less than 20% agricultural land, accounting for 97.8%); For houses, 135 HHs being affected,

Negative Impacts	Description of Impacts
	<p>with total area of 9,747 m<sup>2</sup>, in which 21 HHs are totally affected (accounting for 7.6% of relocated households in the subproject), which are also the subject for the resettlement plan of the project.</p> <p><b>Component 2</b></p> <p><b>Improving canal 62 and canal Cai Nhuc</b> Households to be relocated/resettled for the item of improving canal 62 and Cai nhuc are 195 HHs (accounting for 70.9% total relocated HHs of the project).</p> <p><b>Upgrading and widening road 1/5 and Nguyen Hue street</b> Affecting residential land of 595 HHs in which 55 HHs to be relocated/resettled (accounting for 20% total HHs to be relocated of the subproject); Potential loss of productive land; expected to be limited due to the small scale of the road component outside urban areas; Shopkeepers will be temporarily affected during construction; most of the shops could move back and resume business once reorganized. In case of impacts on livelihood, adequate income restoration program with needs assessment of affected HH to be conducted.</p> <p><b>Improving Tam Giac lake</b> Affecting residential land of 7 households, in which 4 households to be relocated/resettled; Shopkeepers will be temporarily affected during construction; most of the shops could move back and resume business once reorganized;</p>
<b>Impacts on Livelihood</b>	<p>Relocation may affect the income and livelihood of the household doing business. Survey results showed that 161 business households need to be relocated. For canal 62 only, 90 households had to relocate (accounting for 55.9%). Losing livelihood can cause risk of impoverishment for these households.</p> <p>For business establishments affected but not relocated, trading activities may be disrupted during the construction period.</p>
<b>Gender Issues</b>	<p>Men and women often experience the impacts of land acquisition and resettlement in different forms and to different extents by nature of their gendered roles in society. Women tend to bear greater burdens in loss of livelihood and disruption to social networks;</p> <p>Female-headed households (10 households) face additional challenges associated with resettlement, especially when they are reliant on extended family and social networks for the care and socialization of children;</p> <p>Women are also more susceptible to the risks of HIV/AIDS infection compared to men;</p> <p>Women are often managing home based business to be relocated.</p>
<b>Risk of sexually transmitted diseases, including HIV/AIDS</b>	<p>The influx of male construction workers during the construction period creates risk of sexually transmitted diseases, including HIV/AIDS in such programs.</p>
<b>Risk/incidents in construction process</b>	<p>Fire can occur in the transportation and storage of fuel or when lacking of safety for power supply system (in the temporary camps for workers, electrical systems are often connected uncarefully, not ensuring safety).</p>

### **4.3. CUMULATIVE IMPACT ASSESSMENT**

Cumulative impacts are the environmental and social effects of a project in combination with the effects of other existing projects and/or projects that are being carried out, or are reasonably foreseeable, in respect of specific components of the environment and social conditions. The assessment focuses on the effects of concurrent construction and operation of the subproject with other spatially and temporally proximate projects to ensure that the cumulative impacts are identified and evaluated in an integrated manner in the area of Vi Thanh City. As such, this cumulative analysis relies on a list of related projects that have the potential to contribute to cumulative impacts in the subproject area of influence.

#### *Geographic Scope*

Cumulative impacts are assessed for related projects within a similar geographic area. This geographic area may vary, depending upon the issue area discussed and the geographic extent of the potential impact. For the purposes of this analysis, review of the projects in and around the subproject area has found no reasonably foreseeable, on-going, and future projects within the subproject area.

#### *Project Timing*

In addition to the geographic scope, cumulative impacts also take into consideration the timing of related projects relative to the proposed subproject. For this analysis, other past, present, and reasonably-foreseeable future construction projects in the area have been reviewed and found that there were no recent past projects, projects being implemented, or projects to be executed in the City in foreseeable future.

Therefore, it can be concluded that there would be no cumulative impacts from other projects in combination with the proposed subproject.

### **INDUCED IMPACTS**

Induced development can be a positive as well as negative cumulative impact. If not planned to conform to local physical plans, it can lead to urban sprawl along the new roads and improved canals. However, this impact can be manageable if proper planning adopted. The positive induced impacts however will outweigh the negative ones. It is foreseeable that the land value will increase along the new road and improved areas therefore land-use will significantly changed in the surrounding areas. Specifically, current agriculture land along Nguyen Hue and 1/5 road as well as area along operational road of Cai Nhuc, 62 canal and Tam Giac Lake will be subjected to residential land as according to the City Master Plan. Undoubtedly, the local government and the community will be benefited from the land value capture financing. This is one among many other benefits that the urban upgrading project will bring.

## CHAPTER 5. ENVIRONMENTAL AND SOCIAL MITIGATION MEASURES

### 5.1. ENVIRONMENTAL IMPACT MITIGATION MEASURES GENERAL

#### 5.1.1. General principles

In order to minimize adverse environmental impacts, many measures have been proposed since the preparation stage of the subproject. Surveys and design activities have been prepared with many alternatives to minimize the subproject’s impacts during construction and operation processes. During the preparation of the subproject, effort has been made to avoid potential adverse impacts on resettlement and land acquisition by reducing scope and/or modification of the basic design of the subproject investment. In developing the mitigation measures the strategies to minimize and/or rectify the impacts have been applied and where appropriate compensation has been incorporated. The proposed mitigation measures to reduce the impacts due to land acquisition and resettlement are described in the RP. The following principles have been adopted in devising the mitigation measures:

- Disturbance to the life and transportation of the local people must be minimized.
- The proposed measures must be environmentally and socio-economically feasible.
- Technical standards and regulations must be abided by.
- Construction equipment and methods must be environment-friendly.
- Monitoring activities must be conducted on a regular basis.

This chapter identifies mitigation measures of the key subproject impacts during the pre-construction and construction (including measures integrated into detailed technical design, site clearance, ground leveling, construction, and restoration) and operation phases. Given that most of the key impacts will occur due to civil works and transportation of construction/waste materials, many of the potential negative impacts on physical, biological, and social environment could be mitigated through a set of general measures that are typically applied to most of construction subprojects to minimize impacts such as noise, dust, water, waste, etc. Since there are specific impacts, this chapter also address the site-specific measures both during the construction and operation phases.

#### 5.1.2. Measures to mitigate environmental impacts in the detailed technical design

The following measures will need to be included in the detailed technical designs of the works items during subproject implementation.

##### **Component 1: Upgrading tertiary infrastructure in 4 LIAs**

- Expansion of the alleys will be carried out only for the major alleys and with consent of the local communities.
- The alleys with no possibility for expansion will be upgraded within their existing boundaries to limit site clearance and disturbances within the local communities.
- Consistent investments are to be made in all the alleys (drainage and lighting systems) to synchronize them with the secondary technical infrastructure of connecting lines.

##### **Component 2: Upgrading primary and secondary infrastructure priorities**

**Upgrading 02 routes** (Nguyen Hue road – Subcomponent 2.1, 1/5 Road –Subcomponent 2.2)

- The design of the route has been calculated on the basis of surveys on hydrologic regimes (flood levels, flow regimes, etc.), topography and geology of the area to ensure the safety and effective operation of the route.
- The technical designs of the streets are to comply with Circular No. 01/2016/TT-BXD dated Feb 01, 2016 on promulgating the National Technical Regulation on technical infrastructure works; and Circular No. 21/2014/TT-BXD dated Dec 29, 2014 on promulgating the National Technical Regulation on construction works to ensure access for disabled people to use.
- The roads will have drainage systems and energy-saving lighting systems ensuring aesthetic beauty; traffic signs will be placed and green tree cells will be arranged along the roads.
- The surface of the road will be designed not to raise its elevation to avoid possible water run off to the households along the two sides of the roads.
- The wastewater drainage system should be designed as a closed sewage system with connection points to be later connected directly to HHs' drainage systems (generally, one standby connection point for 5 HHs).
- The electrical boxes, mainholes, green cells should be designed to be located between each two households.
- Positions of placing public waste bins along the streets are to be included in the design.

### **Rehabilitating Cai Nhuc and 62 canals and Tam Giac Lacke (Subcomponent 2.3, 2.4 and 2.5)**

- The design of the embankment has been calculated on the basis of surveys on hydrologic regimes (flood levels, flow regimes, etc.), topography and geology of the area to ensure the safety and effective operation of the embankment.
- The sewer system would be proposed to be designed with box culverts, CSO and anti-odor manholes where it comes across residential areas.
- The technical design must include the position for temporary gathering of sludge. This position must be well distant from residential areas and to the tail end of the wind.
- Positions of placing public waste bins along the embankments are to be included in the design so that residents could dispose of garbage properly.
- Trees would be planted along Cai Nhuc and 62 canals to improve the landscape.

#### ***5.1.3. Mitigation Measures During Pre-construction phase***

The impacts of Component 1 are considered to be of medium level, temporary, local and mostly can be mitigated via particular/general mitigation measures determined in ECOPs. Key particular environmental impacts in pre-construction phase of Component 1 are mostly related to resettlement, land acquisition and UXOs. In order to mitigate these impacts, the project will employ the following measures:

#### **Mitigation Measures for Land Acquisition**

During the project preparation, the Resettlement Consultant, Technical Consultant and PMU have worked together to consider technical aspects and construction methods that minimise resettlement on the principle of (i) mitigating impacts from land acquisition for households in the project area; (ii) prioritizing the construction option which requires the smallest land acquisition

area.

On this basis, there are 21 resettled households in Component 1; 254 resettled households in component 2 and no resettled households in component 3 which utilizes and expands the available resettlement area. These have been great efforts from stakeholders for mitigation and reduction of the land acquisition area and resettlement impacts.

As presented in Chapter 4, there are 1,920 PAHs in 04 wards and Vi Tan commune of Vi Thanh subproject. Among the 1,920 PAHs, 493 PAHs are being severely affected; in which, 275 PAHs have to relocate due to the total loss of their house; The total land acquired is 242.421m<sup>2</sup>, of which: Residential land is 122.306m<sup>2</sup>; Agricultural land is 120.115m<sup>2</sup> and Public land is 99.197 m<sup>2</sup>. There are 730 PAHs whose house being affected, of which 275 PAHs being totally; 228 PAHs with business activities are temporarily affected. There are 60 vulnerable households; of which 10 single women headed households (single, widow, disabled husband); 06 PAHs are social policy HH; 35 PAHs are poor; 01 PAH is disabled 8 PAHs are Khmer.

The estimated cost for the Resettlement Action Plan of the subproject is approximately **237.276.987.476 VND** (equivalent to **10.675.650 USD** at the exchange rate of 22.226 VND = 1 USD). Of which:

No.	Component	Total	
		VND	USD
1	Component 1	<b>46.165.253.559</b>	<b>2.077.083</b>
2	Component 2	<b>189.779.149.685</b>	<b>8.538.610</b>
	<b>Total for subject</b>	<b>237.276.987.476</b>	<b>10.675.650</b>

(Source: RP report, Dec 2016)

The estimated cost for land clearance and resettlement is calculated based on provisions set by People Committee of Hau Giang province and the policies determined by the World Bank. The detailed mitigation measures for land acquisition are provided in the RP of the subproject.

#### **For relocation of 87 graves during the construction Nguyen Hue road**

- There are 87 graves of Catholics which will need to be relocated for construction of Nguyen Hue Road in Area 3 of Ward 4 of Vi Thanh City under Component 2 of the subproject.
- Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation, and other related costs which are necessary to satisfy customary religious requirements. Compensation in cash will be paid to each affected family or to the affected group as a whole as is determined through a process of consultation with the affected community. The level of compensation will be decided in consultation with the affected families/communities. All costs of excavation, relocation and reburial (4,800,000 VND/grave) will be reimbursed in cash. Graves are to be exhumed and relocated in a culturally sensitive and appropriate manner.
- During implementation the PMU will make early announcement to the households whose graves are affected so that they can make arrangement consistent with the spiritual practices of the people and compensate the affected household as required in the subproject RP and ESMP.

#### **Mitigation of UXO Risks**

The subproject owner (the subproject PMU) will sign a contract with the military civil engineering agency or Hau Giang Provincial Military Base for UXO detection and clearance at

the construction sites. UXO clearance will be executed right after the completion of site compensation and before the implementation of demolition and ground leveling. The estimated cost is approximately 50 million VND/ha. No construction activity will be allowed until the UXO clearance is completed.

#### **5.1.4. Mitigation Measures During Construction Phase**

##### **5.1.4.1. Mitigation Measures for Generic Impacts**

As part of the Environmental and Social Management Plan (ESMP) for the subproject these generic measures have been translated into a standard environmental specifications to be incorporated into the bidding and contract documents. These are referred to as Environmental Codes of Practice (ECOPs), and they will be applied to mitigate typical impacts of the subproject’s civil works under Component 1, 2 and 3. Section 6.1 briefly explains the scope and content of the ECOPs, which are presented in the next Chapter 6.

The ECOPs describe typical requirements to be undertaken by contractors and supervised by the construction supervision consultant during construction. The ECOPs will be incorporated into the bidding and contractual documents (BD/CD). The scope and content of the ECOPs is as follows:

Scope: Construction activities for civil works governed by these ECOPs are those whose impacts are of limited extent, temporary and reversible, and readily managed with good construction practices.

The measures identify typical mitigation measures for the following aspects:

- ✓ Dust generation, emission, noise and vibration
- ✓ Wastewater management
- ✓ Solid waste management
- ✓ Hazardous waste management
- ✓ Water pollution
- ✓ Plants and aquatic species
- ✓ Urban landscape and beauty
- ✓ Sedimentation, erosion, flooding subsidence and landslide
- ✓ Traffic management
- ✓ Existing infrastructure and services
- ✓ Social impacts
- ✓ Cultural works
- ✓ Community’s safety and health
- ✓ Workers’ health safety
- ✓ Management of warehouses and borrow pits
- ✓ Communication to local community
- ✓ Chance finds procedure

##### **5.1.4.2. Site-Specific Mitigation Measures during Construction Phase**

Some particular impacts of the LIA 1, 2, 3 and 7 items are: (i) Local flooding; (ii) Daily life and traffic safety interruption due to dense population distribution and small, narrow roads; (iii) Odor and management of 35,236 m<sup>3</sup> of dredged sludge of LIA 3 and LIA 7; and (iv) Impacts on PCRs and sensitive locations.

The Component 2 includes: Upgrading Nguyen Hue Road; Rehabilitating Muong Lo Canal and construction 01 May Road, Rehabilitating Cai Nhuc Canal; Upgrading Canal 62 and Le Hong Phong Road; Rehabilitating Tam Giac Lake. The impact assessments on the construction of roads, and embankment rehabilitation are shown in Chapter 4, Section 4.1, which indicated the medium level of almost all the environmental impacts. The Contractors will have to take mitigation measures under ECOPs to control these impacts. In order to mitigate the site - specific impacts arising from the dredging and embankment construction as well as those generated from construction of roads and bridges, the Contractors shall take the following measures:



**Table 5.1: Site-specific mitigation measures during construction phase**

No	Site-Specific impacts and their relation to subproject activity	Specific mitigation measures
<b>1</b>	<b>COMPONENT 1: TERTIARY INFRASTRUCTURE UPGRADING IN LIAs (Lia 1, Lia 2, Lia 3 and Lia 7)</b>	
a	<p><i>Local flooding</i></p> <p>- Residents within LIAs (Lia1, Lia2, Lia3, Lia7) area.</p>	<ul style="list-style-type: none"> <li>- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction</li> <li>- The Contractors must apply the specific construction methods, and flood prevention and control alternatives during construction period or the flow diversion alternatives to ensure the drainage in the location.</li> <li>- The contractors must set up temporary drainage at the construction site and ensure that they are cleared of mud and other obstructions</li> <li>- Arranging the standby pumps for rapid drainage in case of heavy rain or extreme weather events</li> </ul>
b	<p><i>Traffic obstruction and disturbance to daily activities of the local residents in LIAs</i></p> <p>- Local people in LIAs (Lia1, Lia 2, Lia 3 and Lia 7)</p>	<ul style="list-style-type: none"> <li>- Ensure that the contract requires the contractor, before commencing work, to provides a construction plan with a detailed health, safety, environment and traffic management plan</li> <li>- Inform local residents in advanced (at least 07 days) about construction and work schedules, interruption of services, traffic routes.</li> <li>- Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work.</li> <li>- Construction into successive manner, section by section in a short period. Avoid the simultaneous construction and delay all over the LIAs.</li> <li>- Contractors should provide lighting a construction sites at night; security guard staff at construction sites to moderate vehicles entering and exiting the construction site;</li> <li>- Put the road construction warning signs at the site all the time.</li> <li>- Avoiding the waste/material transportation during rush hours;</li> <li>- Construction during night time is not allowed</li> <li>- Limit the construction area; the construction activities only occur within the site boundary</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading. During road excavation, canal dredging processes nearby bridges (LIA3), attention should be paid, avoiding strong impact on bridge foundation, and avoiding synchronous implementation of many construction activities causing vibration; and in case of damage, temporary bridge needs to be created to ensure traffic convenience, with satisfactory compensation and</li> </ul>

No	Site-Specific impacts and their relation to subproject activity	Specific mitigation measures
		reinstatement of original bridge after construction.
c	<p><i>Odor and management of sediments generated from small canal dredging in LIAs 3 and 7</i></p> <ul style="list-style-type: none"> <li>- Residents in ward 3 and ward 5</li> <li>- People commuting along transportation route</li> </ul>	<p><i>To control impacts by odors from dredging process:</i></p> <ul style="list-style-type: none"> <li>- Sediment is collected along the work sites and covered by sheeting to limit sludge water leaking into the soil, and transported for disposal within the day. The management plan for dredged materials will be prepared to instruct the contractors to manage the waste.</li> <li>- Uncontrolled disposal of the dredged sediment is prohibited. The waste source must be managed properly under the supervision of PMU.</li> <li>- In order to limit the impacts of odor and contamination from the dredged sludge, the workers shall be equipped with the masks, boots and gloves when working in/exposed to these waste sources.</li> <li>- Spraying EM (Effective Microorganisms) every day. The deodorants can eliminate malodors from H<sub>2</sub>S, CH<sub>4</sub>, etc.</li> </ul> <p><i>Management of dredged sediments from the canals:</i></p> <ul style="list-style-type: none"> <li>- The Dredged Materials Management Plan (DMMPs) for small canals has been prepared. Overall, sludge will be disposed at Tan Tien commune landfill or used for agricultural or tree planting purpose based on actual need of the local people. The DMMP is described in details in chapter 6 – Environmental and Social Management Plan and Annex 1.</li> <li>- Ensure that detailed design scope for the canal dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor’s dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts.</li> <li>- Prior to construction, the contractors shall develop a specific DMMP based on the updated DMMP. The contractor’s DMMP shall be submitted to Construction Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary storage of dredged materials, and control of polluting material during storage and transportation, pollution control, and risks at disposal sites.</li> <li>- Manage to ensure sediment will be disposed appropriately according to the approved site-specific DMMP.</li> </ul>
d	<p><i>Impacts on PCRs and sensitive locations</i></p> <p>Vi Thanh – Hoa Luu agroville; Hung Thanh Tu Temple; Quan</p>	<p><i>For church, temples</i></p> <ul style="list-style-type: none"> <li>- Inform the temple and church of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction.</li> <li>- The contractor shall coordinate with local authorities (leaders of local wards or communes) for agreed schedules</li> </ul>

No	Site-Specific impacts and their relation to subproject activity	Specific mitigation measures
	<p>De Shrine (20 -30 m from the construction site in LIA7); Vi Thanh Church (15m from the construction site in LIA2)</p> <p>Vi Thanh Market (60 m from the construction site in LIA1)</p> <p>Hoa Van Kindergarten (30m from the construction site in LIA1)</p> <p>Vi Thanh Special High School (50m from the construction site in LIA2)</p> <p>Hoa Mai Vi Thanh Orphanage (100m from the construction site in LIA3)</p> <p>Pink Lotus Kindergarten (20m from the construction site in LIA7)</p>	<p>of construction activities at sensitive times (e.g., religious festival days). Avoid construction activities during religious events every first and 15th days of the lunar month and during festival days if possible.</p> <ul style="list-style-type: none"> <li>- Prohibit gathering of construction materials within 100m in front of the church, temple.</li> <li>- Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as church, temple, shrine.</li> <li>- The contractor shall provide safety measures such as installation of fences, barriers warning signs, lighting system against traffic accidents as well as other risk to local people and church goers.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the church, temple.</li> <li>- Truck drivers shall restrict horn usage in areas close to the church area</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the church, temple.</li> </ul> <p><i>For Vi Thanh Market</i></p> <ul style="list-style-type: none"> <li>- Limiting to transport materials/wastes (for constructing the items of Lias) when passing by Vi Thanh Market at the peak hours (morning: 5-9h; noon: 11-12h; afternoon and evening: 16 - 19h) which does not create any obstacles to the travelling/business activities of the residents.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least two times a day on the road along the market area.</li> <li>- Inform household businesses/market’s management unit of the construction and transportation activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 02 weeks before start of the construction.</li> </ul> <p><i>For schools</i></p> <ul style="list-style-type: none"> <li>- Inform the school management of the construction activities and their potential impacts such as, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction</li> <li>- Construction area to be fenced and marked with warning signs to prevent pupils and unauthorized people from entering.</li> <li>- Teachers to be informed of construction operations to keep pupils off the site during their break time.</li> <li>- Prohibit use of construction methods that cause noise during school learning hours.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at site.</li> <li>- Immediately collect any domestic wastes and construction spoils around the school and dispose in a designated</li> </ul>

No	Site-Specific impacts and their relation to subproject activity	Specific mitigation measures
		site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes when children go to and leave the school. - Do not load construction materials within 20m from school and tidy construction materials and stockpiles every working session. - Cover the incomplete trenches under construction at end of the working day. - Immediately address any issue/problem caused by the construction activities and raised by the schools.
2	<b>COMPONENT 2: PRIORITY PRIMARY AND SECONDARY INFRASTRUCTURES</b> (i) Upgrading Nguyen Hue Road; (ii) Rehabilitating Muong Lo Canal and construction 01 May Road, (iii) Rehabilitating Cai Nhuc Canal; (iv) Upgrading Canal 62 and Le Hong Phong Road; (v) Rehabilitating Tam Giac Lake.	
2.1& 2.2	<b>Upgrading Nguyen Hue Road (subcomponent 2.1) and 01/05 Road and Muong Lo canal (subcomponent 2.2)</b>	
a	<i>Traffic safety risks and social disturbance</i> - Residences near the road alignment and along the transportation route	<ul style="list-style-type: none"> <li>- Ensure that the contract requires the contractor, before commencing work, to provide a construction plan with a detailed health, safety, environment and traffic management plan</li> <li>- Inform local residents in advanced (at least 07 days) about construction and work schedules, interruption of services, traffic routes.</li> <li>- Inform the community of the planned night construction at least 2 days in advance. Limit the construction activities that cause great noise and vibration by night time.</li> <li>- Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work.</li> <li>- Contractors should provide lighting at a construction site at night; security guard staff at construction sites to moderate vehicles go out and in the construction site;</li> <li>- Put the road construction warning signs at the site all the time.</li> <li>- Avoiding the waste/material transportation during rush hours;</li> <li>- Inform the community of the planned night construction at least 2 days in advance.</li> <li>- The construction activities are only conducted in the designated boundary</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading.</li> </ul>

No	Site-Specific impacts and their relation to subproject activity	Specific mitigation measures
	<p><i>Impacts on surface water quality of irrigation canals across (Diem Tua Canal, Tac Huyen Phuong Canal, Ba Huyen Canal) across Nguyen Hue road</i></p>	<ul style="list-style-type: none"> <li>- Strictly prohibit contractors to discharge waste into canals</li> <li>- No material gathered on the sidewalk, this can damage sidewalks and Xang Xa No canal can be polluted.</li> <li>- Upon forecasted stormy weather, suspend all the construction activities, tidy up the sites, brace and protect the materials and construction machines.</li> <li>- Do not gather construction materials as well as machinery and equipment near the stream (at least 50m away). Gathering small quantities of materials, fit with the schedule. Materials must be covered with tarpaulin, avoiding the upwind location, near the canal.</li> <li>- Strictly prevent hazardous waste, waste oils or particularly greasy rags from entering the flow.</li> <li>- Create sedimentation traps and maintain them periodically to ensure that most solids in surface runoff are retained in the traps before entering the existing drains or water sources surrounding the sites;</li> </ul>
	<p>Increased dust, noise, traffic, waste, vibration, and social disturbance to daily activities of PCRs and sensitivities points including</p> <ul style="list-style-type: none"> <li>- Vi Hung Church (On the side of Nguyen Hue Road – Section 1)</li> <li>- Tran Quang Dieu Primary School (On the side of Nguyen Hue Road – Section 3)</li> </ul>	<p><i>For Vi Hung Church</i></p> <ul style="list-style-type: none"> <li>- The contractor shall coordinate with local authorities (leaders of local wards or communes) for agreed schedules of construction activities at sensitive times (e.g., religious festival days). Avoid construction activities during religious events every first and 15th days of the lunar month and during festival days if possible.</li> <li>- Inform the church of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction.</li> <li>- Prohibit gathering of construction materials within 100m in front of the church.</li> <li>- Pile driving activities will not be carried out before 7 am or after 6 pm, or on days and hours advised by the local management.</li> <li>- Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as church.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the church.</li> <li>- The contractor shall provide safety measures as installation of fences, barriers warning signs, lighting system against traffic accidents as well as other risk to local people and goers to church.</li> <li>- Truck drivers shall restrict honking in areas close to the church area</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the church.</li> </ul> <p>- Contractors must submit documentation proving that all the facilities, equipment and construction machines have</p>

No	Site-Specific impacts and their relation to subproject activity	Specific mitigation measures
		<p>been tested and meet the requirements related to the creation of vibration according to current standards of Vietnam QCVN27:2010/BTNMT vibration generated by construction activity.</p> <ul style="list-style-type: none"> <li>- The construction method shall include the measures to protect the foundation of the church such as using supporting pillars or steel frame.</li> <li>- In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the church.</li> </ul> <p><i>For Tran Quang Dieu Primary School</i></p> <ul style="list-style-type: none"> <li>- Similar mitigation measures as those of component 1</li> <li>- The construction method shall include the measures to protect the foundation of the fence/gate of the school such as using supporting pillars or steel frame.</li> <li>- In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the school</li> </ul>
	<p><i>Impacts to small bridges across the Muong Lo canal</i></p> <ul style="list-style-type: none"> <li>- Local residents in ward 5 using the bridge for transportation</li> </ul>	<ul style="list-style-type: none"> <li>- Inform the local people of the construction activities and their potential impacts such as waste, dust, and noise, traffic, especially vibration, risk of cracking on overpass and construction schedule at least 02 weeks before start of the construction.</li> <li>- To use high-tech equipment to reduce vibration for construction activities of embankment;</li> <li>- Provide safety signal boards and instruction for traffic direction at each small bridge across Muong Lo canal in construction phase</li> <li>- Do not gather materials and heavy load machines near the bridges areas.</li> <li>- Stabilize the canal bank surrounding bridges area prior to commencing the dredging and embankment activities</li> <li>- If damage to the bridges are happen, temporary access shall be provided for the local residents. The damage bridges shall be repaired or adequate compensations shall be made upon agreement with affected households.</li> </ul>
<b>2.3&amp; 2.4</b>	<b>Upgrading of Cai Nhuc and No 62 Canals (subcomponents 2.3 and 2.4)</b>	
a	<p><i>Impacts on PCRs and sensitive locations</i></p> <p>Hoa Mai Vi Thanh Orphanage;</p>	<p><i>For schools</i></p> <ul style="list-style-type: none"> <li>- The same component 1</li> </ul> <p><i>For Market</i></p>

No	Site-Specific impacts and their relation to subproject activity	Specific mitigation measures
	<p>Chau Van Liem Secondary School; Hoang Dieu Secondary School (20-30 m from the construction site in 62 canal); Pink Lotus Kindergarten (30 m from the construction site in Cai Nhuc canal)</p> <p>Vi Tan Commune market (80 m from the construction site in 62 canal); Vi Thanh Market (20 m from the construction site in Cai Nhuc canal)</p>	<ul style="list-style-type: none"> <li>- Limiting to transport materials/wastes (for constructing the items of Cai Nhuc and 62 canals) when passing by Vi Thanh and Vi Tan Market at the peak hours (morning: 5-9h; noon: 11-12h; afternoon and evening: 16 - 19h) which does not create any obstacles to the travelling/business activities of the residents.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least two times a day at road along the market area.</li> <li>- Inform household businesses/market's management unit of the construction and transportation activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 02 weeks before start of the construction.</li> </ul>
<p><i>b</i></p>	<p><i>Traffic safety and social disturbance to the residents living along the canals</i></p>	<ul style="list-style-type: none"> <li>- Ensure that the contract requires the contractor, before commencing work, to provide a construction plan with a detailed health, safety, environment and traffic management plan. This plan has to be consulted with the local authorities and approved by CSC</li> <li>- Inform local residents in advance (at least 07 days) about construction and work schedules, interruption of services, traffic routes. Inform the community of the planned night construction at least 2 days in advance.</li> <li>- Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work.</li> <li>- Contractors should provide lighting at a construction site at night; security guard staff at construction sites to moderate vehicles go out and in the construction site;</li> <li>- Put the road construction warning signs at the site all the time.</li> <li>- Avoiding the transportation of sediments during rush hours;</li> <li>- Sediment shall be transported out of construction site or transfer site within the day.</li> <li>- Limit the construction area, the construction activities are only taken in the designated site boundary.</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading at the construction site, sediment transfer site.</li> </ul>
<p><i>c</i></p>	<p><i>Impact on water quality of No</i></p>	<ul style="list-style-type: none"> <li>- Create sedimentation traps and maintain them periodically to ensure that most solids in surface runoff are retained</li> </ul>

No	Site-Specific impacts and their relation to subproject activity	Specific mitigation measures
	<i>62 canal and Cai Nhuc Canals</i>	<ul style="list-style-type: none"> <li>- in the traps before entering the existing drains or water sources surrounding the sites;</li> <li>- Leachate from sediments must be first deposited in sedimentation hole/trap before entering the canals.</li> <li>- Strictly prohibit contractors to discharge waste into canals</li> <li>- Upon forecasted stormy weather, suspend all the construction activities, tidy up the sites, brace and protect the materials and construction machines.</li> <li>- Do not gather construction materials as well as machinery and equipment near the stream. Gathering small quantities of materials, fit with the schedule. Materials must be covered with tarpaulin, avoiding the upwind location, near the canal.</li> <li>- Strictly prevent hazardous waste, waste oils or particularly greasy rags from entering the flow.</li> </ul>
<i>d</i>	<i>Risk on shore erosion and embankment subsidence during the construction process</i>	<ul style="list-style-type: none"> <li>- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure a sustainable, stable embankment;</li> <li>- Ensure that the detailed design and contractor’s construction method take into account the risk to local house cracking</li> <li>- Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to the authorities of concerned for approval by the construction contractors.</li> <li>- To use high-tech equipments to reduce vibration for construction activities of embankment; closely monitoring the vibration level;</li> <li>- Construction of side slope is made in accordance with the design</li> <li>- Limiting to carry out dredging works in rainy season.</li> <li>- Do not place heavy loaded machines and transporation vehicles near the canals banks.</li> <li>- Inspection and supervision on landslide risks must be taken regularly in order to prepare the appropriate reinforcement plans.</li> <li>- Inform the potential affected people on the nature of work and get their agreement on the works;</li> <li>- In any case that the house cracking risk cannot be avoided by technical measures, the affected households shall be temporarily relocated prior to construction. The temporary relocation of the people shall be carried out with appropriate consultation and and adequate compensation.</li> </ul>
<i>e</i>	<i>Impact on waterway traffic activities on the Cai Nhuc</i>	<ul style="list-style-type: none"> <li>- Coordinate with the Department of Inland Waterway to flag the signal system on the inland waterway the transport travel through;</li> </ul>



No	Site-Specific impacts and their relation to subproject activity	Specific mitigation measures
	<p><i>canal (at the 400 m starting section) and on No 62 Canal (section 250 m from the intersection with Xang Xa No canal)</i></p>	<ul style="list-style-type: none"> <li>- Provide the workers with and request them to use life jackets in construction operations on the water surface. Safety staff must be present during entire shifts for timely rescue in case of incidents.</li> <li>- Place warning boards along the construction route, both on land and water surface (arrange the road and waterway traffic guide).</li> <li>- Creating some temporary stations on Xang Xa No Canal to serve anchoring demand of the people residing on two sides of the first section of Canal Cai Nhuc and Canal 62.</li> <li>- Clearly informing people of canal dredging time, encouraging people to anchor boats, ships at the temporary stations to avoid waterway traffic accidents;</li> <li>- For Cai Nhuc canal upgrading: no dredging, canal surface encroachment during rush hours to prevent obstruction to goods transportation via waterway to Vi Thanh Market;</li> <li>- Co-operating with local government to allow transportation of goods by road from temporary stations to Vi Thanh Market.</li> </ul>
<p><i>f</i></p>	<p><i>Impact on structures i.e. bridges on Cai Nhuc canal; bridges and tidal gate of No 62 canal</i></p> <p>- Local residents in ward 4, 5 using the bridge for transportation</p>	<ul style="list-style-type: none"> <li>- To minimize collapse risks of these bridges during pile driving process,</li> <li>- Detailed Design must sufficiently include geological and hydrological surveying work.</li> <li>- Construction contractor’s construction method must be with account of vibration generation factors. The contractor can drive sheet piles to reinforce canal banks before pile driving or use modern pile driving methods to mitigate vibration. This should be a condition in the contract between the contractor and the project owner to raise responsibility to mitigate this impact.</li> <li>- Using sheet piles to mark dredging elevation as well as safe dredging location around bridge foundation;</li> <li>- Co-operating with local government to notify people about pile driving time, possible risks and to implement community consultation; Closely monitoring vibration and keeping daily diary on this;</li> <li>- In case of subsidence or bridge collapse due to pile driving, the contractor must compensate for this.</li> <li>- Inform the local people of the construction activities and their potential impacts such as waste, dust, and noise, traffic, especially vibration, risk of cracking on overpass and construction schedule at least 02 weeks before start of the construction.</li> <li>- To use high-tech equipment to reduce vibration for construction activities of embankment;</li> <li>- Provide safety signal boards and instruction for traffic direction at each small bridge across Muong Lo canal in construction phase</li> <li>- Do not store materials and heavy load machines near the area of the bridge</li> </ul>

No	Site-Specific impacts and their relation to subproject activity	Specific mitigation measures
		<ul style="list-style-type: none"> <li>- Stabilise the canal bank surrounding bridges area prior to commencing the dredging and embankment activities</li> <li>- If damage to the bridges occurs, temporary access shall be provided for the local residents. The damage bridges shall be repaired or adequate compensations shall be made upon agreement with affected households.</li> </ul>
8	<p><i>Odor and management of sediments from dredging of Canal Cai Nhuc and No 62 Canal dredging (135,000 m<sup>3</sup> from 62 Canal; 60.000 m<sup>3</sup> from Cai Nhuc Canal)</i></p> <ul style="list-style-type: none"> <li>- People living along the canal, and at the transfer site in ward xx and along the transportation routes</li> </ul>	<p><i>To control impacts by dredged sludge:</i></p> <ul style="list-style-type: none"> <li>- The Dredged Materials Management Plan (DMMPs) for the dredging works during Cai Nhuc and 62 canals have been prepared. Overall, sludge will be disposed at Tan Tien commune land fill or being used for agricultural or tree planting purpose based on actual need of the local people. Transportation of sediments must meet the environmental protection requirements and avoid sludge leakage; the sediment carrying trunks must be covered closely and not overloaded as permitted. The DMMP is described in detail in chapter 6 – Environmental and Social Management Plan and Annex 1.</li> <li>- Ensure that detailed design scope for the lake dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor’s dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts</li> <li>- Prior to construction, the contractors shall develop a specific DMMP based on the updated DMMP. The contractor’s DMMPs shall be submit by Construction Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary gathering of dredged materials, and control of polluting material during temporary gathering and transportation, pollution control, and risks at disposal sites.</li> <li>- Manage to ensure sediment will be disposed appropriately according to the approved DMMP.</li> </ul> <p><i>To control impacts by odors from dredging process:</i></p> <ul style="list-style-type: none"> <li>- Sludge is collected along the work sites and covered by sheeting to limit sludge water leaking into the soil, and transported for disposal within the day. The management plan on dredged materials will be prepared to instruct the contractors to manage the waste source.</li> <li>- Uncontrolled disposal of the dredged sludge is prohibited. The waste source must be managed properly under the supervision of PMU.</li> <li>- In order to limit the impacts of odor of the dredged sludges, the workers shall be equipped with the masks, boots and gloves when working in/exposing to these waste sources.</li> <li>- Spraying EM (Effective Microorganisms) every day. The deodorants can eliminate malodors from H<sub>2</sub>S, CH<sub>4</sub>, etc.</li> </ul>

No	Site-Specific impacts and their relation to subproject activity	Specific mitigation measures
2.5	<b>Rehabilitating Tam Giac Lake (subcomponents 2.3 and 2.5)</b>	
a	<p><i>Odor treatment and management of 20,000 m<sup>3</sup> of arising dredged sludge.</i></p> <p>- People living along the canal, and at the transfer site in ward xx and along the transportation routes</p>	<p>- Mitigation measures are similar as for Canal Cai Nhuc and Canal 62 investments items;</p>
b	<p><i>Impact to water environment of Tam Giac lake during dredging process</i></p>	<ul style="list-style-type: none"> <li>- The dredging is conducted only during the dry season;</li> <li>- Strict implement construction measures for dredging as designed. In particular the area of 3.0 ha, the dredging will be carried out on a successive basis by dividing the area of the lake to be dredged into 02 cells which are dredged one after one. Before dredging timber piles for embankment of the cell are installed and water is pumped out, then proceed to dredge to the design depth (- 2.5 m). After complete dredging for the first cell, continue to conduct dredging next cell. With this approach, the ecosystem of the lake will be maintained and not altered dramatically ; and the impact on the landscape and environment around will be mitigated</li> <li>- It is strictly forbidden for contractors to gather equipment around the lake</li> <li>- Strict management of generated waste, especially grease and greasy rag that must be collected immediately to prevent leakage into the surrounding environment;</li> <li>- Workers are strictly prohibited to discharge wastes into the environment, particularly into the lake</li> <li>- Limiting the concentration of multiple devices at the same time in the lake to minimize the impact of noise, vibration, dust and emissions to species at site.</li> </ul>

**Mitigation measures for impacts on traffic and traffic safety due to transportation of construction materials and wastes:** During construction, under component 1,2,3: a number of streets and roads will be affected by transportation of construction materials and waste as indicated in Table 5.2 below.

**Table 5.2: Material and waste transport routes**

Construction site	Estimated length (km)	Roads for transportation of wastes
LIA 1	8,5	Nguyen Thai Hoc → Tran Hung Dao → QL61 → Tan Tien commune landfill
LIA 2	9	Luu Huu Phuoc → Nguyen Thai Hoc → Tran Hung Dao → QL61 → Tan Tien commune landfill
LIA 3	10	Đường Lê Hồng Phong → đường Trần Hưng Đạo → QL61 → Tan Tien commune landfill
LIA 7	9,5	3/2 → Tran Hung Dao → QL61 → Tan Tien commune landfill
Nguyen Hue road	11,5	Vo Nguyen Giap → Nguyen An Ninh → Le Hong Phong → Tran Hung Dao → QL61 → Tan Tien commune landfill
1/5 road	9,5	3/2 → Tran Hung Dao → QL61 → Tan Tien commune landfill
Cai Nhuc Canal	8,5	Nguyen Cong Tru → Le Quy Don → Tran Hung Dao → QL61 → Tan Tien commune landfill
62 Canal	10	Le Hong Phong → Tran Hung Dao → QL61 → Tan Tien commune landfill
Tam Giac Lake	9	Luu Huu Phuoc → Nguyen Thai Hoc → Tran Hung Dao → QL61 → Tan Tien commune landfill

**Mitigation measures for impacts include:**

- Clean up the transport vehicles before leaving construction site. Do not load to a height of 10cm higher than the truck body so as not to spill out and scatter materials onto roads, giving rise to dust and endangering road users.
- Do not park vehicles in the roads longer than necessary. Do not allow construction vehicles and materials to encroach upon the pavements.
- Maintain the required speed limit and do not overuse horn.
- Periodically registry and supervise the quality of transport vehicles as required by the government regulations.
- Comply with the traffic safety regulations while participating traffic
- Clean up wastes dropped off on road.
- Assign staff to guide the traffic during transportation, unloading, and loading of construction materials, equipment, and wastes.
- Place stockpile materials at a designated place tidily and successively according to construction schedule.
- Spray water three times per day to reduce dust during dry days if required.
- Reinstall the road surface if occurring the damages during construction.

**5.1.5. Specific Mitigation Measures During Operation**

**Component 1:** The specific impacts during operation are mainly from the operation and maintenance (O&M) of the drainage system. At the same time, the effects on traffic safety must be controlled when the number of vehicles running through alleys highly increases. The mitigation measures for these particular effects are proposed as follows:

*a) Measures for minimizing the effects of O&M of the drainage system*

- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the sewer pipes;
- Carrying out periodical dredging and clearing works of the sewer pipes;
- Sweeping and cleansing pavements must include clearing the rubbish and obstructing objects on the flow/sewer inlets/heads;
- Signing contracts with the responsible agencies on collecting dredged sludge.

*b) Measures for traffic safety*

- Ensure that traffic safety provisions, including signs, lights, and signals regulating speeds, allowed vehicles load that were installed during construction are permanently and effectively maintained, and renewed as necessary
- Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road.
- Cooperating with the local government to appoint the staff for traffic regulation at peak hours;
- Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the alleys in its as-completed condition;

## **Component 2:**

### ***For Upgrading Nguyen Hue road (subcomponent 2.1) and Upgrading 1/5 road (subcomponent 2.2)***

#### *a) Traffic safety issues*

After construction is completed, there will be operations of various vehicles on the new road. Key short term impacts would include an increase in traffic and pedestrian accidents, due to higher standard road allowing more and faster traffic; premature failure of pavements, drainage structures due to inadequate maintenance. Other impacts would be possibly localized flooding related.

To mitigate these impacts the following measures will be carried out by the city road maintenance agency:

- Ensure that traffic safety provisions, including signs, lights, and pavement markings that were installed during construction are permanently and effectively maintained, and renewed as necessary.
- Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the road in its as-completed condition.
- Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road.
- Ensure effective road inspection for any signs of damages, soil erosion and landslide for immediate repairing actions.
- Cooperating with the local government to appoint the staff for traffic regulation at peak hours;

#### *b) Local flooding on the roads due to inadequate maintenance*

To minimize impacts by the status of blockage of drainage system due to inadequate maintenance during operation phase of Nguyen Hue road and 1/5 road, the O&M units will be implemented mitigation measures follow:

- The management of stormwater drainage along the roads should be focused and examined regularly to detect the congested drainage sewer sections and carry out dredging.
- Conduct periodic planning decentralization and dredging sewer sections and manholes in order to minimize the flow congestion (every 6 months).
- Control disposal of sludge: Similar to the construction phase, those who manage the water drainage systems would have contracts with relevant authorities of sludge dredging from the sewer sections and manholes and then transport to the landfill by specialized tank trucks to avoid odor emission and spillage during transportation.

#### *c) Embankment subsidence risk during operation of Muong Lo canal*

- To avoid risk on embankment cracking and subsidence, in detailed design should be implemented hydrology and geological surveys to ensure sustainable and stable designs and
- City shall provide O &M Plan as well as budget source should be approved and arranged by Vi Thanh City.
- Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the embankment periodically

- Closely monitor the construction of other infrastructures within the area that potentially affect the embankment structures

*d) Garbage throwing causing pollution and decreased aesthetic value of the canals*

- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the canals; PMU and DONRE should be in collaboration to impose much more serious penalty to polluter
- Properly arranging the waste baskets along the canal and launching programs of increasing awareness of the community toward environmental protection;

**Measures for the status of direct waste disposal into the Cai Nhuc and 62 canals and Tam Giac Lake (subcomponent 2.3, 2.4 and 2.5)**

*During the O&M, to control risks of pollution and flow stagnation due to disposal of waste from households living along the canals, the O&M unit will be implemented mitigation measures follow:*

- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the canals; PMU and DONRE should be in collaboration to impose much more serious penalty to polluter
- Properly arranging the waste baskets along the canal and launching programs of increasing awareness of the community toward environmental protection;
- Carrying out periodical dredging and clearing works of the canals at least 6 months/time especially before the wet season;
- Signing contracts with the responsible agencies on collecting, transporting and treating dredged sludge.

**Component 3:** Concerning about the impacts from domestic wastewater and solid waste generated from the resettlement sites, the operation management agency has to take the following mitigation measures:

- Households in the resettlement sites have to build the toilets with septic tank in accordance with regulations of the Government, the wastes from the toilets must be primarily treated in the septic tanks of each household before discharging into the public drainage system. The wastewater will be then connected to the Drainage and wastewater treatment system of Vi Thanh city (funded by Denmark government).
- The volume of the solid waste is very few and will be collected and managed by Vi Thanh URENCO.
- In general, the resettlement areas where there are current drainage system and waste collection areas, these impacts are very minor and under control.

**5.2. SOCIAL IMPACT MITIGATION MEASURES**

**Table 5.3: Measures to minimize project disadvantage**

Negative Impacts	Measures to minimize project disadvantage
<b>Land Acquisition</b>	<b>General Impacts for all Components</b>
	In Component 1, the impacts of land acquisition and involuntary resettlement can be mitigated by implementing community upgrade plan (CUP) in each LIA and basing on community consultation on technical solution (width to be expanded/upgraded, ensuring traffic capacity and limiting the land acquisition). One resettlement action plan (RAP) has been prepared for the whole project and the resettlement plan (RP) has also been prepared for Vi Thanh city subproject to

Negative Impacts	Measures to minimize project disadvantage
	<p>mitigate negative impacts.</p> <p><b>Component 1</b></p> <p>Community consultation in the LIA on upgrading/expanding solution to minimize the area of acquired land and give HHs a sense of ownership;                      Ensure in situ relocation as much as possible for households having affected land                      Location of serviced RS between 3-5 km will limit limit impacts on livelihoods for HH with small business affected                      Ensure self-relocation and ensure that people are compensated reasonably at market price (for HHs having LURC and legal document for land ownership)</p> <p><b>Component 2</b></p> <p><b>Improving canal 62 and canal Cai Nhuc</b>                      Support to arrange resettlement in the resettlement site with full infrastructure, improving living condition for households who previously living along the two canals</p> <p><b>Upgrading and widening road 1/5 and Nguyen Hue street</b>                      Ensure in situ relocation as much as possible;                      Self-relocation with adequate support is an option as HH will receive full compensation (HH have LURC);</p> <p><b>Improving Tam Giac lake</b>                      Ensure in situ relocation as much as possible;                      Self-relocation with adequate support is an option as HH will receive full compensation (HH have LURC);</p>
<b>Impacts on Livelihood</b>	<p>Assistance for relocation close to former location;                      Short distance (2 to 5 km) from the resettlement sites to their former business location should not affect their income;                      In case of impacts on livelihood, adequate income restoration program with needs assessment of affected HH to be conducted;                      Civil works should prioritize job opportunities for local people, especially the affected HH and the poor, to increase their income.                      To inform shop owners on schedule and construction time to adapt their planning.                      To support access to the store to help people maintain their trading operation.</p>
<b>Gender Issues</b>	<p>Specific consultation with women to be conducted during project implementation.                      A Gender Action Plan to be prepared.</p>
<b>Risk of sexually transmitted diseases, including HIV/AIDS</b>	<p>HIV/AIDS awareness and prevention measures to be included in the contractors' contracts.                      Organizing awareness program for the local population;                      Specific program targeting women</p>
<b>Risk/incidents in construction process</b>	<p>Following and applying regulation on labor safety;                      There should be backup instrument for fire fighting, rescuing...</p>



### **5.3. MEASURES TO MITIGATE CUMULATIVE IMPACTS**

The assessment indicates that the cumulative impacts of the Subproject and the associated projects are mostly positive. The negative cumulative impacts are minor to moderate and can be addressed individually at the project level.

## **CHAPTER 6. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)**

Based on the assessments of the potential adverse environmental impacts and mitigation measures proposed in Chapter 4 and chapter 5 of this report, this Chapter presents an Environmental and Social Management Plan (ESMP) for Vi Thanh project. EMP identifies the measures to be carried out for the project, including environmental monitoring program and implementation arrangements, taken into account the needs to comply with the government's EIA regulations and WB's environmental safeguard policies, including Environmental, Health, and Safety (EHS) Guidelines of the WB.

### **6.1. BASIC PRINCIPLES**

In order to ensure that all pollution sources arising from the subproject activities during the preparation stage and the construction stage as well as in the operation period will not cause any negative impacts on the environment and public health, it is compulsory that the management, monitoring and supervision of environmental quality are executed in a scientific, systematic and regular manner. Below is a summary of environmental impacts, mitigation measures and responsibilities of stakeholders.

ESMP's mitigation measures are divided into 3 basic parts: (1) ECOP, (2) Specific mitigation measures for the specific types of works, and (3) Site-specific mitigation measures for each sensitive location to be affected by the subproject's work items.

(1) All of the potential negative impacts on physical, biological, and social environment could be mitigated through a set of general measures that are typically applied to most of construction projects to minimize impacts such as noise, dust, vibration, waste generation, traffic hindrance, public safety, etc. In this context, an ECOP has been prepared to describe the specific requirements to be carried out by contractor to mitigate the subproject potential impacts which are considered as the general ones (Section 6.2.1). The contractors will also be required to mitigate site-specific impacts which will be identified in order to address specific issues of the subproject.

(2) In addition to adopting the ECOPs, the specific mitigation measures have been identified (Section 6.2.2) for addressing the impacts associated with the specific types of structures under the subproject. These measures will be included in the contracts for corresponding packages.

(3) All the specific impacts on each sensitive place of which mitigation measures could not be addressed through implementation of the ECOPs, shall be solved by the site-specific mitigation measures. (Section 6.2.4).

Measures to mitigate impacts from land acquisition and resettlement are mentioned separately in the Resettlement Action Plan (RAP) and those measures will be carried out and supervised separately.

### **6.2. KEY IMPACT MITIGATION MEASURES**

#### **6.2.1. ECOPS**

Typical common impacts which will be minimized by mitigation measures defined in ECOP include: (1) Dust, exhaust gases, noise and vibration; (2) wastewater management; (3) Solid waste management; (4) Harmful waste; (5) Water pollution control; (6) Impacts on aquatic species and terrestrial ecology; (7) Management of impacts on urban landscape and beauty; (8) Management measures of sedimentation, erosion and flooding; (9) Traffic safety management; (10) Influence to existing infrastructure and services, (11) Management of impacts on social activities; (12) Management of impacts on cultural and religious works; (13) Measures to secure community health and safety; (14) Measures to secure worker's health and safety, (15) Management of warehouses and borrow pits, (16) Communication to local community.

**Table 6.1: Environmental Codes of Practices for addressing general construction impacts (ECOPs)**

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
<p><b>1. Generated dust, noise, vibration, exhaust gas</b></p>	<ul style="list-style-type: none"> <li>• Maintain the level of emission at construction sites within the permissible limit provided for in QCVN 05: 2013/BTNMT: National Technical Regulation on Ambient Air Quality.</li> <li>• Vehicles in Vietnam must undergo a regular emissions check and obtain certification: “Certificate of conformity from inspection of quality, technical safety and environmental protection” following Decision No. 35/2005/QD-BGTVT</li> <li>• Carry out watering for dust control at least 2 times a day: in the morning and in the afternoon during dry weather with temperatures of over 25°C, or in windy weather. Avoid overwatering as this may make the surrounding muddy.</li> <li>• Exposed soil and material stockpiles shall be protected against wind erosion and the location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors.</li> <li>• Dust masks should be used by workers where dust levels are excessive</li> <li>• There should be no burning of waste or construction materials on site.</li> <li>• Cement processing plants should be far from residential areas.</li> <li>• Only use transportation vehicles with valid registry.</li> <li>• Neatly gather construction materials and wastes. Arrange for the workers to collect and gather construction materials and wastes to the designated places at the end of each day or shift.</li> <li>• Do not overload the materials/soils and stones to extreme heights onto trucks, as this may result in drops along transportation routes. Tightly cover the trucks carrying wastes and bulk materials before getting out of construction sites or quarries and borrow pits so as to restrict scattering along transportation routes.</li> <li>• Put temporarily gathered materials and waste heaps with a volume of</li> </ul>	<ul style="list-style-type: none"> <li>• QCVN 05: 2013/MONRE: National technical regulation on ambient air quality</li> <li>• QCVN 26:2010/BTNMT: National technical regulation on noise</li> <li>• QCVN 27:2010/BTNMT: National technical regulation on vibration</li> <li>• TCVN 6438-2005: Road vehicles. Maximum permitted emission limits of exhaust gas</li> <li>• Decision No. 35/2005/QD-BGTVT on inspection of quality, technical safety and environmental protection;</li> </ul>	<p>Contractor</p>	<p>PMU, CSC, IEMC</p>

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>about 20m<sup>3</sup> within barriers or covered so as to avoid dust dispersion.</p> <ul style="list-style-type: none"> <li>• Transport wastes out of construction sites to the designated locations for reuse or to the disposal sites in the soonest possible time.</li> <li>• Do not put vehicles and machines to run idle in more than 5 minutes.</li> <li>• Avoid preparations of construction materials such as mixing concrete near local people’s houses or other sensitive works like pagodas, school gates, or offices.</li> <li>• Locate vehicle washing stations at the exit/entrance of big construction sites such as the areas for WWTPs, regulation lakes, storm water pumping stations and main pumping stations.</li> <li>• Periodically wash the trucks used for transporting materials and construction wastes.</li> <li>• Avoid construction operations generating great vibration and loud noise within the time between 6pm and 7am when construction takes place near residential areas. Night construction must be informed to the community at least 2 days in advance.</li> <li>• Perform the method of successive construction for each sewer section in construction sites of long sewer lines.</li> <li>• Observe and secure construction progress correctly.</li> <li>• Set up 2.5m-high fences of corrugated iron around the construction sites such as the areas for the WWTP, the balancing lakes, the Southern and Northern embankments and roads of Cai river.</li> <li>• When needed, measures to reduce noise to acceptable levels must be implemented and could include silencers, mufflers, acoustically dampened panels or placement of noisy machines in acoustically protected areas</li> <li>• Avoiding or minimizing transportation through community areas and avoiding as well as material processing areas (such as cement mixing)</li> </ul>			

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
<p><b>2. Wastewater management</b></p>	<ul style="list-style-type: none"> <li>• The Contractor must be responsible for compliance with Vietnamese legislation relevant to wastewater discharges into watercourses.</li> <li>• Employ local workers to limit the amount of generated domestic wastes and wastewater.</li> <li>• Provide septic tanks for toilets for treating wastewater before it can be discharged into the environment. On-site mobile toilets with 3-compartment septic tanks can be used in areas for major work items as LiAs, Nguyen Hue road, 1/5 road, Cai Nhuc canal, 62 canal and Tam Giac Lake embankment. Wastewater from toilets as well as kitchens, showers, sinks, etc. shall be discharged into a conservancy tank for removal from the site or discharged into municipal sewerage systems; there should be no direct discharges to any waterbody</li> <li>• Wastewater containing pollutants over standards set by relevant Vietnamese technical standards/regulations must be collected in a conservancy tank and removed from site by licensed waste collectors.</li> <li>• Clear ditches around the workers’ camps every week.</li> <li>• Build sedimentation ponds and ditches to receive storm water runoff at the construction sites such as the areas for WWTP, balancing lakes, storm water pumping stations, and main pumping stations.</li> <li>• Make appropriate arrangements for collecting, diverting or intercepting wastewater from households to ensure minimal discharge or local clogging and flooding.</li> <li>• Before construction, all necessary wastewater disposal permits/licenses and/or wastewater disposal contracts have been obtained.</li> <li>• At completion of construction works, wastewater collection tanks and septic tanks shall be safely disposed or effectively sealed off.</li> </ul>	<ul style="list-style-type: none"> <li>• QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater;</li> <li>• QCVN 40: 2011/ BTNMT: National technical regulation on industrial wastewater</li> </ul>	<p>Contractor</p>	<p>PMU, CSC, IEMC</p>
<p><b>3. Solid waste management</b></p>	<ul style="list-style-type: none"> <li>• Before construction, a solid waste control procedure (storage, provision of bins, site clean-up schedule, bin clean-out schedule, etc.) must be prepared by the Contractors and it must be carefully followed during</li> </ul>	<ul style="list-style-type: none"> <li>• Decision No, 59/2007/NĐ-CP on</li> </ul>	<p>Contractor</p>	<p>PMU, CSC, IEMC</p>

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>construction activities.</p> <ul style="list-style-type: none"> <li>• Before construction, all necessary waste disposal permits or licenses must be obtained.</li> <li>• Solid waste may be temporarily stored on site in a designated area approved by the CSC and relevant local authorities prior to collection and disposal through a licensed waste collector.</li> <li>• Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof.</li> <li>• No burning, on-site burying or dumping of solid waste shall occur.</li> <li>• If not removed off site, solid waste or construction debris shall be disposed of only at sites identified and approved by the CSC and included in the solid waste plan. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas, such as in areas of natural habitat or in watercourses.</li> <li>• Limit waste pollution from litter and drop of materials. Place dustbins at the workers' camps.</li> <li>• Temporarily collect and separate domestic wastes. Provide watertight dustbins for domestic waste and tightly cover them to avoid giving rise to bad odors and leachate leakage, attracting flies, mice and other pathogenic species. Periodically collect and transport the waste to the dispose at Tan Tien commune landfill.</li> <li>• Perform concrete mixing on impermeable ground. Collect waste and wastewater containing cement through drainage ditches with sedimentation pits in construction sites before being discharged into receiving waters.</li> <li>• Separate the components and parts which can be reused or recycled in the construction wastes before transporting the waste Tan Tien commune landfill in accordance with design documents acceptable to the supervision engineer.</li> </ul>	<p>garbage management;</p> <ul style="list-style-type: none"> <li>• Decision No,38/2015/NĐ-CP dated 24/04/2015 on waste and scrap management</li> </ul>		

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>Weathered soil, wood and bricks can be reused for useful purposes such as ground leveling. Wood scraps may be used for cooking. Corrugated iron, iron, steel, packing materials and other materials which can be recycled can be delivered and sold to scrap traders.</li> <li>Collect waste and tidy up construction sites at the end of a working day/shift and the transport waste out of the construction sites in the soonest possible time. If dredged materials are to be temporarily stored, necessary measures must be applied to control pollution such as gathering them within enclosures, under coverings, within fenced areas, etc. with warning signs.</li> <li>The Contractor will sign a contract with Hau Giang Urban Environment to collect solid waste, conforming to Decree No. 59/2007/ND-CP dated 09 April 2007 on solid waste management and Decree No. 38/2015/ND-CP dated 24 April 2015 on management of waste and waste materials.</li> </ul>			
<b>4. Hazardous waste management</b>	<ul style="list-style-type: none"> <li>Temporarily collect, store, and transported for treatment all harmful wastes (road asphalt, waste oil and grease, organic solvents, chemicals, oil paints, etc.) in accordance with Circular No. 36/2015/TT-BTNMT on management of harmful waste.</li> <li>Collect and temporarily store used oil and grease separately in specialized containers and place in safe and fire-free areas with impermeable floors roofs, at a safe distance from fire sources. Sign contracts with for oil and grease to be delivered to suppliers/ manufacturers</li> <li>Chemical waste of any kind shall be disposed of at an approved appropriate landfill site and in accordance with local legislative requirements. The Contractor shall obtain needed disposal certificates.</li> <li>The removal of asbestos-containing materials or other toxic substances shall be performed and disposed of by specially trained and certified workers.</li> </ul>	<ul style="list-style-type: none"> <li>Circular No. 36/2015/TT-BTNMT on harmful waste management;</li> <li>Decision No.38/2015/NĐ-CP dated 24/04/2015 on waste and scrap management</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>• Used oil and grease shall be removed from site and sold to an approved used oil recycling company.</li> <li>• Used oil, lubricants, cleaning materials, etc. from the maintenance of vehicles and machinery shall be collected in holding tanks and removed from site by a specialized oil recycling company for disposal at an approved harmful waste site.</li> <li>• Used oil or oil-contaminated materials that could potentially contain PCBs shall be securely stored to avoid any leakage or affecting workers.</li> <li>• Unused or rejected tar or bituminous products shall be returned to the supplier’s production plant.</li> <li>• Relevant agencies shall be promptly informed of any accidental spill or incident</li> <li>• Store chemicals appropriately and with appropriate labeling</li> <li>• Appropriate communication and training programs should be put in place to prepare workers to recognize and respond to workplace chemical hazards</li> <li>• Prepare and initiate a remedial action following any spill or incident. In this case, the contractor shall provide a report explaining the reasons for the spill or incident, remedial action taken, consequences/damage from the spill, and proposed corrective actions</li> </ul>			
<p><b>5. Water pollution</b></p>	<ul style="list-style-type: none"> <li>• Provide preliminary sedimentation ponds and ditches of stormwater run off at the construction sites such as the areas for LIAs, Cai Nhuc and 62 canals; Tam Giac Lake.</li> <li>• Provide construction workers on site with mobile toilets.</li> <li>• Avoid excavation and backfilling during rains.</li> <li>• Gather materials and wastes generated during excavation and backfilling, collect and transport them out of the construction site to the</li> </ul>	<ul style="list-style-type: none"> <li>• QCVN 09-MT:2015/BTNMT: National technical regulation on underground water;</li> <li>• QCVN 14:2008/BTNMT: National technical regulation on domestic</li> </ul>	Contractor	MU, CSC, IEMC



Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>approved disposal sites within the soonest possible time.</p> <ul style="list-style-type: none"> <li>• Do not allow temporary gathering of bulk materials and mixing of concrete within 50m from ponds, lakes, rivers, streams, or other water sources. Maintain maximum distances possible between the gathering points to water sources in the construction of LIAs, Cai Nhuc and 62 canals; Tam Giac Lake.</li> <li>• Store used and unused oil and petrol in closed containers on impermeable ground covered with roofs and contained within surrounding banks for easy control and collection in case of leakage. Do not locate oil and petrol storages within 25m from ponds, lakes, rivers, and streams.</li> <li>• Collect and transport excavated soils from the construction of sewers and ditches out of the construction site within 24 hours.</li> <li>• Only perform maintenance work of motored vehicles and equipment, including oil replacement or lubrication in designated areas, without allowing chemicals, petrol, oil, or grease to leak onto soil or into the drainage system or water sources. Trays are to be used to hold rags and materials used in maintenance. Collect and discard wastes in accordance with harmful waste management regulation</li> </ul>	<p>wastewater;</p> <ul style="list-style-type: none"> <li>• QCVN 40: 2011/ BTNMT: National technical regulation on industrial wastewater;</li> <li>• TCVN 7222: 2002: General requirements for concentrated wastewater treatment plants</li> </ul>		
<p><b>6. Impacts on plants and aquatic species</b></p>	<ul style="list-style-type: none"> <li>• The Contractor shall prepare a Clearance, Revegetation and Restoration Management</li> <li>• Plan for prior approval by the Construction Engineer, following relevant regulations. The Clearance Plan shall be approved by the Construction Supervision Consultant and followed strictly by the contractor. Areas to be cleared should be minimized as much as possible.</li> <li>• Limit disturbances to areas with construction operations, especially in locations covered with green trees or vegetation. Do not use chemicals to clear vegetation.</li> <li>• Do not gather materials and wastes at places covered with vegetation or</li> </ul>	<ul style="list-style-type: none"> <li>• Law on environmental protection No. 55/2014/QH13</li> </ul>	<p>Contractor</p>	<p>PMU, CSC, IEMC</p>

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>with green trees, but on vacant land instead.</p> <ul style="list-style-type: none"> <li>• Use sheet pile driving method using Larsen piles to limit impacts on the water quality.</li> <li>• If possible, green trees should be moved and replanted in other places if the trees are in the way of the pipelines to be constructed.</li> <li>• The contractor shall remove topsoil from all areas where topsoil will be impacted by construction activities, including temporary activities such as storage and stockpiling, etc.; the stripped topsoil shall be stockpiled in areas agreed to by the Construction Supervision Consultant for later use in re-vegetation and shall be adequately protected.</li> <li>• Trees cannot be cut down unless explicitly authorized in the vegetation clearing plan.</li> <li>• When needed, temporary protective fencing will be erected to efficiently protect the preserved trees before commencement of any works within the site.</li> <li>• No area of potential importance as an ecological resource should be disturbed unless there is prior authorization from CSC, who should consult with PMU, IEMC and the relevant local authorities. This could include areas of breeding or feeding for birds or animals, fish spawning areas, or any area that is protected as a green space.</li> <li>• The Contractor shall ensure that no hunting, trapping, shooting, poisoning of fauna takes place.</li> </ul>			
<p><b>7. Impacts on urban landscape and beauty</b></p>	<ul style="list-style-type: none"> <li>• Carefully cover transport vehicles for materials and waste and periodically wash and clean the vehicles.</li> <li>• Dismantle the camps as well as other temporary works set up during construction and restore the site before the completed work could be handed over to the subproject owner. Back fill and tightly seal toilet pits, septic tanks, and temporary sewerage ditches.</li> <li>• Do not temporarily gather construction materials and wastes within 20m</li> </ul>	<ul style="list-style-type: none"> <li>• Law on environmental protection No. 55/2014/QH13</li> <li>• TCVN 4447:1987: Construction regulation</li> <li>• Circular No.</li> </ul>	<p>Contractor</p>	<p>PMU, CSC, IEMC</p>

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>from the gate of schools, offices temples, pagodas, etc.</p> <ul style="list-style-type: none"> <li>The Contractor will have to work out construction plans in such a way as to avoid the 1<sup>st</sup> and 15<sup>th</sup> days of each lunar month if construction is to be carried out near historical and cultural works such as pagodas, temples, etc.</li> <li>Regularly collect materials and wastes and tidy up the construction site.</li> </ul>	<p>22/2010/TT-BXD on requirements on safety</p>		
<p><b>8. Sedimentation, erosion, flooding, subsidence and slides</b></p>	<ul style="list-style-type: none"> <li>Avoid disturbances and damage to the existing vegetation and green trees.</li> <li>Periodically and thoroughly remove soils, stones and wastes from drainage sewers and ditches inside and around the construction site.</li> <li>Neatly gather materials and wastes so as to limit them being swept away by storm water.</li> <li>Carry out ground leveling and rolling after discarding materials at disposal sites.</li> </ul>	<ul style="list-style-type: none"> <li>TCVN 4447:1987: Construction regulation</li> <li>Circular No. 22/2010/TT-BXD: Regulation on construction safety</li> <li>QCVN 08:2008/BTNMT – National technical regulation on surface water quality</li> </ul>	<p>Contractor</p>	<p>PMU, CSC, IEMC</p>
<p><b>9. Traffic management</b></p>	<ul style="list-style-type: none"> <li>Before construction, carry out consultations with local government and community and with traffic police.</li> <li>Set up traffic and maintain instruction signs and warnings to secure safety for people and means of transport during construction.</li> <li>Put speed limit signs at a distance of 200m from the construction site.</li> <li>Carefully cover materials on trucks. Do not load to a height of 10cm higher than the truck body so as not to spill out and scatter materials onto roads, giving rise to dust and endangering road users. Collect spilt soils and materials at the construction site each day to avoid slippery incidents for vehicles.</li> <li>Do not park vehicles in the roads longer than necessary. Do not allow</li> </ul>	<ul style="list-style-type: none"> <li>Law on communication and transport No. 23/2008/QH12;</li> <li>Law on construction No. 50/2014/QH13;</li> <li>Law No. 38/2009/QH12 dated 19/6/2009 amending and supplementing some articles of the Law relating to capital</li> </ul>	<p>Contractor</p>	<p>PMU, CSC, IEMC</p>

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>construction vehicles and materials to encroach upon the pavements.</p> <ul style="list-style-type: none"> <li>• During construction near schools, deploy staff at the site to guide the traffic at the start of school time and when school is over. Water the roads to prevent dust, limit the speed of traveling trucks, do not allow flared horns, and do not dispose the waste and wastewater onto areas near schools.</li> <li>• Install night lighting of all construction sites.</li> <li>• Significant increases in number of vehicle trips must be covered in a construction plan previously approved. Routing, especially of heavy vehicles, needs to take into account sensitive sites such as schools, hospitals, and markets.</li> <li>• Installation of lighting at night must be done, if necessary, to ensure safe traffic circulation.</li> <li>• Employ safe traffic control measures, including road/rivers/canal signs and flag persons to warn of dangerous conditions.</li> <li>• Avoid material transportation for construction during rush hours.</li> <li>• Passageways for pedestrians and vehicles within and outside construction areas should be segregated and provide for easy, safe, and appropriate access. Signposts shall be installed appropriately in both water-ways and roads where necessary</li> </ul>	<p>construction investment</p> <ul style="list-style-type: none"> <li>• Circular No. 22/2010/TT-BXD on regulation on construction safety</li> </ul>		
<p><b>10. Influence to existing infrastructure and services</b></p>	<ul style="list-style-type: none"> <li>• Provide information to affected households on working schedules as well as planned disruptions (at least 2 days in advance).</li> <li>• The Contractor must only use vehicles of sizes and loads within permissible limits for the roads along such vehicles’ route.</li> <li>• During the construction under power lines, deploy qualified staff to observe and give instructions to the drivers of cranes and excavators so as to avoid causing damages to power lines, telecommunications lines, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Decree No. 73/2010/ND-CP on administrative penalization of violations related to security and social affairs</li> </ul>	<p>Contractor</p>	<p>PMU, CSC, IEMC</p>

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>• Stop construction when existing works are damaged. Identify causes of related incidents and work out solutions. In case the damages are due to the Contractors’ faults, the Contractors have to repair, recover, and compensate for all damages at their own expenses. The results of handling such damages must be approved by the Supervisor Engineer.</li> <li>• Reinstall the road surface and sidewalks at construction sites after the construction of sewer lines has been completed.</li> <li>• The contractor should ensure alternative water supply to affected residents in the event of disruptions lasting more than one day.</li> <li>• Any damages to existing cable utility systems shall be reported to the authorities and repaired as soon as possible.</li> </ul>			
<b>11. Social mitigation measures through worker management</b>	<ul style="list-style-type: none"> <li>• Inform the community at least 2 weeks before commencement of the construction. In case electricity and water supplies are to be disrupted, the PMU must inform PAHs of the same at least 2 days in advance.</li> <li>• Employ local laborers for simple tasks. Instruct workers on environmental issues, safety and health before construction tasks are assigned. It is advisable to communicate to migrant workers on local customs, practices and habits in order to avoid conflicts with local people.</li> <li>• The subproject owner and contractor are to cooperate closely with the local government in performing effective community sanitation in case of epidemic symptoms breaking out in the area.</li> <li>• The subproject owner and contractor are to cooperate with local authorities in preventing and fighting against social evils. Conduct sensitization campaigns with both workers and communities on these issues, liaison with local organizations to ensure monitoring, and a grievance redress system to which the community can refer to.</li> <li>• The subproject will cooperate with the local health agency in developing and implementing plans for control of diseases among</li> </ul>	<ul style="list-style-type: none"> <li>• Decree No. 73/2010/ND-CP on administrative penalization of violations against security and social affairs</li> <li>• Circular No. 22/2010/TT-BXD regulation on construction safety</li> <li>• Directive No. 02/2008/CT-BXD on safety and sanitation issues in construction units</li> <li>• TCVN 5308-91: Technical regulation on</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>workers.</p> <ul style="list-style-type: none"> <li>• Workers temporarily residing at the camps and rented houses must be registered with the local authorities for temporary residence.</li> <li>• Train workers on issues related to social security, social evils, diseases and epidemics, prostitution and drug use, environment, safety and health, HIV/AIDS and infectious diseases within 2 weeks prior to the commencement of packages with construction items lasting at least 6 months.</li> <li>• Prohibit workers from:               <ul style="list-style-type: none"> <li>+ Consuming alcoholic drinks during working time</li> <li>+ Quarreling and fighting</li> <li>+ Gambling and indulging in social evils such as drug use and prostitution</li> <li>+ Disposing of garbage indiscriminately.</li> </ul> </li> </ul>	<p>construction safety</p> <ul style="list-style-type: none"> <li>• Decision No. 96/2008/QD-TTg on clearance of UXOs</li> </ul>		
<p><b>12. Control of impacts on cultural works</b></p>	<ul style="list-style-type: none"> <li>• Do not gather materials and wastes within 20m from cultural, historical, and religious works such as temples, pagodas, churches, monuments, historic relics, etc. Spray water the construction sites next to such works.</li> <li>• Do not use machines generating loud noise and high vibration levels near cultural, historical, and religious works.</li> <li>• In case of archeological objects being unearthed during the implementation of earthwork, all parties will conform to the following procedures:               <ul style="list-style-type: none"> <li>+ In case of archeological objects being unearthed during the implementation of earthwork, all parties will conform to the following procedures:</li> <li>+ Suspend construction operations at the place of discovery;</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Law on cultural heritage No. 28/2001/QH10;</li> <li>• Amended and supplemented Law on cultural heritage No. 32/2009/QH12;</li> <li>• Amended and supplemented Decree No. 98/2010/ND-CP</li> </ul>	<p>Contractor</p>	<p>PMU, CSC, IEMC</p>

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>+ Preliminarily describe the area where the archaeological objects are to be unearthed;</li> <li>+ Strictly protect the area of the discovery so as not to damage or lose moveable objects. In case the unearthed objects are moveable or sensitive ruins, provide night protection until the local authorities, the Department of Culture, Sports and Tourism or the Institute of Archaeology takes over these unearthed objects;</li> <li>+ Inform the Supervision Engineer of the event and who in turn will immediately inform the subproject owner, the local authorities in charge of the case and the Institute of Archaeology (within 24 hours or less);</li> <li>+ Local relevant agencies and the Vietnam National Administration of Tourism will be responsible for protecting and preserving such archaeological relics before making decisions on the next suitable formalities. The Institute of Archaeology may be needed in the preliminarily assessment of the unearthed objects. The significance and importance of such discovered objects will be assessed by different criteria related to the nature of cultural heritages; such criteria would include aesthetic, historical, scientific, social or economic values;</li> <li>+ Decisions on handling such discovered objects will be made by competent levels. Such decisions can result in changes in site arrangements (e.g. when the discovered item is a cultural relic which cannot be displaced or is archaeologically important, it is necessary to preserve, recover and excavate it);</li> <li>+ The implementation of such decision by competent agencies related to the management of discovered objects will be communicated in writing by local competent agencies; and</li> <li>+ Only resume construction activities at the site after being permitted by the local competent agencies and the PMU in relation to safeguarding such relics</li> </ul>			

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
<p><b>13. Management of warehouses and borrow pits</b></p>	<ul style="list-style-type: none"> <li>• All borrow pit locations to be used must be previously identified in conformity with approved construction technical specifications. Sensitive sites such as scenic spots, areas of natural habitat, areas near sensitive receiving waters, or areas near water sources should be avoided. An open ditch shall be built around the stockpile site to intercept wastewater.</li> <li>• Retaining walls are to set up around disposal areas if necessary.</li> <li>• The use of new sites for stockpiling, gathering or exploiting materials necessary for construction operations must obtain prior approval from the Construction Engineer.</li> <li>• In case landowners are affected by the use of their areas for stockpiling, gathering or exploiting materials, such landowners must be included in the project resettlement plan.</li> <li>• If access roads are needed for these new sites, they must be considered in the environmental assessment report.</li> </ul>		Contractor	PMU, CSC, IEMC
<p><b>14. Communication to local community</b></p>	<ul style="list-style-type: none"> <li>• Open communications channels are to be maintained with the local government and concerned communities; the contractor shall coordinate with local authorities (leaders of local wards or communes, leaders of hamlets) for agreed schedules of construction operations in areas nearby sensitive places or during sensitive times (e.g. religious festival days).</li> <li>• Copies of Vietnamese versions of these ECOPs and of other relevant environmental protection documents shall be made available to local communities and to workers at the site.</li> <li>• Project information will be disseminated to affected parties (e.g. local authorities, enterprises and affected households, etc.) through community meetings before construction commencement.</li> <li>• A contact address will be provided to the community.</li> <li>• The community will be provided with all information, especially</li> </ul>	<ul style="list-style-type: none"> <li>• Decree No. 73/2010/ND-CP on administrative penalization of violations related to security and social affairs</li> </ul>	Contractor	PMU, CSC, IEMC



Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>technical findings, in a language that is understandable to the general public and in a form convenient to interested citizens and elected officials through the preparation of fact sheets and news releases, when major findings become available during project phase.</p> <ul style="list-style-type: none"> <li>• Community concerns and requested information are to be monitored as the project progresses.</li> <li>• Inquiries must be responded by telephone and written correspondence in a timely and accurate manner.</li> <li>• Local residents must be informed about construction and work schedules, interruption of services, traffic detour routes and provisional bus routes, blasting and demolition operations, as appropriate.</li> <li>• Technical documents and drawings will be provided to local People's Committees, especially the sketch of construction areas and the EMP of the construction site.</li> <li>• Notification boards shall be erected at all construction sites providing information about the project, as well as contact information about the site managers, environmental staff, health and safety staff, telephone numbers and other contact information so that affected people could have a channel to voice their concerns and suggestions.</li> </ul>			
<p><b>15. Mitigation measures for limitation of access to street household businesses</b></p>	<ul style="list-style-type: none"> <li>• Inform the street household businesses of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 02 weeks before start of the construction.</li> <li>• Set up construction and traffic warning signs at the construction site.</li> <li>• Provide safe and easy access to the household businesses putting clean and strong thick wood panels or steel plates over the open ditches.</li> <li>• Do not gather materials and wastes within 20m from household businesses and shops.</li> <li>• Do not use machines generating loud noise and high vibration levels</li> </ul>	<ul style="list-style-type: none"> <li>• Decree No. 73/2010/ND-CP on administrative penalization of violations against security and social affairs</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>near the businesses.</p> <ul style="list-style-type: none"> <li>• Spray sufficient water to suppress dust during dry and windy days at least three times a day at site.</li> <li>• Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes, and to guard high risk operations.</li> <li>• Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session.</li> <li>• Cleaning up construction areas at the end of the day, especially construction areas in front of business shops.</li> <li>• Providing night lighting system with luminously painted fence and night lamp.</li> <li>• Manage the worker force to any avoid the conflict with the local people and traders.</li> <li>• Compensate goods, products damaged by construction activities of the subproject.</li> <li>• Immediately address any issue/problem caused by the construction activities and raised by the local household traders.</li> </ul>			

**The details on the DMMP (Embankment for small canals in LIA 3,7, Cai Nhuc and 62 and Tam Giac Lake):**

- The contractors are requested to prepare a specific dredging material management plan (DMMP) and submit the same to the Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary gathering of dredged materials, control of polluting material during temporary gathering and transportation, pollution control, and risks at disposal sites. The detailed guidelines on DMMP are provided in Annex 1.

**6.2.2. Site-specific Impacts and Mitigation Measures**

The following table presents site-specific impacts and mitigation measures that are not fully addressed through the application of ECOPs. This may

be because the impact is not a typical one and is not included in the ECOPs, because the severity of the impact goes beyond the scope of the mitigation measures in the ECOPs, or because simply of the very specific nature of the mitigation measure that is needed.

**Table 6.2: Site-specific impacts and mitigation measures**

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
<b>COMPONENT 1: TERTIARY INFRASTRUCTURE UPGRADING IN LIAs</b>				
<b>Infrastructure in LIAs (1, 2, 3, 7)</b>				
<b>Preparation</b>				
UXO clearance	The subproject owner (the subproject PMU) will sign a contract with the military civil engineering agency or Hau Giang Provincial Military Base for UXO detection and clearance at the construction sites. UXO clearance will be executed right after the completion of site compensation and before the implementation of demolition and ground leveling. The estimated cost is approximately 50 million VND/ha. No construction activity will be allowed until the UXO clearance is completed.	The military civil engineering agency or Vinh Long Provincial Military	PMU	- Counter part fund. - IM: Contract - City fund
Lan acquisition and resettlement	Implementation of approved RP in accordance with its provision	Center for Land Fund Development at City Level	PMU, Ward People’s Committee	- Counter part fund - IM: approved RP - City fund
<b>Construction</b>				
Local flooding	- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction	Detailed Design Consultant	PMU	- Fund: City/ or IDA/IBRD - IM: detailed design contract

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	<ul style="list-style-type: none"> <li>- The Contractors must apply the specific construction methods, and flood prevention and control alternatives during construction period or the flow diversion alternatives to ensure the drainage in the location.</li> <li>- The contractors must set up temporary drainage at the construction site and ensure that they are cleared of mud and other obstructions</li> <li>- Arranging the standby pumps for rapid drainage in case of heavy rain or extreme weather events</li> </ul>	Contractor	PMU, CSC IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA/IBRD</li> <li>- IM: Construction contract conditions</li> </ul>
<p><i>Traffic obstruction and disturbance to daily activities of the local residents in LIAs</i></p>	<ul style="list-style-type: none"> <li>- Ensure that the contract requires the contractor, before commencing work, to provides a construction plan with a detailed health, safety, environment and traffic management plan</li> <li>- Inform local residents in advanced (at least 07 days) about construction and work schedules, interruption of services, traffic routes.</li> <li>- Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work.</li> <li>- Construction into succesive manner, section by section in a short period. Avoid the simultaneous construction and delay all over the LIAs.</li> <li>- Contractors should provide lighting a construction sites at night; security guard staff at construction sites to moderate vehicles entering and exiting the construction site;</li> <li>- Put the road construction warning signs at the site all the time.</li> <li>- Avoiding the waste/material transportation during rush hours;</li> <li>- Construction during night time is not allowed</li> <li>- Limit the construction area; the construction activities only occur within the site boundary</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading. During road excavation, canal dredging processes nearby bridges (LIA3), attention should be paid, avoiding strong impact on bridge foundation, and avoiding synchronous implementation of many construction activities causing vibration; and in case of</li> </ul>	Contractor	PMU, CSC IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA/IBRD</li> <li>- IM: Construction contract conditions</li> </ul>

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	damage, temporary bridge needs to be created to ensure traffic convenience, with satisfactory compensation and reinstatement of original bridge after construction.			
<p><i>Odor and management of sediments generated from small canal dredging in LIAs 3 and 7</i></p>	<p><i>Bà nêu tổng khối lượng nạo vét ở đây (Thúy cmts)</i>  <i>To control impacts by odors from dredging process:</i></p> <ul style="list-style-type: none"> <li>- Sediment is collected along the work sites and covered by sheeting to limit sludge water leaking into the soil, and transported for disposal within the day. The management plan for dredged materials will be prepared to instruct the contractors to manage the waste.</li> <li>- Uncontrolled disposal of the dredged sediment is prohibited. The waste source must be managed properly under the supervision of PMU.</li> <li>- In order to limit the impacts of odor and contamination from the dredged sludge, the workers shall be equipped with the masks, boots and gloves when working in/exposed to these waste sources.</li> <li>- Spraying EM (Effective Microorganisms) every day. The deodorants can eliminate malodors from H<sub>2</sub>S, CH<sub>4</sub>, etc.</li> </ul> <p><i>Management of dredged sediments from the canals:</i></p> <ul style="list-style-type: none"> <li>- The Dredged Materials Management Plan (DMMPs) for small canals has been prepared. Overall, sludge will be disposed at Tan Tien commune landfill or used for agricultural or tree planting purpose based on actual need of the local people. The DMMP is described in detail in chapter 6 – Environmental and Social Management Plan and Annex 1.</li> <li>- Ensure that detailed design scope for the canal dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor’s dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts.</li> <li>- Prior to construction, the contractors shall develop a specific DMMP based on the updated DMMP. The contractor’s DMMP shall be submitted to Construction Supervision Consultant for approval before starting the work. The dredging plan will</li> </ul>	Contractor	PMU, CSC IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA</li> <li>- IM: Construction contract conditions</li> </ul>

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	<p>indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary storage of dredged materials, and control of polluting material during storage and transportation, pollution control, and risks at disposal sites.</p> <ul style="list-style-type: none"> <li>- Manage to ensure sediment will be disposed appropriately according to the approved site-specific DMMP</li> </ul>			
<p><i>Impacts on PCRs and sensitive locations</i></p>	<p><i>For church, temples</i></p> <ul style="list-style-type: none"> <li>- Inform the temple and church of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction.</li> <li>- The contractor shall coordinate with local authorities (leaders of local wards or communes) for agreed schedules of construction activities at sensitive times (e.g., religious festival days). Avoid construction activities during religious events every first and 15th days of the lunar month and during festival days if possible.</li> <li>- Prohibit gathering of construction materials within 100m in front of the church, temple.</li> <li>- Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as church, temple, and shrine.</li> <li>- The contractor shall provide safety measures such as installation of fences, barriers warning signs, lighting system against traffic accidents as well as other risk to local people and church goers.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the church, temple.</li> <li>- Truck drivers shall restrict horn usage in areas close to the church area</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the church, temple.</li> </ul> <p><i>For Vi Thanh Market</i></p> <ul style="list-style-type: none"> <li>- Limiting to transport materials/wastes (for constructing the items of Lias) when passing by Vi Thanh Market at the peak hours (morning: 5-9h; noon: 11-12h;</li> </ul>	<p>Contractor</p>	<p>PMU, CSC, IEMC</p>	<ul style="list-style-type: none"> <li>- - Fund: IDA</li> <li>- IM: Construction contract conditions</li> </ul>

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	<p>afternoon and evening: 16 - 19h) which does not create any obstacles to the travelling/business activities of the residents.</p> <ul style="list-style-type: none"> <li>- Spray sufficient water to suppress dust during dry and windy days at least two times a day on the road along the market area.</li> <li>- Inform household businesses/market's management unit of the construction and transportation activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 02 weeks before start of the construction.</li> </ul> <p><i>For schools</i></p> <ul style="list-style-type: none"> <li>- Inform the school management of the construction activities and their potential impacts such as, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction</li> <li>- Construction area to be fenced and marked with warning signs to prevent pupils and unauthorized people from entering.</li> <li>- Teachers to be informed of construction operations to keep pupils off the site during their break time.</li> <li>- Prohibit use of construction methods that cause noise during school learning hours.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at site.</li> <li>- Immediately collect any domestic wastes and construction spoils around the school and dispose in a designated site.</li> <li>- Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes when children go to and leave the school.</li> <li>- Do not load construction materials within 20m from school and tidy construction materials and stockpiles every working session.</li> <li>- Cover the incomplete trenches under construction at end of the working day.</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the schools.</li> </ul>			

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
<b>Operation</b>				
<i>Measures for minimizing the effects of O&amp;M of the drainage system</i>	<ul style="list-style-type: none"> <li>- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the sewer pipes;</li> <li>- Carrying out periodical dredging and clearing works of the sewer pipes;</li> <li>- Sweeping and cleansing pavements must include clearing the rubbish and obstructing objects on the flow/sewer inlets/heads;</li> <li>- Signing contracts with the responsible agencies on collecting dredged sludge.</li> </ul>	Vi Thanh URENCO	Vi Thanh'PC	- City Budget - IM: City Operation and Maintenance Plan
<i>Measures for traffic safety</i>	<ul style="list-style-type: none"> <li>- Ensure that traffic safety provisions, including signs, lights, and signals regulating speeds, allowed vehicles load that were installed during construction are permanently and effectively maintained, and renewed as necessary</li> <li>- Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road.</li> <li>- Cooperating with the local government to appoint the staff for traffic regulation at peak hours;</li> <li>- Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the alleys in its as-completed condition;</li> </ul>	Vi Thanh URENCO	Vi Thanh'PC	- City Budget - IM: City Operation and Maintenance Plan
<b>COMPONENT 2: PRIORITY PRIMARY AND SECONDARY INFRASTRUCTURE</b>				
<b>(i) Upgrading Nguyen Hue Road; (ii) Rehabilitating Muong Lo Canal and construction 01 May Road, (iii) Rehabilitating Cai Nhuc Canal; (iv) Upgrading Canal 62 and Le Hong Phong Road; (v) Rehabilitating Tam Giac Lake.</b>				
<b>Upgrading Nguyen Hue Road (subcomponent 2.1) and 01/05 Road and Muong Lo canal (subcomponent 2.2)</b>				
<b>Preparation phase</b>				
UXO clearance	The same component 1	Competent Military Unit	PMU	- Counterpart fund. - IM: Contractor's conditions
Lan acquisition and resettlement	The same component 1	PMU, City People's	IEMC	- Counterpart fund - IM: approved RP



Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
For relocation of 87 graves during the construction Nguyen Hue road	<ul style="list-style-type: none"> <li>- Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation and other related costs which are necessary to satisfy customary religious requirements. Compensation in cash will be paid to each affected family or to the affected group as a whole as is determined through a process of consultation with the affected community. The level of compensation will be decided in consultation with the affected families/communities. All costs of excavation, relocation and reburial (5,000,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways.</li> <li>- During implementation the PMU will make early announcement to the households whose graves are affected so that they can make arrangement consistent with the spiritual practices of the people and compensate the affected household as required in the subproject RP and ESMP.</li> <li>- Implementation of approved RP in accordance with its provision</li> </ul>	Committee  PMU, City People's Committee	IEMC	<ul style="list-style-type: none"> <li>- Counter part fund</li> <li>- IM: approved RP</li> </ul>
<b>Construction phase</b>				
<i>Traffic safety risks and social disturbance</i>	<ul style="list-style-type: none"> <li>- Ensure that the contract requires the contractor, before commencing work, to provide a construction plan with a detailed health, safety, environment and traffic management plan</li> <li>- Inform local residents in advanced (at least 07 days) about construction and work schedules, interruption of services, traffic routes.</li> <li>- Inform the community of the planned night construction at least 2 days in advance. Limit the construction activities that cause great noise and vibration by night time.</li> <li>- Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work.</li> <li>- Contractors should provide lighting at a construction site at night; security guard staff at construction sites to moderate vehicles go out and in the construction site;</li> </ul>	Contractor	PMU, CSC IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA</li> <li>- IM: Construction contract conditions</li> </ul>

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	<ul style="list-style-type: none"> <li>- Put the road construction warning signs at the site all the time.</li> <li>- Avoiding the waste/material transportation during rush hours;</li> <li>- Inform the community of the planned night construction at least 2 days in advance.</li> <li>- The construction activities are only conducted in the designated boundary</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading.</li> </ul>			
<p><i>Impacts on surface water quality of irrigation canals across (Diem Tua Canal, Tac Huyen Phuong Canal, Ba Huyen Canal) across Nguyen Hue road</i></p>	<ul style="list-style-type: none"> <li>- Strictly prohibit contractors to discharge waste into canals</li> <li>- No material gathered on the sidewalk, this can damage sidewalks and Xang Xa No canal can be polluted.</li> <li>- Upon forecasted stormy weather, suspend all the construction activities, tidy up the sites, brace and protect the materials and construction machines.</li> <li>- Do not gather construction materials as well as machinery and equipment near the stream (at least 50m away). Gathering small quantities of materials, fit with the schedule. Materials must be covered with tarpaulin, avoiding the upwind location, near the canal.</li> <li>- Strictly prevent hazardous waste, waste oils or particularly greasy rags from entering the flow.</li> <li>- Create sedimentation traps and maintain them periodically to ensure that most solids in surface runoff are retained in the traps before entering the existing drains or water sources surrounding the sites;</li> </ul>	Contractor	PMU, CSC IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA Suf</li> <li>- IM: Construction contract conditions</li> </ul>
<p><i>Increased dust, noise, traffic, waste, vibration, and social disturbance to daily activities of PCRs and sentivities points including</i> - Vi Hung Church</p>	<ul style="list-style-type: none"> <li>- Apply similar mitigation measures as for component 1, and supplementing those below:</li> </ul> <p><i>For Vi Hung Church:</i></p> <ul style="list-style-type: none"> <li>- The construction method shall include the measures to protect the foundation of the Vi Hung Church - The construction method shall include the measures to protect the foundation of the church such as using supporting pillars or steel frame.</li> <li>- In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the church.</li> </ul>	Contractor	PMU, CSC IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA</li> <li>- IM: Construction contract conditions</li> </ul>

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
<p>- Tran Quang Dieu Primary School (On the side of Nguyen Hue Road – Section 3)</p>	<p><i>For Tran Quang Dieu Primary School</i></p> <ul style="list-style-type: none"> <li>- The construction method shall include the measures to protect the foundation of the fence/gate of the school such as using supporting pillars or steel frame.</li> <li>- In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the church.</li> </ul>			
<p><i>Impacts to small bridges across the Muong Lo canal</i></p>	<ul style="list-style-type: none"> <li>- Inform the local people of the construction activities and their potential impacts such as waste, dust, and noise, traffic, especially vibration, risk of cracking on overpass and construction schedule at least 02 weeks before start of the construction.</li> <li>- To use high-tech equipment to reduce vibration for construction activities of embankment;</li> <li>- Provide safety signal boards and instruction for traffic direction at each small bridge across Muong Lo canal in construction phase</li> <li>- Do not gather materials and heavy load machines near the bridges areas.</li> <li>- Stabilize the canal bank surrounding bridges area prior to commencing the dredging and embankment activities</li> <li>- If damage to the bridges are happen, temporary access shall be provided for the local residents. The damaged bridges shall be repaired or adequate compensations shall be made upon agreement with affected households.</li> </ul>	Contractor	PMU, CSC IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA Suf</li> <li>- IM: Construction contract conditions</li> </ul>
<p><i>Impacts on traffic and traffic safety due to transportation of construction materials and wastes</i></p>	<ul style="list-style-type: none"> <li>- Clean up the transport vehicles before leaving construction site. Do not load to a height of 10cm higher than the truck body so as not to spill out and scatter materials onto roads, giving rise to dust and endangering road users.</li> <li>- Do not park vehicles in the roads longer than necessary. Do not allow construction vehicles and materials to encroach upon the pavements.</li> <li>- Maintain the required speed limit and do not overuse horn.</li> <li>- Periodically register and supervise the quality of transport vehicles as required by the government regulations.</li> <li>- Comply with the traffic safety regulations while participating traffic</li> <li>- Clean up wastes dropped off on road.</li> </ul>	Contractor	PMU	<ul style="list-style-type: none"> <li>- Fund: IDA and IDA Suf</li> <li>- IM: Construction contract conditions</li> </ul>

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	<ul style="list-style-type: none"> <li>- Assign staff to guide the traffic during transportation, unloading, and loading of construction materials, equipment, and wastes.</li> <li>- Place stockpile materials at a designated place tidily and successively according to construction schedule.</li> <li>- Spray water three times per day to reduce dust during dry days if required.</li> <li>- Reinstall the road surface if occurring the damages during construction.</li> </ul>			
<b>Upgrading of Cai Nhuc and No 62 Canals (subcomponents 2.3 and 2.4)</b>				
<i>Impacts on PCRs and sensitive locations</i>	- The same component 1	Contractor	PMU, CSC IEMC	- Fund: IDA - IM: Construction contract conditions
<i>Traffic safety and social disturbance to the residents living along the canals</i>	- The same (subcomponent 2.1 and 2.2)	Contractor	PMU	- Fund: IDA and IDA SUF - IM: Construction contract conditions
<i>Impact on water quality of No 62 canal and Cai Nhuc Canals</i>	- The same (subcomponent 2.2)	Contractor	PMU, CSC IEMC	- Fund: IDA Suf - IM: Construction contract conditions
<i>Risk on shore erosion and embankment subsidence during</i>	<ul style="list-style-type: none"> <li>- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure a sustainable, stable embankment;</li> <li>- Ensure that the detailed design and contractor’s construction method take into account the risk to local house cracking</li> </ul>	Detailed design consultant	PMU	- Fund: City/ or IDA - IM: detailed design contract

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
<i>the construction process</i>	<ul style="list-style-type: none"> <li>- Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to the authorities of concerned for approval by the construction contractors.</li> <li>- To use high-tech equipments to reduce vibration for construction activities of embankment; closely monitoring the vibration level;</li> <li>- Construction of side slope is made in accordance with the design</li> <li>- Limiting to carry out dredging works in rainy season.</li> <li>- Do not place heavy loaded machines and transporation vehicles near the canals banks.</li> <li>- Inspection and supervision on landslide risks must be taken regularly in order to prepare the appropriate reinforcement plans.</li> <li>- Inform the potential affected people on the nature of work and get their agreement on the works;</li> <li>- In any case that the house cracking risk cannot be avoided by technical measures, the affected households shall be temporarily relocated prior to construction. The temporary relocation of the people shall be carried out with appropriate consultation and and adequate compensation.</li> </ul>	Contractor	PMU, CSC IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA</li> <li>- IM: Construction contract conditions</li> </ul>
<i>Impact on waterway traffic activities on the Cai Nhuc canal (at the 400 m starting section) and on No 62 Canal (section 250 m from the intersection with Xang Xa No canal)</i>	<ul style="list-style-type: none"> <li>- Coordinate with the Department of Inland Waterway to flag the signal system on the inland waterway the transport travel through;</li> <li>- Provide the workers with and request them to use life jackets in construction operations on the water surface. Safety staff must be present during entire shifts for timely rescue in case of incidents.</li> <li>- Place warning boards along the construction route, both on land and water surface (arrange the road and waterway traffic guide).</li> <li>- Creating some temporary stations on Xang Xa No Canal to serve anchoring demand of the people residing on two sides of the first section of Canal Cai Nhuc and Canal 62.</li> <li>- Clearly informing people of canal dredging time, encouraging people to anchor</li> </ul>	Detailed design consultant	PMU	<ul style="list-style-type: none"> <li>- Fund: City/ or IDASuf</li> <li>- IM: detailed design contract</li> </ul>

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	<ul style="list-style-type: none"> <li>boats, ships at the temporary stations to avoid waterway traffic accidents;</li> <li>- For Cai Nhuc canal upgrading: no dredging, canal surface encroachment during rush hours to prevent obstruction to goods transportation via waterway to Vi Thanh Market;</li> <li>- Co-operating with local government to allow transportation of goods by road from temporary stations to Vi Thanh Market.</li> </ul>			
<p><i>Impact on structures i.e. bridges on Cai Nhuc canal; bridges and tidal gate of No 62 canal</i></p>	<ul style="list-style-type: none"> <li>- To minimize collapse risks of these bridges during pile driving process,</li> <li>- DD must sufficiently include geological and hydrological surveying work.</li> <li>- Construction contractor's construction method must be with account of vibration generation factors. The contractor can drive sheet piles to reinforce canal banks before pile driving or use modern pile driving methods to mitigate vibration. This should be a condition in the contract between the contractor and the project owner to raise responsibility to mitigate this impact.</li> <li>- Using sheet piles to mark dredging elevation as well as safe dredging location around bridge foundation;</li> <li>- Co-operating with local government to notify people about pile driving time, possible risks and to implement community consultation; Closely monitoring vibration and keeping daily diary on this;</li> <li>- In case of subsidence or bridge collapse due to pile driving, the contractor must compensate for this.</li> <li>- Inform the local people of the construction activities and their potential impacts such as waste, dust, and noise, traffic, especially vibration, risk of cracking on overpass and construction schedule at least 02 weeks before start of the construction.</li> <li>- To use high-tech equipment to reduce vibration for construction activities of embankment;</li> <li>- Provide safety signal boards and instruction for traffic direction at each small bridge across Muong Lo canal in construction phase</li> <li>- Do not store materials and heavy load machines near the area of the bridge</li> </ul>	Contractor	PMU, CSC IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA</li> <li>- IM: Construction contract conditions</li> </ul>

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	<ul style="list-style-type: none"> <li>- Stabilise the canal bank surrounding bridges area prior to commencing the dredging and embankment activities</li> <li>- If damage to the bridges occurs, temporary access shall be provided for the local residents. The damage bridges shall be repaired or adequate compensations shall be made upon agreement with affected households.</li> </ul>			
<p><i>Odor and management of sediments from dredging of Canal Cai Nhuc and No 62 Canal dredging</i></p>	<p><i>To control impacts by dredged sludge: (135,000 m<sup>3</sup> from 62 Canal; 60.000 m<sup>3</sup> from Cai Nhuc Canal)</i></p> <ul style="list-style-type: none"> <li>- The Dredged Materials Management Plan (DMMPs) for the dredging works during Cai Nhuc and 62 canals have been prepared. Overall, sludge will be disposed at Tan Tien commune land fill or being used for agricultural or tree planting purpose based on actual need of the local people. Transportation of sediments must meet the environmental protection requirements and avoid sludge leakage; the sediment carrying trucks must be covered closely and not overloaded as permitted. The DMMP is described in detail in chapter 6 – Environmental and Social Management Plan and Annex 1.</li> <li>- Ensure that detailed design scope for the lake dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor’s dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts</li> <li>- Prior to construction, the contractors shall develop a specific DMMP based on the updated DMMP. The contractor’s DMMPs shall be submit by Construction Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary gathering of dredged materials, and control of polluting material during temporary gathering and transportation, pollution control, and risks at disposal sites.</li> <li>- Manage to ensure sediment will be disposed appropriately according to the approved DMMP.</li> </ul> <p><i>To control impacts by odors from dredging process:</i></p>	<p>Detailed design consultant Contractor</p>	<p>PMU, CSC IEMC</p>	<ul style="list-style-type: none"> <li>- Fund: IDA</li> <li>- IM: Construction contract conditions</li> </ul>

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	<ul style="list-style-type: none"> <li>- Sludge is collected along the work sites and covered by sheeting to limit sludge water leaking into the soil, and transported for disposal within the day. The management plan on dredged materials will be prepared to instruct the contractors to manage the waste source.</li> <li>- Uncontrolled disposal of the dredged sludge is prohibited. The waste source must be managed properly under the supervision of PMU.</li> <li>- In order to limit the impacts of odor of the dredged sludges, the workers shall be equipped with the masks, boots and gloves when working in/exposing to these waste sources.</li> <li>- Spraying EM (Effective Microorganisms) every day. The deodorants can eliminate malodors from H<sub>2</sub>S, CH<sub>4</sub>, etc</li> </ul>			
<i>Impacts on traffic and traffic safety due to transportation of construction materials and wastes</i>	<ul style="list-style-type: none"> <li>- The same (subcomponent 2.1 and 2.2)</li> </ul>	Contractor	PMU, CSC IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA</li> <li>- IM: Construction contract conditions</li> </ul>
<b>Rehabilitating Tam Giac Lake (subcomponents 2.5)</b>				
<i>Odor treatment and management of 20,000 m<sup>3</sup> of arising dredged sludge.</i>	<ul style="list-style-type: none"> <li>- The same Cai Nhuc and 62 canals</li> </ul>	Detailed design consultant Contractor	PMU, CSC IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA</li> <li>- IM: Construction contract conditions</li> </ul>
<i>Impact to water environment of Tam Giac lake during dredging process</i>	<ul style="list-style-type: none"> <li>- The dredging is conducted only during the dry season;</li> <li>- Strict implement construction measures for dredging as designed. In particular the area of 3.0 ha, the dredging will be carried out on a successive basis by dividing the area of the lake to be dredged into 02 cells which are dredged one after one. Before dredging timber piles for embankment of the cell are installed and water is pumped</li> </ul>	Contractor	PMU, CSC IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA Suf</li> <li>- IM: Construction contract conditions</li> </ul>



Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	<p>out, then proceed to dredge to the design depth (- 2.5 m). After complete dredging for the first cell, continue to conduct dredging next cell. With this approach, the ecosystem of the lake will be maintained and not altered dramatically ; and the impact on the landscape and environment around will be mitigated</p> <ul style="list-style-type: none"> <li>- It is strictly forbidden for contractors to gather equipment around the lake</li> <li>- Strict management of generated waste, especially grease and greasy rag that must be collected immediately to prevent leakage into the surrounding environment;</li> <li>- Workers are strictly prohibited to discharge wastes into the environment, particularly into the lake</li> <li>- Limiting the concentration of multiple devices at the same time in the lake to minimize the impact of noise, vibration, dust and emissions to species at site.</li> </ul>			
<b>Operation</b>				
<b><i>For Upgrading Nguyen Hue road (subcomponent 2.1) and Upgrading 1/5 road (subcomponent 2.2)</i></b>				
<i>Traffic safety issues</i>	<ul style="list-style-type: none"> <li>- Ensure that traffic safety provisions, including signs, lights, and pavement markings that were installed during construction are permanently and effectively maintained, and renewed as necessary.</li> <li>- Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the road in its as-completed condition.</li> <li>- Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road.</li> <li>- Ensure effective road inspection for any signs of damages, soil erosion and landslide for immediate repairing actions.</li> <li>- Cooperating with the local government to appoint the staff for traffic regulation at peak hours;</li> </ul>	Vi Thanh DOT	Vi Thanh'PC	City operations and maintenance plan, City Fund
<i>Local flooding on the roads due to inadequate maintenance</i>	<ul style="list-style-type: none"> <li>- The management of stormwater drainage along the roads should be focused and examined regularly to detect the congested drainage sewer sections and carry out dredging.</li> <li>- Conduct periodic planning decentralization and dredging sewer sections and</li> </ul>	Vi Thanh DOT	Vi Thanh'PC	City Budget IM: City Operation and Maintenance

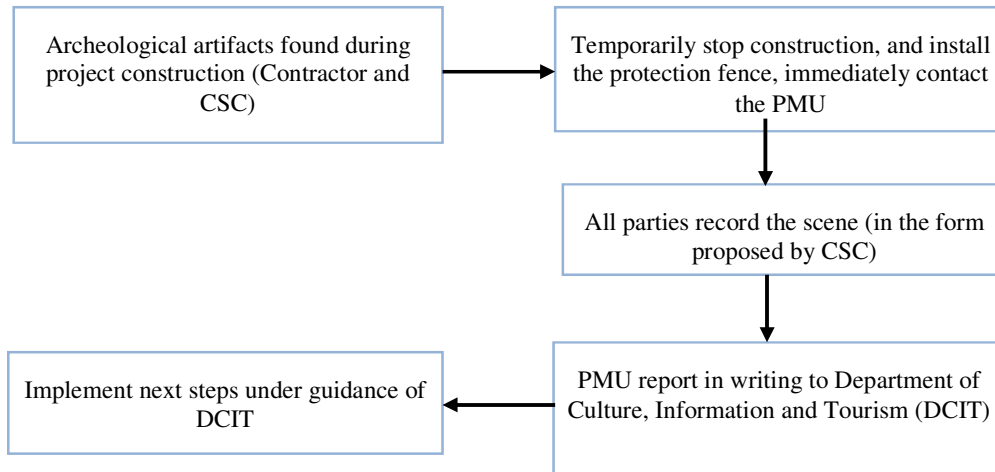
Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	manholes in order to minimize the flow congestion (every 6 months). - Control disposal of sludge: Similar to the construction phase, those who manage the water drainage systems would have contracts with relevant authorities of sludge dredging from the sewer sections and manholes and then transport to the landfill by specialized tank trucks to avoid odor emission and spillage during transportation.			Plan
<i>Embankment subsidence risk during operation of Muong Lo canal</i>	- To avoid risk on embankment cracking and subsidence, in detailed design should be implemented hydrology and geological surveys to ensure sustainable and stable designs and - City shall provide O &M Plan as well as budget source should be approved and arranged by Vi Thanh City. - Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the embankment periodically - Closely monitor the construction of other infrastructures within the area that potentially affect the embankment structures	Vi Thanh DOT	Vi Thanh'PC	City Budget IM: City Operation and Maintenance Plan
<i>Garbage throwing causing pollution and decreased aesthetic value of the canals</i>	- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the canals; PMU and DONRE should be in collaboration to impose much more serious penalty to polluter - Properly arranging the waste baskets along the canal and launching programs of increasing awareness of the community toward environmental protection;	Vi Thanh DOT	Vi Thanh'PC	City Budget IM: City Operation and Maintenance Plan
<b><i>For the status of direct waste disposal into the Cai Nhuc and 62 canals and Tam Giac Lake (subcomponent 2.3, 2.4 and 2.5)</i></b>				
<i>Control risks of pollution and flow stagnation due to disposal of waste from households living along the canals</i>	- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the canals; PMU and DONRE should be in collaboration to impose much more serious penalty to polluter - Properly arranging the waste baskets along the canal and launching programs of increasing awareness of the community toward environmental protection; - Carrying out periodical dredging and clearing works of the canals at least 6 months/time especially before the wet season; - Signing contracts with the responsible agencies on collecting, transporting and	Vi Thanh DOT	Vi Thanh'PC	City Budget IM: City Operation and Maintenance Plan

Site-specific impacts and Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	treating dredged sludge.			
<b>COMPONENT 3:</b>				
<b>Operation</b>				
The impacts from domestic wastewater and solid waste generated from the resettlement sites	<ul style="list-style-type: none"> <li>- The generated wastewater from resettlement site is about 46.62 m<sup>3</sup>/d.</li> <li>- Households in the resettlement sites have to build the toilets with septic tank in accordance with regulations of the Government, the wastes from the toilets must be primarily treated in the septic tanks of each household before discharging into the public drainage system. The wastewater will be then connected to the Drainage and wastewater treatment system of Vi Thanh city (funded by Denmark government).</li> <li>- The volume of the solid waste is (about...) very few and will be collected and managed by Vi Thanh URENCO.</li> <li>- In general, the resettlement areas where there are current drainage system and waste collection areas, these impacts are very minor and under control.</li> </ul>	Vi thanh URENCO	Vi Thanh DONRE Vi Thanh'PC	City Budget IM: City Operation and Maintenance Plan

### 6.2.3. Management of Impacts on Physical Cultural Resources

Based on the ESIA study and the preparation of the RAP, non sensitive works, temples, historical sites, and natural conservation areas are affected by land acquisition.

If in the construction phase, specific procedures are to be applied in case of archeological artifact finds. The Chart 6.1 below identifies steps to be taken. The PMU will be responsible for the overall coordination and reporting. The chance find procedures will be included in all construction contracts and key staff and contractors will be trained on how to implement them.



**Chart 6.1: Chance-finding procedure in case of archeological artifacts found during the project construction.**

### 6.2.4. Emergency Procedures

During construction period, if there are environmental emergency or labor accidents, the Contractors must make a report to describe in details the incidents and taken actions. The reports on the incidents must be submitted to the Construction Supervision Consultants (CSC) and PMU for review and archive. The reports also must be submitted to the concerned agencies if required. Please find below some risk response action plans:

#### 6.2.4.1. Vehicle Accidents

Vehicle accidents may include, but are not limited to:

- Vehicle roll-over; and
- Vehicle crash with another vehicle, structure or with a person (worker or person from the local community).

#### **Procedure:**

- Stop work immediately;
- Turn off the vehicle, if possible;
- Help passengers of the vehicle(s) exit the vehicle and move to a safe place, if possible;
- If there is an injury, follow the procedure for medical emergencies (see below); and
- If there is a fuel/chemical spill, follow the procedure for spill emergency (see below).

#### 6.2.4.2. Electrical faults/accidents

It is not safe to carry out the works within a 10m radius area of electrical cables, electrical

accidents may happen as the result of:

- Collision with power cables and poles;
- Collapse of cable poles; and
- Hitting underground cables.

***Procedure:***

When an electrical accident occurs:

- Stop work immediately;
- Isolate the power source, if possible and safe to do so (e.g. using a non-conductive rod to detach cables);
- If there is an injury/medical need, follow the procedure for medical emergencies (see below); and
- HSE Manager of the Contractor will inform EVN for further action (e.g. stopping power and conduct repairs), coordinate the authority inspection and facilitate the communication with authorities/media, if required.

**Fire**

Flammable hazardous materials and wastes will be present on site (including fuels, oils, etc.). A fire can also be caused by using ignition sources nearby (e.g. smoking or cooking by workers and residents) or engine incidents.

All the bulldozers, excavators, HW and hazardous materials storage areas, and the site office must be equipped with portable (?) 2 kg fire extinguisher in each location (the type depends on the immediate fire risk). The fire extinguishers must be in good working condition. The Contractors' Supervisor – Vehicles and Devices shall perform monthly checks and replace as needed – tags shall be kept on the extinguishers which indicate their validity.

***Procedure:***

- Upon identification of a fire incident, try to suppress the fire if it is deemed possible and safe to do so using the available suppression equipment);
- If it is not possible to do so, move to a safe location (up wind and sufficient distance) and report the fire to the fire brigade stating your name, location, the status of the fire;
- Report the fire to the Contractors' General Manager; and
- The Contractors' General Manager will inform all workers and on-site visitors and ensure that they are all accounted for and in safe locations. They shall also inform the PMU HSE Manager, who shall inform the applicable government department and any households on or off site who may be in danger and advise them to evacuate.

***Chemical/Fuel Spill***

A spill of chemical/fuel has the potential to cause soil and underground water contamination, if not controlled and cleaned up timely and properly. Chemical/fuel spills include, but are not limited to, the following:

- Fuel spill during refueling;
- Fuel/oil/grease leaks during vehicle parking or operating; and
- Breaking of fuel tanks on vehicles.

Spill response facilities: A spill kit shall be provided on each heavy equipment (bulldozers and excavators), in the HW and hazardous materials storage areas, and in any designated fueling locations. A spill kit includes a drip tray, absorbent materials, and impermeable bags to collect contaminated soil and used absorbent materials, and a small spade used for collecting contaminated soil.

***Procedure:***

- When there is a spill, immediately use the absorbent materials to absorb the spilled materials and locate the drip tray to collect the spilled flow (if the spill continues);
- Collect used absorbent materials into an impermeable bag;
- Use the spade to collect the contaminated soil into the impermeable bag; note that there should be no contaminated soil left (stained soil must be collected to the full horizontal and vertical depth of the impact);
- Transfer the filled impermeable bag to the HW Storage Area for storage;
- If the spill is larger than one spill kit or person can handle, request another worker to support (e.g. to bring more spill kits);
- Use work gloves, safety glasses, long sleeved tops and trousers during the above response process and minimize direct contact with the spilled fuel/oil; and
- At and around the location of release, samples shall be taken to confirm whether any contaminated soil/underground water remains. The number of samples will depend on the scale of the release and the estimated impacted area. The parameters to be analyzed will depend on the substance released. Depths where samples are taken should be at the ground surface and immediately above the underground water table. These should be identified in a sampling plan prepared by the HSE Management and Monitoring Office in consultation with appropriately qualified technical staff. Response to any remaining contamination should be defined accordingly.

***Medical Emergency***

A medical emergency is a situation in which, due to an acute illness or injury, there is an immediate risk to a person’s life or long-term health. Medical emergencies include, but are not limited to, the following:

- Injuries from vehicle accidents;
- Wildlife attacks, e.g. snake bites or bees attack;
- Heat stress;
- Electrocutation; and
- Unexploded-ordnance incidents.

***Procedure:***

- Report the injury to the First Aider, stating your name, location, nature of emergency and assistance required;
- Where safe to do so, stay in the location until assistance arrives;

The First Aider will co-ordinate first aid response; the First Aider can give first aid as far as they are capable. If further medical attention is required, then the injured shall be transferred to the nearest medical clinic for further treatment.

Within two working days of receiving an occupational accident investigation record and the minutes of the meeting about disclosure of the occupational accident investigation record, the First Aider must prepare statistics of the occurred occupational accidents and records in a Statistic Book with following principles:

- Every occupational accident that has happened to workers must be recorded;
- When a worker suffers from multiple occupational accidents, each accident must be separately recorded;
- Every occupational accident that has happened to workers that cause them to take one day off or more must be recorded.

### ***Adverse Weather***

Potential adverse weather events include, but are not limited to: Heavy rain; Strong wind; or Typhoon. The potential for an earthquake, tsunami and heavy flood happening at the site is considered unlikely.

### ***Procedure:***

The Contractor General Manager will check the national and local weather forecast each morning prior to work commencing. Should adverse weather be predicted, depending on the severity and timing of the weather expected. If adverse weather is expected to be serious, lengthy and soon (e.g. in the case of a typhoon), the Contractor General Manager shall contact all workers not to come to work. If the weather is less serious and is not expected to last long, the Contractor Supervisor - Workers will cover this situation during the daily toolbox talk, continue to monitor the weather situation throughout the day and issue instructions as necessary to stop work, do their work sites safe, and find a safe sheltering location (either back at the site office, if sufficient time to return, or locally to the active works (in the case of the latter, the worker shall call the Contractor Supervisor – Workers to inform them where and when they are in the sheltering location). If the Contractor Supervisor – Workers do not hear from a worker(s) within 15 minutes of instruction to shelter, the Contractor Supervisor – Workers shall mobilize to the location by car to ensure the safety of the worker(s).

### ***Broken water pipes***

The existing water supply pipes on the routes may be broken due to the following reasons:

- During earthwork process for constructing foundation holes, inappropriate identification of the location or the wrong operating actions by the workers, non-compliance with the technical design drawings may cause the collision between the construction equipment and the water supply pipes;
- The affecting force of the construction equipment focuses on one place, while the foundation of the construction area is weak, which creates the break of the water supply pipes;
- Such incidents if occur will create a loss of the huge water volume and an impact on the domestic water demand of the residents who access to this water supply source.

### ***Procedure:***

- Immediately turn off the valve/use the available facilities, materials in the site to seal the cracks, breaks temporarily;
- Inform immediately the functional agency in charge of the particular water supply pipes for timely repair; Excavate a ditch to lead the water flow to the drainage sewer/canals to limit the water spill out on the surface;

- Advise the residents in vicinity the water reserve alternative during repair, incident recovery time.

### ***Sanitary Effluent Spill***

- A spill of sanitary effluent has the potential to cause surface water, soil and underground water contamination and nuisance/health hazard to nearby households, if not controlled and cleaned up timely and properly. Sanitary effluent spills can occur during emptying and transportation of effluent from septic tanks being demolished on site.
- Spill response facilities: A spill kit shall be provided on each septic tank collection truck. A spill kit includes impermeable bags to collect contaminated soil and a small spade used for collecting contaminated soil.

### ***Procedure:***

- When there is a spill, immediately stop the flow;
- Use the spade to collect the contaminated soil into the impermeable bag; note that there should be no contaminated soil left (contaminated soil must be collected to the full horizontal and vertical depth of the impact);
- Transfer the filled impermeable bag to the Waste Storage Area for storage;
- If the spill is larger than one spill kit or person can handle, request another worker to support (e.g. to bring more spill kits);
- Use work gloves, safety glasses, long sleeved tops and trousers during the above response process and minimize direct contact with the spilled effluent.

## **6.3. SOCIAL ACTION PLAN**

### ***6.3.1. Occupational training foundation***

Establishment of the occupational training foundations for the households, the members of which are unemployed is the critical demand in order to ensure that the people stay in the project areas and able to find out the appropriate job. Curricula on skills need to be designed relevant to the household's consultation on the priorities, demand and educational background. The curricula need to be focused to ensure to find out the jobs. It is necessary to coordinate with the potential employers in this matter.

The occupational training schools under MOET management in the project areas, the occupational training centers may organize the training courses on IT, textile and sewing skills, mechanics, electrical techniques, mushroom planting, animal husbandry, other agricultural technical supporting services...; organize training courses, expanding programs for the high school's pupils and even for the members of the rural households. It is necessary to train both men and women in the project areas. Moreover, it requires setting up the training courses on occupational re-training for men and women just in case they lose the jobs after completing the project. It also includes the training for the households having people with disability.

### ***6.3.2. Supporting internal and external forces for the people***

Around 1/3 of the interviewed people advised that they have received the supports. However, many people told that many supporting programs have taken place in the past, now only a few programs are ongoing. The main supporting sources are from the government agencies and locality, mainly from the communes' People's Committees and villages, Women's Union, Farmers Union of the communes, villages, and hamlets. Some people said that the supporting sources are from NGO, Red Cross and Vietnamese overseas.

During project implementation, it is necessary to conduct the consultation with the affected households on the programs of the government, the local unions such as Women's Union,



Farmers’ Union, and Youth Union. The seriously affected households should be able to access to the ongoing national programs such as National Target Program on Water Supply and Sanitation, especially for the poor.

**6.3.3. HIV/AIDS and other sexually transmitted diseases, human trafficking**

During project implementation, there will be a large amount of the labor force focusing in the construction sites. According to the experience from the previous similar construction projects, the STI rate in the labor groups will increase if there are no applied prevention measures in order to ensure that the workers are protected against the STD, which include HIV/AIDS. The public health action plan will be set up based on the previous experience of the earlier projects and the public consultation in order to ensure that the works are protected against STI.

In order to mitigate and address the HIV/AIDS related risks and human trafficking, it requires paying a special attention to women. The Project needs to conduct a good communication and dissemination on HIV/AIDS and other risks such as drug abuse and human trafficking. HIV/AIDS programs should include the awareness enhancement campaigns in the construction sites and in the community, peer education development and public monitoring in combination with understanding about safe migration which are implemented and monitored by the communities, PMU and Women’s Unions of the project’s communes.

**6.3.4. Temporary impact mitigation measures**

The implemented activities include:

- Increase the community awareness on safe transport and prevention of social evils during construction period;
- Incorporate in the Contracts with the Contractors the measures for transporting the materials and sludge wastes in conformity with the regulations on the loads of the vehicles taking the materials and wastes. When there are damages in the local infrastructures due to the transportation, the contractors must recover the affected infrastructures, reinstate the original site as before carrying out the project.

**Table 6.4: Social impact mitigation measures**

Negative impacts	Mitigation measures	Implementing agencies
Impacts on transport and incremental social evils	Public awareness improvement on safe transport and prevention of social evils for the local citizens	PMU should coordinate closely with the various level authorities in carry out the communication strategy. Based on the available communication system in the communes, to take necessary action on dissemination of information on Project’s activities to the households.
Effects to the infrastructures	Contractors’ compliance with the rules on infrastructure recovery	PMU should request the contractors to follow the regulations on loads and environment and sanitation measures in transporting materials as well as regulations stipulated for cases of creating effects on roads.

**6.3.5. Gender action plan**

A gender action plan is needed to facilitate the maximum participation of women in the construction phase of the project, providing new opportunities for women to increase their income, but not increasing the burden for their life, to enhance benefits for women and contributing to increase the role and position of women in the family in the project area.

This Gender action plan needs to achieve following objectives:

- Raising awareness of the local leaders and local people on gender;

- Raising awareness of local people including men and women about the positive and negative effects of the project;
- Ensuring the involvement of women (at least 30%) in the community monitoring committee;
- Ensuring the involvement of women (at least 30%) in the consultation activities of the project;
- Ensuring the involvement of both women and men in the area in communication activities to mitigate negative impacts of the project;
- Ensuring equal opportunity for both women and men in accessing to and getting benefits from livelihood supporting programs, especially single women, poor women, women from ethnic minorities .

### **Communication and community consultation**

Community consultation meetings need to be organized through the implementation of the project, from preparation to construction and after handing over and operation of the project, ensuring (i) to provide people with full information on the project; (ii) community consultation on technical solutions in LIAs; (iii) active participation of community in activities of the project; (iv) participatory monitoring and evaluation of the community.

Information in the public consultation will be provided free of charge, publicly and in advance; people's demands, wishes and contribution ideas will also be recorded in these consultation meetings.

## **6.4. ENVIRONMENT MONITORING PROGRAM**

### **6.4.1. Objective and Approach**

Main objective of the Environment Monitoring program is to ensure that (a) the potential negative impacts of the project are minimized; (b) the ESMP is effectively implemented; and (c) the ESMP is adequate to mitigate the potential negative impacts. Given that monitoring the implementation of the RP will be conducted separately, the environmental monitoring program will comprise (a) monitoring the safeguard performance of the contractor during site clearance and construction, (b) environmental quality monitoring, (c) monitoring effectiveness of the ESMP.

### **6.4.2. Monitoring of Contractor's Safeguard Performance**

Three levels of safeguard monitoring will be implemented: routine monitoring, periodic monitoring, and community monitoring as follows:

**Routine monitoring:** The routine monitoring will be made by the Construction Supervision Consultant (CSC) as assigned by PMU. The CSC will include the monitoring results in the project progress reports.

**Periodical monitoring (every six months):** As part of the overall monitoring of the ESMP, the ESU assisted by the Independent Environmental Monitoring Consultant (IEMC) will also monitor the contractors' performance every 6 months and the results will be reported to the PMU and the WB.

**Community monitoring:** Monitoring by local communities will be conducted following the Government practices with the technical and management support from the PMU.

### 6.4.3. Environmental Quality Monitoring

To ensure an acceptable level of environmental quality, monitoring of dust, noise, vibration, air quality, and water quality will be made at project specific locations that are likely to be significantly affected by the construction activities, or requested by local authorities and communities for specific purposes. ESU/IEMC will be responsible for the monitoring of the program.

Below is a list of the key issues and scope of monitoring that will be considered in the implementation of the monitoring program:

Implementation of the Dredge Material Management Plan (DMMP) for all sludge and similar material excavated from the project work sites: Amount, level of heavy metals, locations and performance at disposal sites, and impacts on residents will be monitored. Outline DMMPs will be prepared during detailed design, and will be used as the basis for contractors’ dredged materials management plans.

General Construction Impacts: To include local flooding; traffic management especially in residential areas; air, noise, and dust levels in residential areas; and water quality upstream and downstream of construction sites, with specific attention paid and impact on local residents;

Others: As agreed with local agencies and communities during the preparation of the monitoring program.

**Table 6.4** provide general guidance on the monitoring program considering that the activities will be carried out before construction (project baseline environment), during construction (assumed 4 years), and during the first year of operation. Detailed monitoring programs will be prepared during the detailed design stage. An estimated cost for monitoring is incorporated into the ESMP cost (**Section 6.4.5**). Many of these measurements are required by Vietnamese regulations and would need to be done even if not directly related to expected project impacts.

**Table 6.5: Location, parameters and frequency of monitoring**

No	Monitored items	Preparation and construction phase
<b>I</b>	<b>Monitoring of air quality</b>	
	1. Monitoring parameters	noise, TSP, CO, NO <sub>2</sub> , SO <sub>2</sub> , HC, H <sub>2</sub> S, microclimate
	2. Monitoring frequency	<u>Preparation phase</u> : one obtained for determining base conditions <u>Construction phase</u> : measurements taken every three-months
	3. Applied Regulation	QCVN 05 :2013/BTNMT, QCVN 06:2009/BTNMT

No	Monitored items	Preparation and construction phase
	4. Monitoring positions	KK1 - At Trung Nhi- Nguyen Thai Hoc intersection KK2 - At LIA 1 residential area KK3 - At LIA2, near Vi Thanh church KK4 - At LIA2, near Tam Giac lake (intersecting Quan De temple) KK5 - Between LIA3, Nguyen Thi Minh Khai street. KK6 - The east of LIA7 (bordering Quan De temple cannal); KK7 - The west of LIA7 (bordering Quan De temple cannal) KK8 - Area of Tam Quan lake, bordering LIA 2 residential area KK9 - At 1/5- Hai Thuong Lan Ong intersection KK10 - At 1/5 street, before security gate of ward 5. KK11 - At 1/5 – cannal intersection KK12 - At the top of Nguyen Hue, bordering Vi Dong commune (section 1) KK13 - Area of Nguyen Hue street, section between Vi Hung church and cemetery (section 1) KK14 - At the end of Nguyen Hue street (section 1); KK15 - At the top of Nguyen Hue street (section 3). KK16 - At the end of Nguyen Hue street (section 3); KK17 - At Nguyen Cong Tru bridge; KK18 - At the end of Cai Nhuc cannal (intersecting with Than Hoang temple cannal); KK19 - At area access to Tam Giac lake intersecting Cai Nhuc cannal KK20 - At 62 – Xa No cannal intersection KK21 - At 62 – Le Thi Hong Gam cannal (LIA3).
<b>II</b>	<b>Surface Water Quality Monitoring</b>	
1. Monitoring parameters	pH, temperatures, salinity, TSS, BOD5, NH4+, Cl-, T-N, T-P, Fe, As, Mn, total oil, coliform	
2. Monitoring frequency	<u>Preparation phase</u> : one obtained for determining base conditions <u>Construction phase</u> : measurements taken every three - months	
3. Applied Regulation	QCVN 08-MT:2015/BTNMT	

No	Monitored items	Preparation and construction phase
	4. Monitoring positions	NM1 - At LIA2, near Tam Giac lake (intersecting Quan De temple); NM2 - The east of LIA7 (bordering Than Hoang temple cannal); NM3 - The south of LIA7 (bordering Phan Lo cannal) NM4 - The west of LIA7 (bordering Quan De temple cannal). NM5 - Among LIA7 (bordering Cai Nhuc cannal); NM6 - Area of Tam Quan lake, bordering LIA 2 residentail area NM7 - The north of LIA7 bordering 3/2 cannal NM8 - At the end of 1/5-Hai Thuong Lan Ong street. NM9 - At 1/5 street, before security gate of ward 5; NM10 - At 1/5 street interecting cannal NM11 - At 1/5 street interecting HW61 NM12 - At Cai Nhuc cannal under Nguyen Cong Tru bridge. NM13 - At Cai Nhuc cannal – Xa No cannal intersection NM14 - At the end of Cai Nhuc cannal (intersecting with Than Hoang temple cannal); NM15 - At area access to Tam Giac lake intersecting Cai Nhuc cannal NM16 - At 62 – Xa No cannal intersection NM17 - At cannal 62, under Le Thi Hong Gam bridge (LIA3); NM18 - At cannal 62, under Nguyen An Ninh bridge (LIA3) NM19 - At cannal 62, section intersecting livelihood bridge NM20 - At the end of cannal 62, section intersecting Vo Nguyen Giap street.
<b>III</b>	<b>Wastewater quality monitoring</b>	
1.	Monitoring parameters	○ pH, TSS, BOD5, COD, NH4+, T-N, T-P, Fe, As, Cr, Cu, Zn, Pb, total oil and grease, coliform
2.	Monitoring frequency	○ <u>Measurements taken every three - months</u>
3.	Applied Regulation	○ QCVN 14:2008/BTNMT
4.	Position monitoring	NT1 - Wastewater at LIA1 residential area NT2 - Wastewater at LIA2 residential area NT3 - Wastewater at LIA3 residential area (Nguyen Thi Minh Khai street); NT4 - Wastewater at the west of LIA7 (near Quan De temple); NT5 - Wastewater at the north of LIA7 (bordering 3/2 cannal).
<b>IV</b>	<b>Soil</b>	
1.	Monitoring parameters	○ pH, As, Hg,Cd, Cr, Cu, Pb, Zn
2.	Monitoring frequency	<u>Preparation phase</u> : oneobtained for determining base conditions ○ <u>Construction phase</u> : measurements taken every6 months
3.	Applied Regulation	○ QCVN 03-MT :2015/BTNMT

No	Monitored items	Preparation and construction phase
	4. Monitoring positions	Đ1 - at LIA1 area Đ2 - Soil at LIA2 area Đ3 - Soil at LIA3 area, Nguyen Thi Minh Khai street; Đ4 - Soil at the east of LIA7 area (bordering Than Hoang temple canal); Đ5 - Soil at at the south of LIA7 area (Bordering Phan Lo canal). Đ6 - Soil at Tam Giac lake bordering LIA2 area Đ7 - Soil at the north of LIA7 area bordering 3/2 canal Đ8 - Soil at the top of 1/5 street intersecting Hai Thuong Lan Ong street Đ9 - Soil at the top of Nguyen Hue intersecting Vi Dong commune (section 1); Đ10 - Soil at Nguyen Hue (section 2) bordering LIA3 and Xa No canal Đ11 - Soil at Nguyen Hue (section 3)
<b>V</b>	<b>Sediment quality</b>	
1	Monitoring parameters	<ul style="list-style-type: none"> <li>○ (Cu) (Pb) (Zn)(Cd)(As); Total hydrocarbon; Plant protection chemicals (CI); Plant protection chemicals (P)</li> </ul>
2	Monitoring frequency	<u>Preparation phase</u> : oneobtained for determining base conditions <ul style="list-style-type: none"> <li>○ <u>Construction phase</u>: measurements taken every 6 months</li> </ul>
3	Applied Regulation	QCVN 43-MT:2012/BTNMT
4	Monitoring positions	TT1: At LIA2 area near Tam Giac lake (intersecting Quan De temple canal); TT2: At the east of LIA7 area (Bordering Than Hoang temple canal); TT3: At the south of LIA7 area (Bordering Phan Lo canal); TT4: At the west of LIA7 area (Bordering Quan De temple canal). TT5: Among LIA7 area (Bordering Cai Nhuc canal); TT6: At the north of LIA 7 area bordering 3/2 canal TT7: At the top of 1/5 intersecting Hai Thuong Lan Ong street TT8: At 1/5 - HW61 intersection. TT9: At Cai Nhuc – Xa No canal intersection TT10: At area access to Tam Giac lake intersecting Cai Nhuc canal TT11: At canal 62, section intersecting Xa No canal TT12: At canal 62, under Nguyen An Ninh bridge (LIA3).
<b>VI</b>	<b>Monitoring of erosion</b>	<ul style="list-style-type: none"> <li>○ <b>During embankment construction</b></li> </ul>
<b>VII</b>	<b>Monitoring of solid waste</b>	<ul style="list-style-type: none"> <li>○ <b>Monitoring volume of waste generated and sludge dredged</b></li> </ul>
<b>VIII</b>	<b>Monitoring of hazardous waste</b>	<ul style="list-style-type: none"> <li>○ <b>Monitoring volume at storage location</b></li> </ul>

**Table 6.6: Summary of number of monitoring samples**

Total construction time	Monitoring frequency	Total sessions of monitoring	Samples of air, noise	Wastewater samples	Total samples of surface water	Soil samples	Underground water	Sediment	Aquatic
60 months	Every 6 months	10	210	50	200	110	30	120	130

**6.4.4. Estimated Costs for Environmental Monitoring Program**

**Table 6.7: Monitoring costs**

No.	Monitoring	Frequency	The number of samples	Total samples	Unit (VND)	Amount	Amount
						(VND)	(USD)
1	Quality of air, noise and vibration	Every 6 months	21	210	854.000	179.340.000	8.057
2	Soil	Every 6 months	11	110	870.000	95.700.000	4.299
3	Surface water	Every 6 months	20	200	1.962.000	392.400.000	17.628
4	Underground water	Every 6 months	3	30	1.470.000	44.100.000	1.981
5	Waste water	Every 6 months	5	50	1.393.000	69.650.000	3.129
6	Sediment	Every 6 months	12	120	535.000	64.200.000	2.884
7	Aquatic	Every 6 months	13	130	630.000	81.900.000	3.679
<b>Total</b>						<b>927.290.000</b>	<b>41.657</b>

**6.4.5. Monitoring Effectiveness of the ESMP**

The ESU assisted by IEMC will monitor performance of the ESMP implementation during the detailed design/bidding stage as well as during construction and first year operation of the facilities to ensure that (a) appropriate dredging and disposal of drainage sludge is properly carried out, in accordance with the DMMP, 9b) other impacts identified in the ESMP are effectively managed and mitigated; and (c) traffic management is adequate and the level of impacts are acceptable (no complaints or outstanding cases. Results/are to be properly kept in the project file for possible review by PMU and the WB. Cost for the monitoring will be part of the PMU cost.

**6.5. SOCIAL MONITORING PROGRAM**

The objectives of social monitoring program is to ensure the implementation of impact mitigation measures in order to minimize the negative effects on the living condition of the residents, social and cultural life in the project areas and maintain the sustainable community concurrence on the Project. The program contents are stated as below:

- Monitoring land acquisition and resettlement works
- Monitoring livelihood and income recovery: primary financial supports as per policies; expediting Occupational training programs
- Supervising the implementation of impacts mitigation program on community health and safety
- Supervising mitigation of conflicts of benefits and local economic effects
- Supervising mitigation of gender impacts
- Supervising information release and accountability

The detail contents are presented in Table below:

**Table 6.8: Proposed social monitoring program for Soc Trang city subproject**

NO.	Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
	Land acquisition and resettlement works	<ul style="list-style-type: none"> <li>- The affected households are able to receive compensation according to WB policy and their income will be recovered;</li> <li>- HHs which have no land will receive one slot in resettlement area.</li> </ul>	<ul style="list-style-type: none"> <li>- Setting up Resettlement policy framework in accordance with the GoV regulations harmonized with WB’s policy</li> <li>- Establishing Resettlement Action Plan for land acquisition, compensation, support and implementation of resettlement works</li> <li>- Implementing land acquisition and resettlement works</li> </ul>	<ul style="list-style-type: none"> <li>- Resettlement policy frameworks and plans are established.</li> <li>- Number of the affected HHs, quantity/level of grassroots affection</li> <li>- Number of affected HHs on illegal land assets is clearly identified.</li> <li>- Number of HHs participating in livelihood recovery, occupational training, occupational change.</li> </ul>	<ul style="list-style-type: none"> <li>- PMU</li> <li>- Center of Municipal Land Fund Management and Development</li> <li>- Local authorities</li> <li>- Consultants</li> </ul>
	Monitoring livelihood and income recovery: primary financial supports as per policies; expediting Occupational training programs	HHs participating in livelihood/income are well assisted.	<ul style="list-style-type: none"> <li>- Assistanes are made following Resettlement Plan Framework - Loan programs</li> <li>- Occupational training</li> </ul>	<ul style="list-style-type: none"> <li>- Number of HHs are assisted as per Resettlement policy framework</li> <li>- Number of HHs has access to loan programs</li> <li>- Number of people/HHs have the occupational trainings</li> </ul>	
	Supervising the implementation of impacts mitigation program on community health and safety	Minimizing risks during construction period, social evils and traffic disturbance.	<ul style="list-style-type: none"> <li>- Developing action plans on risks and emergency response during construction</li> <li>- Developing social evils mitigation plans during construction</li> <li>- Developing action plans on reducing traffic disturbance during construction</li> </ul>	<ul style="list-style-type: none"> <li>- Number of site shelters/camps fully equipped by first aid services</li> <li>- Number of training courses on occupational safety regulations delivered to the workers</li> <li>- Number of provided labor protective equipment/ total number of laborers</li> <li>- Number of entry restriction sign boards installed in the fences, barriers, warning boards.</li> <li>- Number of local workers (living &lt;5km far from the sites)</li> <li>- Number of site visits by the grassroots</li> </ul>	As the above



NO.	Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
				health staff - Activities on traffic lane control and divergence	
	Supervising mitigation of conflicts of benefits and local economic effects	Minimizing local conflicts of benefits due to free labor migration	Recruiting local labor force instead of recruiting workers from other areas.	- Number of recruited local laborers / total workers of the construction structures	As the above
	Supervising mitigation of gender impacts	Assuring maximum participation of the women during the Project implementation as well as the economic role of the women in the HHs	- Mobilizing women to join in community activities of the Project - Supporting to maintain the previous occupation or change to the new ones. - Training on new occupations for women if needed	- Ratios of women participating in Project’s community activities - Number of women is assisted to maintain the previous occupations. - Number of women attends in the new occupational training courses.	As the above
	Supervising information release and accountability	Project information is fully, timely disclosed and easy to be accessed by the local citizens.	- Information disclose is made on wards’ radio broadcast, residence information boards, cultural houses, ward People’s Committee office areas... - Distribution of leaflets if necessary	- Number of communication sessions on the radio - Number of information stations/wards/work items - Number of distributed leaflets	as the above

## 6.6. ROLE AND RESPONSIBILITIES FOR ESMP IMPLEMENTATION

### 6.6.1. Implementation Arrangement

The tables and Charts below summarize the roles and responsibilities of the key parties and their relationships regarding the implementation of the ESMP.

- Contractors will be responsible for implementing mitigation measures. These measures will be included in bidding documents and their costs are included in construction bid packages;
- CSC will be responsible for monitoring the day-to-day implementation of mitigation measures. Related costs are included in the CSC service contract;
- IEMC will be responsible for overall environmental monitoring which includes support to the PMU in implementing environmental supervision and monitoring, and responsible for reporting on the implementation through monitoring reports.

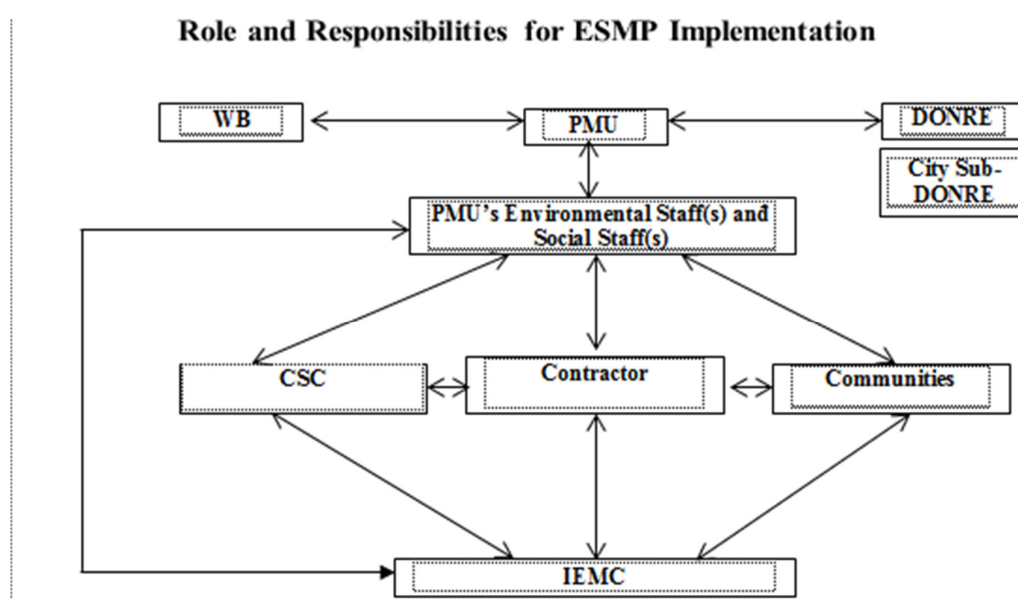


Chart 6.2: Organization chart for ESMP Implementation

**Table 6.9: Roles and responsibilities of key parties**

Community/ Agencies	Responsibilities
PMU (Vi Thanh) Development Project Management Unit)	<ul style="list-style-type: none"> <li>- PMU will be responsible for monitoring the overall subproject implementation, including environmental compliance of the subproject. PMU will have the final responsibility for ESMP implementation and environmental performance of the subproject during the construction and operational phases.</li> <li>- Specifically the PMU will: (i) closely coordinate with local authorities in the participation of the community during subproject preparation and implementation; (ii) Ensure that the detailed design include all environment provisions as indicated in the ESMP; (iii) monitor and supervise ESMP implementation including incorporation of ESMP into the detailed technical designs and bidding and contractual documents; (iv) ensure that an environmental management system is set up and functions properly; (v) be in charge of reporting on ESMP implementation to the DONRE and the World Bank.</li> </ul>

Community/ Agencies	Responsibilities
	<ul style="list-style-type: none"> <li>- In order to be effective in the implementation process, PMU will assign Environmental Staff (s)(ES) to help with the environmental aspects of the subproject.</li> </ul>
PMU Environmental and Social Staff(s) (ES)	<ul style="list-style-type: none"> <li>- The ES is responsible for monitoring the implementation of the World Bank’s environmental and social safeguard policies in all phases and process of the Project. Specifically, ES will be responsible for: (i) helping PMU incorporate ESMP into the detailed technical designs and civil works bidding and contractual documents; (ii) helping PMU incorporate responsibilities for ESMP and RAP monitoring and supervision into the TORs, bidding and contractual documents for the Construction Supervision Consultant (CSC) and other safeguard consultant (IEMC) as needed; (iii) providing relevant inputs to the consultant selection process; (iv) reviewing reports submitted by the CSC and safeguard consultants; (v) conducting periodic site checks; (vi) helping the PMU on solutions to handle social and resettlement issues of the subproject; and (vii) preparing environmental and social performance section on the progress and review reports to be submitted to the DONRE and the World Bank.</li> </ul>
Construction Supervision Consultant (CSC)	<ul style="list-style-type: none"> <li>- The CSC will assign Environmental and Social Staff(s) and will be responsible for routine supervising and monitoring all construction activities and for ensuring that Contractors comply with the requirements of the contracts and the ECOP. The CSC will engage sufficient number of qualified staff (e.g. Environmental Engineers) with adequate knowledge on environmental protection and construction project management to perform the required duties and to supervise the Contractor’s performance.</li> <li>- The CSC will also assist the PMU in reporting and maintaining close coordination with the local community.</li> </ul>
Contractor	<ul style="list-style-type: none"> <li>- The contractor will assign Environmental and Social Staff(s) to carry out Environmental and Social mitigation measures proposed in ESIA/ESMP.</li> <li>- Based on the approved environmental specifications (ECOP) in the bidding and contractual documents, the Contractor is responsible for establishing a contractor site-specific ESMP and Dredging Material Management Plan (DMMP) (if any) for each construction site area, submit the plan to PMU and CSC for review and approval before commencement of construction.</li> <li>- In addition, it is required that the Contractor get all permissions for construction (traffic control and diversion, excavation, labor safety, etc. before civil works) following current regulations.</li> <li>- The Contractor is required to appoint a competent individual as the contractor’s on-site <i>Safety and Environment Officer (SEO)</i> who will be responsible for monitoring the contractor’s compliance with health and safety requirements, the site-specific ESMP requirements, and the environmental specifications (ECOP).</li> <li>- Take actions to mitigate all potential negative impacts in line with the objective described in the site-specific ESMP.</li> <li>- Actively communicate with local residents and take actions to prevent disturbance during construction.</li> <li>- Ensure that all staff and workers understand the procedure and their tasks in the environmental management program.</li> <li>- Report to the PMU and CSC on any difficulties and their solutions.</li> <li>- Report to local authority and PMU and CSC if environmental accidents occur and coordinate with agencies and keys stakeholders to resolve these issues.</li> </ul>
Independent Environmental Monitoring Consultants	<ul style="list-style-type: none"> <li>- IEMC will, under the contract scope, provide support to PMU to establish and operate an environmental management system, offers suggestions for adjusting and building capacity for relevant agencies during subproject implementation and monitor the site-specific ESMP implementation in both construction and operation</li> </ul>

Community/ Agencies	Responsibilities
(IEMC)	phases. IEMC will also be responsible to support PMU to prepare monitoring reports on site-specific ESMP implementation. <ul style="list-style-type: none"> <li>- The IEMC will have extensive knowledge and experience in environmental monitoring and auditing to provide independent, objective and professional advice on the environmental performance of the subproject.</li> <li>- Carry out the periodical environmental quality monitoring during construction period.</li> </ul>
Local community	<ul style="list-style-type: none"> <li>- Community: According to Vietnamese practice, the community has the right and responsibility to routinely monitor environmental performance during construction to ensure that their rights and safety are adequately protected and that the mitigation measures are effectively implemented by contractors and the PMU. If unexpected problems occur, they will report to the CSC and PMU.</li> </ul>
Province and City; People’s Committees (PPCs/DPCs), Provincial DONRE	<ul style="list-style-type: none"> <li>- Oversee implementation of subprojects under recommendations of DONRE and PMU to ensure compliance of Government policy and regulations. DONRE is responsible for monitoring the compliance with the Government environmental requirements.</li> </ul>

### **Evaluation of PMU’s existing capabilities**

#### ***Regarding project implementation experience***

So far, Vi Thanh city has not implemented any projects financed by WB/ADB or other IFCs, especially urban upgrade projects like SUUP. At the same time, organizational structures and duties have no unit/agency specialized in management/implementation of projects with capital sources from donors. Therefore, experience and implementation capability is very limited in comparison with the donor’s requirements.

#### ***Capability of staff:***

An assessment of safeguards implementation capacity of existing PMU staff indicates that PMU staffs have limited knowledge on WB safeguard requirements as well as limited knowledge of environment and social issues. Such lack of capacity represents a risk to project implementation of safeguards requirements contained in the ESMP and, as required by the WB policy, is to be addressed through capacity building. Therefore it is proposed to provide capacity building through technical assistance that will support the PMU during the implementation of the safeguards requirements. The technical assistance will provide the necessary technical support the PMU in its work with contractors as well as other entities involved in the implementation of the ESMP.

#### ***Equipment***

The PMU will also need to be provided, equipped and updated with new computer software to be used in financial and accounting management as well as data analyses and consolidation, suiting the accounting standards of both the Vietnamese system and the Donor’s system, so that a most suitable and optimal accounting system could be set up to handle finance-accounting management tasks.

### ***6.6.2 Environmental Compliance Framework***

#### **(i) Environmental Duties of the Contractor**

The contractor firstly shall adhere to minimize the impact that may be result of the project construction activities and secondly, apply the mitigation measures under ESMP to prevent harm

and nuisances on local communities and environment caused by the impacts in construction and operation phases.

Prior to construction, the contractor will be required to prepare and submit a contractor’s site-specific Environmental Management Plan (Contractor’s SEMP) to the CSC and PMU based on the ESMP of the project and requirement in the Specification of Bidding Document. The contractor’s site-specific SEMP shall demonstrate compliance with Vietnamese environmental technical regulations/ standards, the mitigation measures set down in the specifications and the World Bank Safeguard Policies. The content of the site-specific SEMP shall be in line with the subproject specific ESMP and shall be enhanced by the Contractor’s works practices, implementation procedures and program. The site-specific SEMP shall be certified by the CSC with subsequent submission to the PMU for approval. No construction activity should be implemented before approval of the contractor’s site-specific SEMP.

Remedial actions that cannot be effectively carried out during construction should be carried out on completion of the works (and before issuance of the acceptance of completion of works)

The duties of the Contractor include but not limiting to:

- Compliance with relevant legislative requirements governing the environment, public health and safety;
- Work within the scope of contractual requirements and other tender conditions;
- Organize representatives of the construction team to participate in the joint site inspections undertaken by the Environmental Staff of the CSC;
- Carry out any corrective actions instructed by the Environmental Staff of the PMU and CSC;
- In case of non-compliances/discrepancies, carry out investigation and submit proposals on mitigation measures, and implement remedial measures to reduce environmental impact;
- Stop construction activities, which generate adverse impacts upon receiving instructions from the Environmental Staff of PMU and CSC. Propose and carry out corrective actions and implement alternative construction method, if required, in order to minimize the environmental impacts; Non-compliance by the Contractor will be cause for suspension of works and other penalties until the non-compliance has been resolved to the satisfaction of the ES of PMU and CSC.

**(ii) Contractor’s Safety, Social and Environmental Officer (SEO)**

The contractor shall be required to appoint competent staff(s) as the Contractor’s on-site safety, social and environment officer (SEO). The SEO must be appropriately trained in environmental management and must possess the skills necessary to transfer environmental management knowledge to all personnel involved in the contract. The SEO will be responsible for monitoring the contractor’s compliance with the ESMP requirements and the environmental specifications. The duties of the SEO shall include but not be limited to the following:

- Carry out environmental site inspections to assess and audit the contractors' site practice, equipment and work methodologies with respect to pollution control and adequacy of environmental mitigation measures implemented;
- Monitor compliance with environmental protection measures, pollution prevention and control measures and contractual requirements;
- Monitor the implementation of environmental mitigation measures;
- Prepare audit reports for the site environmental conditions;

- Investigate complaints and recommend any required corrective measures;
- Advise the contractor on environment improvement, awareness and proactive pollution prevention measures;
- Recommend suitable mitigation measures to the contractor in the case of non-compliance. Carry out additional monitoring of noncompliance instructed by the ES of PMU and CSC
- Inform the contractor and ES (of PMU and CSC) of environmental issues, submit contractor’s ESMP Implementation Plan to the ES of PMU and CSC, and relevant authorities, if required;
- Keep detailed records of all site activities that may relate to the environment.

**(iii) Independent Environmental Monitoring Consultant (IEMC)**

In order to minimize the environmental impacts during construction phase of the Project, the Project owner shall ensure that environmental quality monitoring requirements are established for the project. An IEMC appointed by PMU shall carry out the monitoring.

- IEMC will be responsible for carrying out environmental sampling, monitoring and marking report during subproject implementation. Environmental monitoring will be report periodically to PMU and World Bank (respectively every 03 months for PMU and every 6 months for WB in construction phase).
- IEMC will also supply specialized assistance to PMU and ES in environmental matters.

**(iv) Environmental Supervision during Construction (CSC)**

During construction phase, a qualified CSC reporting to the PMU shall carry out the environmental supervision. The CSC will assign environmental and social staff(s), will be responsible for inspecting, and supervising all construction activities to ensure that mitigation measures adopted in the ESMP are properly implemented, and that the negative environmental impacts of the subproject are minimized. The CSC shall engage sufficient number of Environmental Supervision Engineers with adequate knowledge on environmental protection and construction project management to perform the required duties and to supervise the Contractor’s performance. Specifically ES of CSC will:

- Review and assess on behalf of the PMU whether the construction design meets the requirements of the mitigation and management measures of the ESMP,
- Supervise site environmental management system of contractors including their performance, experience and handling of site environmental issues, and provide corrective instructions;
- Review the ESMP implementation by the contractors, verify and confirm environmental supervision procedures, parameters, monitoring locations, equipment and results;
- Report ESMP implementation status to PMU and prepare the environmental supervision statement during the construction phase; and

**(v) Compliance with Legal and Contractual Requirements**

The constructions activities shall comply not only with contractual environmental protection and pollution control requirements but also with environmental protection and pollution control laws of the Socialist Republic of Viet Nam.

All the works method statements submitted by the Contractor to the CSC and PMU for approval to see whether sufficient environmental protection and pollution control measures have been included.

The CSC and PMU shall also review the progress and program of the works to check that relevant environmental laws have not been violated, and that any potential for violating the laws can be prevented.

The Contractor shall copy relevant documents to the SEO and the ES of CSC and PMU. The document shall at least include the updated work progress report, the updated work measure, and the application letters for different license/permits under the environmental protection laws, and all the valid license/permit. The SEO and the ES shall also have access, upon request, to the Site Log-Book.

After reviewing the documents, the SEO or the ES shall advise the PMU and the contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the SEO or the ES concludes that the status on license/permit application and any environmental protection and pollution control preparation works may not comply with the work measure or may result in potential violation of environmental protection and pollution control requirements, they shall advise the Contractor and the PMU accordingly.

**(vi) Environmental Claims and Penalty System**

In the compliance framework, if non-compliance with environmental regulations are discovered by CSC/ES/IEMC/PMU during the site supervision, 2% values of interim payment of the contractor of this month will be held back. The Contractor will be given a grace period (determined by CSC/PMU) to repair the violation. If the Contractor performs the repairs within the grace period (confirmed by CSC/PMU), no penalty is incurred and keeping money will be pay. However, if the Contractor fails to successfully make the necessary repairs within the grace period, the Contractor will pay the cost for a third party to repair the damages (deduction from keeping money).

In case of IEMC/CSC/PMU not detected of non-compliance with environmental regulations of the contractor, they will be responsibility payment to repair the violation.

**(vii) Reporting Arrangements**

ESMP monitoring and reporting requirements are summarized in table 6-7.

**Table 6.10: Regular Reporting Requirements**

No.	Report Prepared by	Submitted to	Frequency of Reporting
1	Contractor to the Employer	PMU	Once before construction commences and monthly thereafter
2	Construction Supervision consultant (CSC)	PMU	Weekly and monthly
4	Community Monitoring	PMU	When the community has any complaint about the subproject safeguards implementation
	IEMC	PMU	Every three-month
5	PMU	DONRE	Every six-month
6	PMU	WB	Every six-month

### 6.6.3. Estimated Costs for Each Work of Environmental Protection Measures

**Table 6.11: Costs for environmental protection items**

NO.	Works	Costs (estimated)
1	Renting areas for dumping mud/dredged soil	VND 150 million
2	Construction site fencing	VND 200 million
3	Prevention and control of fire and explosion (fire extinguishers, fire hoses, emergency lights)	VND 200 million
4	Watering and sprinkling	5 million/month
5	Trash bins on site	VND 50 million
6	Portable toilet	VND 60 million
7	Standby pump	VND 150 million
8	Planting trees at the treatment plant	VND 300 million
9	Wastewater treatment plants, sewer lines, drainage lines	VND 34.156.897 million

### 6.6.4. Responsibilities for the implementation (mục này to lên)

The operating unit has responsible for implementing environmental mitigation measures during operation of the project. Responsibilities for the implementation are shown in the Table below:

**Table 6.12: Responsibilities for implementation of mitigation measures in operation phase**

No	Items	Subproject owner	Representative of subproject owner	Operator
1	LIAs;	Vi Thanh PPC	Vi Thanh PMU	URENCO
2	Nguyen Hue Street			Department of Transportation
3	1/5 street			
4	Rehabilitating Cai Nhuc Canal			
5	Rehabilitating 62 Canal			
6	Rehabilitating Tam Giac Lake			

## 6.7. CAPACITY BUILDING PROGRAM

The table 6-12 below provides a typical training program on safety policies. Training programs will be developed and implemented by a team of Technical Assistance for the implementation of safety policies for PMU. PMU / IEMC with the help of the Technical Assistance Team will provide training for contractors, CSC and other groups.

- *Trainee groups:* the PMU staff, the ESU department staff, the field engineers (FE), construction supervision consultants (CSC), the building contractors, representatives of relevant stakeholders and local communities in the project area. The contractors take the responsibility for training workers and drivers.

- *Training Schedule:* Training will be given at least one month before performing the first construction contract. Subsequent training sessions can be modified to suit the construction schedule for project components.

- *Frequency of training:* The basic training programs given in the table below will be provided every 6 months annually, and the contents will be updated and tailored to items to be implemented. Training programs for PMU staff are expected to continue in the first years of the



Project. Three-day training for CSC and contractors is also planned to take place twice a year for at least 2 years.

**Table 6.16: Advanced training program on environmental monitoring management capacity**

I. Subjects	PROJECT MANAGEMENT UNIT
Training course	Environmental monitoring and reporting
Participants	Staff in charge of environmental issues; environmental managers
Training frequency	Immediately after the project becomes valid, but at least one month prior to the first bid package. The next training will be planned on demand.
Duration	Four days
Content	<p>Project-related general environmental management including the request from World Bank, Department of Natural Resources and Environment, in collaboration with competent authorities and concerned stakeholders;</p> <p>Environmental monitoring for the Subproject includes:</p> <ul style="list-style-type: none"> <li>- Requirements of environmental monitoring;</li> <li>- Monitoring and implementation of mitigation measures;</li> <li>- Community involvement in environmental assessment;</li> <li>- Guiding and monitoring contractors, CSC and community representatives in the implementation of environmental monitoring;</li> <li>- Forms used in environmental monitoring processes;</li> <li>- Reaction and risk control;</li> <li>- Manner of receiving and submit forms;</li> <li>- Other issues to be determined.</li> </ul>
Responsibility	With the help of the Technical Assistance Team, the Independent environmental Monitoring Consultant (IEMC) and PMU implement safety policies.
II. Subjects	CSC, CONTRACTORS, REPRESENTATIVES OF LOCAL AUTHORITIES (WARDS/COMMUNES), COMMUNITIES
Training course	Implementation of mitigation measures
Participants	CSC; construction engineers, site construction field manager. staff in charge of environment issues, the contractor; representatives of local authorities; representatives of urban groups
Training frequency	Shortly after awarding contracts to the contractors with updates on demand
Duration	Three-day training for CSC and contractors, and two-day training for others
Content	<ul style="list-style-type: none"> <li>- Overview of the overall environmental monitoring;</li> <li>- Requirements of environmental monitoring;</li> <li>- The roles and responsibility of the contractors and CSC;</li> <li>- The content and method of environmental monitoring;</li> <li>- Reaction and risk control;</li> <li>- Introducing monitoring forms and instructing on filling out forms and reporting incidents;</li> <li>- Other issues to be determined</li> <li>- Preparing and submitting reports</li> </ul>
Responsibility	With the help of technical assistance teams, PMU, the independent environmental

	monitoring consultant (IEMC) implement safety policies.
<b>III. Subjects</b>	<b>COMMUNITIES / WORKERS</b>
Training course	Safety and environmental sanitation
Participants	Representatives of workers (team leaders) working directly for the project components
Training frequency	As appropriate
Duration	One day of presentation and one day of on-site presentation
Content	<ul style="list-style-type: none"> <li>- Brief presentation on safety issues and overview on the environment;</li> <li>- Key issues requiring the attention of the community and construction workers to mitigating safety risks (land roads, waterways, equipment, machinery, etc.) as well as reducing pollution (dust, exhaust gases, oil spills, waste management, etc.);</li> <li>- Management of safety and environmental sanitation on site and at workers’ camps;</li> <li>- Mitigation measures applied on site and camps;</li> <li>- Safety measures for electricity, mechanical engineering, transportation, air pollution;</li> <li>- Methods of dealing with emergency situations;</li> <li>- The rights and responsibilities of environmental monitoring</li> <li>- Environmental monitoring, environmental monitoring form</li> <li>- Measures to mitigate the social impact and monitoring implementationOther issues to be determined</li> </ul>
Responsibility	Contractors, PMU with the assistance of IEMC

### 6.8. TOTAL ESTIMATES

The following table provides a cost estimate for the implementation of environmental management plan (ESMP). The cost of ESMP<sup>8</sup> implementation will include (i) the costs of implementing mitigation measures by the contractor, (ii) expenses supervised by CSC, (iii) cost of the independent environmental monitoring consultant (IEMC), (iv) the costs of environmental quality monitoring, (v) the cost of safety management for the PMU, including both technical assistance in implementing safety policies and training programs. The costs of implementing mitigation measures during construction will be a part of the value of construction contracts, while the costs for a site-specific environmental monitoring plan(SEMP) by the construction supervision consultant (CSC) will be provided in construction supervision contracts. The costs of the PMU operations relating to EMP are allocated from the project management budget of the PMU, including safety training programs, and basic allowances to participants in the monitoring programs. After the project has been completed, the costs of environmental monitoring of constructed works will be taken from the operation and maintenance budget of the city.

It should be noted that the involvement of the community in the process of ESMP implementation is completely voluntary participation for the benefit of own community and households. Therefore, communities partaking in monitoring the ESMP will not get paid. However, in order to encourage community participation, it is necessary to allocate costs of materials and instruments for monitoring activities and some remuneration for a small number of members chosen by the public to participate in monitoring activities. As stipulated in the Prime Minister’s Decision No. 80/2005 / QD-TTg dated 18 April 2005 promulgating the regulations on investment supervision

<sup>8</sup>Excluding costs for RP implementation and independent monitoring the performance of RP/EMP

by the community and Joint Circular guiding the implementation of Decision 80/2005 / QD-TTg, "expenses for the community' s investment monitoring in the commune/ward in are reflected in the cost estimates of the Communal Fatherland Front Committee's budget and allocated from the communal/municipal budget; support funds for the dissemination, organization of training courses, guidance, preliminary and final report on investment monitoring by the community at provincial and district levels are balanced in the cost estimates of the Fatherland Front Committee at provincial/district level and allocated from the provincial budget”.

The following table provides the estimated costs for environmental quality monitoring and IEMC (in accordance with national practices) for reference purposes. However, final costs will be updated in the detailed design phase.

**Table 6.17: Estimated costs of EMP implementation (USD million)**

Content	Items of Vi Thanh Sub-project (million USD)	Funded by
(a) Mitigation during construction	As a part of the contract	WB
(b) Monitoring safety policies during construction	As a part of the cost for Construction Supervision Consulting (CSC)	WB
(c) PMU's units in charge of environmental safety policies	As part of the costs for the PMU	Counterpart funds
(d) Environmental quality monitoring	0.034	WB
(e) Independent environmental monitoring consulting(IEMC)	0.087	WB
(f) Capacity building programs on safeguard policies	0.01	WB

**Table 6.18: Estimated costs of IEMC (Exchange rate: 1 USD = 22,230 VND)**

NNo.	Content	Unit	Quantity	Price (VND)	Total (VND)	Total (USD)
1	Specialist salary (I)	person-month	60	40.000.000	2.400.000.000	102.128
2	Specialist salary (II)	person-month	60	30.000.000	1.800.000.000	76.596
3	Specialist salary (III)	person-month	60	15.000.000	900.000.000	38.298
4	Local stays and allowance	person-day	1.800	520.000	936.000.000	39.830
5	Traveling expenses	Trip/ person	270	3.000.000	810.000.000	34.468
6	Training course	class	20	10.000.000	200.000.000	8.511
7	Office supply	monitoring session			300.000.000	12.766
8	Office and communication	month	60	5.000.000	300.000.000	12.766
	<b>Total</b>				<b>7.646.000.000</b>	<b>325.363</b>

## 6.9. GRIEVANCE REDRESS MECHANISM (GRM)

Complaints relating to any subproject's problems will be solved through negotiations to achieve the consensus. A complaint will go through three stages before it can be transferred to the court. The enforcement unit will pay all administrative and legal fees relating to the acceptance of complaints. This cost is included in the project budget.

Complaint procedures and resolution will be performed as follows:

**The first level *People’s Committee of ward/commune*.** An affected household is to take his/her complaint to any member of the People's Committee of the ward / commune, through the village head or directly to People’s Committee of the commune / ward, in written or oral form. The said member(s) of the People’s Committee or the village head will inform the People’s Committee of the ward/commune on the complaint. The People's Committee of Ward/Commune will work directly in person with the said affected household and will decide on the settlement of the complaint 5 days after receiving such complaint (this may take 15 days in mountainous or remote areas). The Secretariat of the People’s Committee of the relevant commune/ward is responsible for documenting and recording all the complaints that it is handling.

After the Ward/Commune People's Committee issues its decision, the relevant household can make an appeal within 30 days. In case a second decision has been issued but the said household is still not satisfied with such decision, such household can appeal to the municipal (city) People’s Committee (CPC).

**The second level *The CPC*.** Upon receiving a complaint from a household, the CPC will have 15 days (or 30 days in case of remote and mountainous areas) after receiving the complaint to resolve the case. The CPC is responsible for filing and storing documents on all complaints that it handles.

When the CPC has issued a decision, the household can make an appeal within 30 days. In case a second decision has been issued and the household is still not satisfied with such a decision, they can appeal to the Provincial People’s Committee (PPC).

**The third level *The PPC*.** Upon receiving a complaint from the household, the PPC will have 30 days (or 45 days in case of remote and mountainous areas) after receiving the complaint to resolve the case. The PPC is responsible for filing and storing documents for all complaints to be submitted.

After the PPC has issued a decision, the household can appeal within 45 days. In case a second decision has been issued and the household is still not satisfied with such decision, they can appeal to the court within 45 days. The PPC will then have to pay the compensation into an account.

**The Forth level *Provincial Court*.** In case a complainant brings his/her case to a provincial court and the court rules in favor of the complainant, the provincial authorities will have to increase the compensation up to such a rate as may be ruled by the court. In case the court’s ruling is in favor of the PPC, the complainant will be refunded the amount of money that has been paid to the court.

The decision ruling the settlement of complaints will have to be sent to complainants and concerned parties, and shall be publicly posted at the headquarters of the People's Committee of the relevant level. The complainant will receive such ruling three days after the result of complaint resolution at the ward / commune / town level has been decided upon and 7 days at the district or provincial level.

**Personnel:** The environment and resettlement staff chosen by the PMU will design and maintain a database of the project-related complaints from affected households, including information such as: the nature of the complaint, the source and date of receipt of the complaint, the name and address of the complainant, action plan, and current status.

For oral complaints, the receiving / mediator board will record these requests in a complaint form at the first meeting with the affected person.

***Contractor and Construction Supervision Consultant:***

During construction, the GRM will also be managed by the contractors under supervision of the CSC. The contractors will inform the affected communities and communes about the GRM availability to handle complaints and concerns about the project. This will be done via the community consultation and information disclosure process under which the contractors will communicate with the affected communities and interested authorities on a regular basis. Meetings will be held at least quarterly, monthly information brochures will be published, announcements will be placed in local media, and notices of upcoming planned activities will be posted, etc.

All complaints and corresponding actions undertaken by the contractors will be recorded in project safeguard monitoring reports. Complaints and claims for damages could be lodged as follows:

- Verbally: direct to the CSC and/ or the contractors' safeguard staff or representatives at the site offices.
- In writing: by hand-delivering or posting a written complaint to specified addresses.
- By telephone, fax, e-mails: to the CSC, the contractors' safeguard staff or representatives.

Upon receipt of a complaint, the CSC, the contractors' safeguard staff or representatives will register the complaint in a complaint file and maintain a log of events pertaining to it thereafter, until it is resolved. Immediately after receipt, four copies of the complaint will be prepared. The original will be kept in the file, one copy will be used by the contractor's safeguard staff, one copy will be forwarded to the CSC, and the fourth copy to the PPMU within 24 hours since receipt of the complaint.

Information to be recorded in the complaint log will consist of:

- The date and time of the complaint.
- The name, address and contact details of the complainant.
- A short description of the complaint.
- Actions taken to address the complaint, including contact persons and findings at each step in the complaint redress process.
- The dates and times when the complainant is contacted during the redress process.
- The final resolution of the complaint.
- The date, time and manner in which the complainant was informed thereof.
- The complainant's signature when resolution has been obtained.

Minor complaints will be dealt with within one week. Within two weeks (and weekly thereafter), a written reply will be delivered to the complainant (by hand, post, fax, e-mails) indicating the procedures taken and progress to date.

The main objective will be to resolve an issue as quickly as possible by the simplest means, involving as few people as possible, and at the lowest possible level. Only when an issue cannot be resolved at the simplest level and/ or within 15 days, will other authorities be involved. Such a situation may arise, for example, when damages are claimed, the to-be-paid amount cannot be resolved, or damage causes are determined.

***Independent monitoring consultants (environmental, social and resettlement)***, who have enough the specialized capacity, would be selected by PMU through bidding. Independent monitoring consultants are responsible for checking the procedures and decisions on settling complaints. Independent monitoring consultants may propose additional measures to address any outstanding complaints. While checking the procedure for complaint resolution and reviewing the decision on complaint resolution, the independent monitoring agencies are required to closely coordinate with the Vietnam Fatherland Front, whose members are responsible for monitoring law enforcement of local complaints.

**World Bank Grievance Redress Mechanism:** Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanism or the WB’s Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaints to the WB’s independent Inspection Panel which determines whether harms occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the WB’s attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank’s corporate Grievance Redress Service (GRS), please visit [www.worldbank.org/grs](http://www.worldbank.org/grs). For information on how to submit complaints to the World Bank Inspection Panel, please visit [www.inspectionpanel.org](http://www.inspectionpanel.org).

## **CHAPTER 7. PUBLIC CONSULTATION**

This Chapter describes the process and results of public consultations as required in the national and Bank environmental safeguard policies. It describes feedback and options received from each ward or commune-based consultation and evidence of broad community support for the subproject investments. It provides sample pictures of public consultation meetings. The Chapter also summarizes responses and commitments of the subproject owner in complying with the environmental and social mitigation measures and information disclosure.

### **7.1. PUBLIC CONSULTATION PROCESS**

Public consultation is specifically required by the World Bank’s environmental and social safeguard policies. The public consultation in preparation of the subproject ESIA also must comply with the requirements in the Government’s Decree No. 18/2015/ND-CP dated 14 February 2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan, and Circular No. 27/2015/TT-BTNMT dated 29 May 2015 of the Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment and environmental protection plan. The objectives of public consultation for this ESIA are:

- To share all information on the items and tentative activities of the Subproject with local community and stakeholders;
- To gather opinions/comments and concerns from local authorities and the community on local particularities and environmentally sensitive matters in the subproject area, especially matters that the environmental assessment impact group has not been aware of. On such basis, the concerns of the local community may be proposed for proper settlement during the selection of subproject design options;
- To collect opinions/comments from the local community on the Subproject’s tasks in the preparation of the ESIA as well as comments on the draft ESIA to adequately and precisely assess environmental impacts and propose the most effective and feasible mitigation measures for negative environmental impacts.

The public consultations were conducted during the subproject preparation to ensure that affected households and key stakeholders to participate and express their opinions about environmental and social issues. Key topics covered in the public consultations are:

- i. Disseminate key information related to policies of the World Bank, the Government and the subprojects.
- ii. Provide locals with subproject on resettlement, environment, gender as well as ethnic minority issues through village loudspeaker system and subproject information brochures/leaflets;
- iii. Collect opinions and feedback of the local communities regarding the subproject implementation;
- iv. In the community consultation, needs to introduce and public all information of subproject and WB’s safeguard policies, collect opinions and comments of the residents on design and resettlement options as well as their aspirations and expectations are recorded;
- v. Respond questions to local communities concerning the subproject and safeguard policies;

vi. CPCs and PMU provided answers to questions to local residents related to subproject and local policies;

vii. Local communities, representatives of the CPC’s and other stakeholders’ contributions

This is a Category A subproject, thus according to WB’s requirements, public consultation is conducted at two different times during environmental and social impact assessment process.

The first public consultation was conducted from 27 July to 28 July 2016 and the second consultation was conducted from 15 December to 25 December 2016. The first public consultation discussed about the subproject scope, investment and ESIA preparation process. The second public consultation followed up on the first consultation inputs and substance of the draft ESIA. The public consultation meetings were held at 4 wards (1,3,4,5) and Vi Tan commune.

About 7 days prior to each public consultation, the consultant informed the local authority about the proposed investment and cooperated with the local authority to invite the affected people and representatives of the affected HHs to attend public consultation meeting. Attending the meeting were representatives of the People's Committee, the Veterans Association, the Vietnam Fatherland Front, Women's Union, Youth Union, administration officials, head of residential areas and affected households by the subproject. The number of participants in the first and second consultations was 110 and 115 respectively. The results of the two public consultation meetings are described in the following Tables 7.1 and 7.2.

## **7.2. PUBLIC CONSULTATION RESULTS**

### **7.2.1. The first public consultation**

First-time consultation was carried out on 28 and 29 July 2016 at the project wards, communes. The first public consultation was conducted from July 27 to 28, 2016 in the subproject wards. Place, time, participants and content of the first public consultation are presented in Table 7.1:

**Table 7.1: The results of the first consultation in Vi Thanh City**

<b>Location and Time</b>	<b>Participants</b>	<b>Participants’ opinions</b>	<b>PMU and Consultant’s responses</b>
Ward No. 1 (27/07/2016)	<ul style="list-style-type: none"> <li>○ Representatives of PC; Veterans Association; Youth Union; Fatherland Front; Women’s Union: 6 people</li> <li>○ Participants: 13 people</li> <li>○ Affected people</li> </ul>	<ol style="list-style-type: none"> <li>1. Supports project implementation;</li> <li>2. Construction will generate noise and dust, affecting environment and residents; Construction contractors need to apply necessary mitigation measures to minimize possible impacts;</li> <li>3. People of the wards hope that the project will be implemented soon, and upon implementation, attention needs to be paid to storm-water/domestic WW collection systems, ensuring that storm-water, WW are through the city’s treatment system before discharged into the environment to help limit water environment pollution;</li> <li>4. Construction activities need to utilize proper machineries/vehicles to mitigate noise impacts. Construction material transportation</li> </ol>	The options/issues will be addressed in the ESIA report and included in the bidding documents of construction packages.



Location and Time	Participants	Participants’ opinions	PMU and Consultant’s responses
		vehicles also need to be well covered to limit dust generation; 5. Client needs to pay due attention to rehabilitation of Tam Giac Lake and Cai Nhuc Canal embankment;	
Ward No. 3 (25/07/2016)	<ul style="list-style-type: none"> <li>○ Representatives of PC; Veterans Association; Youth Union; Fatherland Front; Women’s Union: 4 people</li> <li>○ Participants: 17 people</li> <li>○ Affected people</li> </ul>	<ol style="list-style-type: none"> <li>1. Totally supports project implementation;</li> <li>2. Project activities will generate some environmental impacts such as dust, exhaust gases, waste and landscape influence. However, these impacts are insignificant, local and temporary, in construction course;</li> <li>3. People of the ward hope that the project will be implemented soon so that they will no longer have to live together with pollution and flooding issues;</li> <li>4. Project activities will generate negative impacts on the environment. Construction contractors need to co-operate with the ward’s PC and people in the project areas to limit generated negative impacts;</li> <li>5. Upon implementation of the project, Client should pay due attention to the drainage system and waste collection system of people in Area 6 and rehabilitation of Cai Nhuc Canal, and spatial expansion in the ward.</li> </ol>	<ul style="list-style-type: none"> <li>○ The options/issues will be addressed in the ESIA report and included in the bidding documents of construction packages</li> </ul>
Ward No. 4 (28/07/2016)	<ul style="list-style-type: none"> <li>○ Representatives of PC; Veterans Association; Youth Union; Fatherland Front; Women’s Union: 7 people</li> <li>○ Participants: 18 people</li> <li>○ Affected people</li> </ul>	<ol style="list-style-type: none"> <li>1. Highly supports project implementation;</li> <li>2. During project construction phase there will arise environmental impacts such as dust, exhaust gases in the air, impacts of WW on soil and water environment, impacts of WW on soil/water environments, and impacts of solid waste on soil environment. However, these impacts are merely local, and temporary, in the construction phase;</li> <li>3. Hopes that the project will be implemented soon and Canal 62 will be implemented soon for a better environment and a better life for the people in the area;</li> <li>4. During construction phase, Client should control construction materials placement, to avoid encroaching roads and traffic flow. Utilised machineries/equipment should be appropriate to limit noise and vibration;</li> <li>5. Client needs to pay due attention to rehabilitate Nguyen Hue Road, dredging and construct embankment for Canal 62’s banks; upgrade, expand small alley roads; construct, develop drainage sewer system and waste</li> </ol>	The options/issues will be addressed in the ESIA report and included in the bidding documents of construction packages

Location and Time	Participants	Participants’ opinions	PMU and Consultant’s responses
Ward No. 5 (28/07/2016)	<ul style="list-style-type: none"> <li>○ Representatives of PC; Veterans Association; Youth Union; Fatherland Front; Women’s Union: 4 people</li> <li>○ Participants: 21 people</li> <li>○ Affected people</li> </ul>	<p>collection system for the ward.</p> <ol style="list-style-type: none"> <li>1. Supports project implementation;</li> <li>2. Client and construction contractors needs to implement auxiliary items such as drainage sewer system and waste collection system. Due attention must also be paid to application of proper measures to mitigate environmental impacts and improve people’s life quality.</li> <li>3. People hope that the Client will upgrade the roads in Area 1 to improve traffic convenience, and will make waste collection available for each HH to help improve their life quality.</li> <li>4. During construction phase, Client and construction contractors needs to closely co-operate with Ward 5’s PC and people in the project areas to ensure labor safety and implement well environmental mitigation measures. Material transportation vehicles must be well covered to avoid generating dust affecting environment and people in the area.</li> <li>5. Client needs to pay due attention to upgrade, rehabilitate, dredge Cai Nhuc Canal, construct 01/05 Road, expand small alley roads, construct/develop drainage sewer system to improve the environment and life quality of the project areas.</li> </ol>	<p>The options/issues will be addressed in the ESIA report and included in the bidding documents of construction packages</p>
<ul style="list-style-type: none"> <li>○ 28 July 2016</li> <li>○ Vi Tan Commune</li> </ul>	<ul style="list-style-type: none"> <li>○ Representatives of PC; Veterans Association; Youth Union; Fatherland Front; Women’s Union: 6 people</li> <li>○ Participants: 8 people</li> <li>○ Affected people</li> </ul>	<ol style="list-style-type: none"> <li>1. Support project implementation;</li> <li>2. Construction contractors needs to apply “successive construction” method. Construction of each section needs to be fully completed before moving forwards to the next section to help minimize impacts on people. Site clearance needs to be carried out thoroughly so that roadside HHs will not greatly be affected during construction time.</li> <li>3. People hope the project will soon be implemented to bring a green, clean, beautiful environment as well as improve life quality for people in the commune.</li> <li>4. The project, upon implementation, will affect people in the area (dust, noise, possible accidents, WW and waste generated by the workers, etc.) Construction contractors need to strictly implement mitigation measures. Road construction asphalt melting needs to be done in remote</li> </ol>	<ul style="list-style-type: none"> <li>○ The options/issues will be addressed in the ESIA report and included in the bidding documents of construction packages</li> </ul>

Location and Time	Participants	Participants’ opinions	PMU and Consultant’s responses
		<p>places to minimize generation of dust and pollutants. Careful coverage is also necessary during construction to minimize generation of dust and noise.</p> <p>5. Client and construction contractors needs to make careful storm-water and WW calculations to develop a properly-designed sewer system, with least possible risks of flooding. Proper waste collection system also needs to be developed. Lien Minh Resettlement and Commercial Area also needs investments in terms of water supply, sewer, lighting systems, as well as expansion of width and increase of surface elevation of alley roads.</p>	

### 7.2.2. The results from the second public consultation

The second public consultation was conducted from 16 December to 25 December 2016. The second consultation was conducted with local authorities and representatives of households, enterprises in the wards/communes. Place, time, participants and outcomes of the second public consultation are presented in Table 7.2.

**Table 7.2: Results of the second environmental consultation in the project area**

Location, Time	Participants	Community’s opinions	PMU and Consultant’s responses
Ward 1 05 Dec 2016	<ul style="list-style-type: none"> <li>▪ Representatives of PC; Veterans Association; Youth Union; Fatherland Front; Women’s Union: 8 people</li> <li>▪ Participants: 22 people</li> <li>▪ Affected people</li> </ul>	<ol style="list-style-type: none"> <li>1. Ward 1’s PC agrees with mitigation measures mentioned in the draft report;</li> <li>2. Project activities will cause some environmental impacts such as dust, exhaust gases, waste and landscape influence. Construction contractors needs to apply proper measures to minimize impacts as mentioned in the draft report;</li> <li>3. Client needs to strictly ensure labor safety measures during construction course.</li> <li>4. Proper calculations need to be made on storm-water and domestic WW drainage sewer systems to avoid risks of flooding upon raining;</li> </ol>	<ul style="list-style-type: none"> <li>▪ The opinions will be considered in preparation of ESIA and Bidding Documents for construction packages</li> </ul>
Ward 3 15 Dec 2016	<ul style="list-style-type: none"> <li>▪ Representatives of PC; Veterans Association; Youth Union; Fatherland Front; Women’s Union: 6 people</li> </ul>	<ol style="list-style-type: none"> <li>1. Ward 3’s PC agrees with mitigation measures proposed in the draft report, yet these measures need to be mentioned in more detail.</li> <li>2. Demolition of structures within the wards must be notified in advance to the ward’s PC and HHs and must not be</li> </ol>	<ul style="list-style-type: none"> <li>▪ This will be considered in preparation of ESIA and Bidding Documents for construction</li> </ul>

Location, Time	Participants	Community’s opinions	PMU and Consultant’s responses
	<ul style="list-style-type: none"> <li>▪ Participants: 25 people</li> <li>▪ Affected people</li> </ul>	<p>implemented at sensitive times such as lunch time or late night.</p> <p>3. Dredged sludge and construction waste must be collected and dumped with approval of ward PCs.</p>	<p>packages</p>
<p>Ward 4 15 Dec 2016</p>	<ul style="list-style-type: none"> <li>▪ Representatives of PC; Veterans Association; Youth Union; Fatherland Front; Women’s Union: 6 people</li> <li>▪ Participants: 28 people</li> <li>▪ Affected people</li> </ul>	<p>1. Ward 4’s PC agrees with mitigation measures proposed in the draft report.</p> <p>2. Construction machineries/vehicles used must be of suitable types to mitigate noise impacts. Construction material transportation vehicles must also be well covered to mitigate dust generation.</p> <p>3. Nguyen Hue Road rehabilitation: Client needs to carefully calculate road surface elevation to avoid risks of flooding like present time.</p> <p>Dredged sludge of Canal 62 must be collected and dumped properly as required by the ward PC. Construction material/canal dredging sludge transportation vehicles must be well covered not to affect surrounding environment and people.</p>	<ul style="list-style-type: none"> <li>▪ This will be considered in preparation of ESIA and Bidding Documents for construction packages</li> </ul>
<p>Ward 5 16 Dec 2016</p>	<ul style="list-style-type: none"> <li>▪ Representatives of PC; Veterans Association; Youth Union; Fatherland Front; Women’s Union: 8 people</li> <li>▪ Participants: 25 people</li> <li>▪ Affected people</li> </ul>	<p>1. Ward 5’s PC agrees with mitigation measures proposed in the draft report, yet these measures need to be mentioned in more detail.</p> <p>2. Client and construction contractors needs to make careful storm-water and WW calculations to develop a properly-designed sewer system, with least possible risks of flooding. Proper waste collection system also needs to be developed.</p> <p>3. 01/05 Road upgrading: Special attention needs to be paid to rehabilitation of Muong Lo Canal. Dredged sludge during transportation must be well covered not to affect the environment.</p> <p>4. Road construction asphalt melting must be done at isolate places. Construction materials needs to be collected, and placed properly to ensure traffic safety.</p>	<ul style="list-style-type: none"> <li>▪ This will be considered in preparation of ESIA and Bidding Documents for construction packages</li> </ul>

Location, Time	Participants	Community’s opinions	PMU and Consultant’s responses
Vi Tan Commune 16 Dec 2016	<ul style="list-style-type: none"> <li>▪ Representatives of PC; Veterans Association; Youth Union; Fatherland Front; Women’s Union: 8 people</li> <li>▪ Participants: 27people</li> <li>▪ Affected people</li> </ul>	<ol style="list-style-type: none"> <li>1. Vi Tan Commune’s PC agree with the mitigation measures proposed in the draft report.</li> <li>2. Proper measures needs to be applied to mitigate negative impacts on environment during the project implementation course.</li> </ol>	<ul style="list-style-type: none"> <li>▪ The opinions will be considered in preparation of ESIA and Bidding Documents for construction packages</li> </ul>

### 7.3. RESPONSES AND COMMITMENTS OF SUBPROJECT OWNER

The Subproject Owner agrees on and acknowledges opinions and comments from the People’s Committees of Wards/Communes and their local residents. The Subproject Owner and the Consultant have reviewed and incorporated those opinions/comments in the ESIA report.

The Subproject Owner will continue to pay attention to the implementation and supervise the Contractor’s performance of mitigation measures for environmental impacts adequately and in accordance with the contents in the ESIA report.

The Subproject Owner commits to reasonably handle all issues related to compensation and assistance for local people, according to regulations prescribed by the Vietnamese Government.

### 7.4. INFORMATION DISCLOSURE

The draft ESIA report was publically disclosed at the offices of Vi Thanh City People’s Committee and the People’s Committees of subproject wards and communes on January 4, 2017. The draft ESIA report allows local people to further access the subproject information and contribute their opinions/comments on environmental and social concerns to the subproject owner. The draft ESIA was also disclosed in the World Bank’s Operations Portal on January 4, 2017.

## **CHAPTER 8. CONCLUSIONS, RECOMMENDATIONS AND COMMITMENTS**

### **8.1. CONCLUSIONS**

The “*Vietnam Scaling Up Urban Upgrading Project (SUUP) – Vi Thanh City Project*” is an urban upgrading project of which the main work includes rehabilitation of existing infrastructures, especially those of the city’s low income areas and new development of secondary and primary infrastructures. Vinh Long project will help to improve the city’s drainage conditions, local flooding and environmental conditions, contributing to the sustainable growth of the city.

The contents of ESIA report comply with the current requirements for environmental impact assessment stipulated by the Vietnamese Government and WB’s policies. The report will be one of the key documents to be submitted to State management agencies in charge of the environment to determine the location and scope of the work as a basis for applying for an investment license. In addition, this is also an important document helping the project appraisal and in the negotiation and signing of the loan agreement between the Government of Vietnam and the World Bank.

#### **Environmental impacts:**

The environmental impacts were theoretically and empirically assessed with support from the baseline and statistical data as well as experiences from similar WB projects. The impacts are relatively quantified as best as they can be for all three stages of project’s preparation, construction and operation and will be further assessed and adjusted during the project implementation in order to mitigate the negative impacts and enhance the positive ones.

The positive impacts of the project include improvement of water supply and drainage and other basic infrastructures in LIAs, mitigation of local flooding, better connectivity within and out of the city and enhancement of climate resilience. The embankment of Cai Nhuc and 62 canals will help to address the drainage, environmental pollution and local encroachment and will create more green spaces for the city.

Most of the impacts during the pre-construction and construction stages are temporary and short-term, taking place in areas around construction sites or on transport routes and at disposal sites. The main impacts during the site preparation relate to the acquisition of land affecting residential land, agriculture land and small areas around fences of some religious facilities and local residents. In the construction phase, impacts from dust, vibration and noise as well as issues of social security and occupational safety are much likely to arise. In addition, the transportation and disposal of dredging sludge will also be an area of concern. However, these can be limited or mitigated to the lowest levels by the implementation of the ESMP.

Subproject construction operations might cause a number of negative impacts on the social life of residents in the Subproject area, by bringing about changes in their living conditions and disturb their daily routines as well as production and economy. Emerging issues might include increase in air pollution and traffic accidents, land subsidence or breakdown of drainage or road system, accumulation of sediments and sludge at manholes or canals among others. Nevertheless, these impacts are short-term and can be mitigated.

#### **Mitigation measures:**

Measures to control pollution and limit adverse impacts on environment in the construction and operation phases proposed and recommended in this report. Besides the application of

appropriate managerial and technical measures, awareness raising and behavior change communication to local people should be paid attention to help maintain the good environment. All the measures are proven to be feasible and able to meet Vietnamese environmental standards.

The environmental monitoring program will be carried out as soon as the State’s approval and the license of subproject construction and operation have been obtained. Monitoring data will be stored and serve as a legal basis for compliance with the Environmental Protection Law of Vietnam as well as the environmental safeguard policies of World Bank. These data will also serve the evaluation of the effectiveness and environmental sustainability of the project.

An environmental and social management plan (ESMP) is in place to ensure the management, monitoring, reporting, preparation and adjustment of measures to minimize environmental pollution during project implementation. The project owner, contractors and project management unit, will be responsible for implementing this plan in cooperation with local state management agencies and authorities.

Public consultations have been conducted to share the project contents, potential environmental impacts and mitigation measures to local residents and concerned stakeholders. So far, the project has been receiving great support from the local communities and authorities.

## **8.2. RECOMMENDATION**

This is an environmentally significant project, contributing to the sustainable growth of Vi Thanh City and in particularly helping Hau Giang to achieve several key targets for becoming the class III city by 2020. Therefore, the Owner would like to propose for DONRE’s appraisal and approval of the ESIA report of the project as well as WB’s approval for timely and prompt deployment of the project.

During the Project implementation, the Project PMU/ Project owner would seek the participation, coordination, support and constructive comments from line departments and local authorities in carrying out the environmental protection efficiently. In particular, the Project would like DONRE to provide capacity support for PMU staff and related operational workers in the areas of environmental compliances and environmental management and awareness raising and communication on environmental protection to local people.

In order to ensure the synergy between this project and other investments of the city, PMU would like to urge the PC to accelerate the implementation and operation of the proposed waste and wastewater treatment facilities so that the project can connect into.

## **8.3. COMMITMENT OF IMPLEMENTATION**

During the operation of the project, the Owner commits to carrying out seriously the regulations of Vietnam’s environmental protection laws, including: the Law on Environmental Protection No.55/2014/QH13 passed by the National Assembly of the Socialist Republic of Vietnam dated 23 June, 2014; Decree No.80/2014/ND-CP dated 6 August, 2014 by the Government on drainage and wastewater treatment; Decree No.19/2015/ND-CP dated 14 February, 2015 by the Government detailing the implementation of some Articles of the Law on Environmental Protection; Decree No.18/2015/ND-CP dated 01 April, 2015 by the Government on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan; Circular No.27/2015/TT-BTNMT dated 29 May, 2015 by MONRE on strategic

environmental assessment, environmental impact assessment and environmental protection plan, and other relevant documents. The Owner also commits to complying with WB’s environmental safeguard policies.

In addition, the Client commits to carrying out environmental protection and mitigation measures as mentioned in Chapter 5 and implementing the environmental and social management plan for the Subproject as mentioned in Chapter 6, and fulfilling commitments towards the communities specified in Chapter 7. The Owner also commits to make compensation and overcoming environmental pollution once environmental incidents and risks occur during the implementation of the project and taking steps of environmental recovery in accordance with to legal regulations on environmental protection when subproject operation has been completed.



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## **APPENDIX 1 - VI THANH DREDGED MATERIALS MANAGEMENT PLAN**

### ***1. Location of Dredging, Volume and Characteristics of Dredged Materials***

- a. Dredging of small canals LIA 03 and LIA 07: The volume of dredging sludge estimated about 35,217m<sup>3</sup>.
- b. Upgrading and Dredging of Cai Nhuc and 62 canals and Tam Giac Lake. The volume of dredging sludge estimated about 215,000m<sup>3</sup>.
- c. Dredging of Muong Lo canal: The volume of dredging sludge estimated about 51.750 m<sup>3</sup>

### ***2. Final Disposal Site***

According to the analyses, the sediments from the canals dredged work are not hazardous, with the levels of heavy metals. However, it has high amount of organic compounds and pathogenic microbial (e.g. *Ecoli*) thus should not be used directly for agricultural purpose. This could rather be drained out and kept at least 03 months so as to remove the microbial and partial decomposition of organic compounds. The sediments could then be used for perennial crops or planting tree for urban landscape purpose, based on the actual needs of local people. Otherwise, it will be transported and disposed at Tan Tien commune landfill.

The disposal site- Tan Tien commune landfill is away approximately 10 km and 12 km from dredging area.

Although a separate management plan is prepared for the excavated materials of the entire project, disposals of the excavated materials will also follow the above principles. During construction phase additional tests for deeper layer will also be carried out by the contractors.

### ***3. Contractor’s Dredging Management Plan***

The Contractor is required to prepare a Contractor’s Dredging Management Plan (CDMP) and submitted to the Environmental Consultant of the Construction Supervision team and the PMU Environmental Officer for review and approval. The CDMP will include, but not limited to the followings:

- 1) The Scope of Works in the Contract package, construction method and schedule
- 2) Volume and quality of water quality and sediment quality in the dredging area covered by the contract
- 3) Water users that may be affected by the dredging and embankment lining
- 4) Materials uploading and transportation method: indicate proposed route of the transport from the dredged site to the disposal area, time of operation, type of vehicles/trucks and proposed measures to reduce the leakage of the dredged materials from the transport trucks,
- 5) Schedule to inform the nearby communities about the project, disclosure of name and contact number for possible complaints.
- 6) Potential social and environmental impacts, including the site-specific impacts and risks
- 7) Mitigation measures to address the potential impacts and risks. The mitigation measures should be proposed based on ESIA/ECOP, ESMP, SEMP, the potential impacts and mitigation measures presented in Section 4 and 5 of this Plan and the following requirements:

- 8) Environmental Quality Monitoring plan carried out by the contractor (particularly pH, DO, TSS, BOD, salinity etc. for water and heavy metals including pH, Hg, As, Cd, Cu, Pb, Zn and Cr, Organic Materials and Mineral Oils for sediments and soil
- 9) For soil and sediment: The number of samples taken will follow the following guidelines

**Table 1. The number of Sediment samples**

<i>Volume of dredged (m3)</i>	<i>No of Sediment Samples</i>
Up to 25,000	3
25,000 to 100,000	4-6
100,000 to 500,000	6-10
500,000 to 2,000,000	10-20
For each 1,000,000 above 2,000,000	Additional 10

At least one water, soil and sediment sample must be taken for each contract package

- Consultation with affected community about the draft CDMP
- Excavated soil are separated from dredged materials from source. Excavated soils will be reused on-site and off-site as much as possible and transported to the nearest disposal site appraised under ESIA, or identified and approved during detail engineering design or construction phase;
- The mitigation measures are adequate to address the potential social and environmental impacts associated with various steps and activities, areas of influence and receptors of dredging, temporary storage, transportation and final disposal of the dredged materials.
- Field survey are carried out by the Contractor during the preparation of the CDMP in order to identify if there are additional sensitive receptors not identified previously under CCSEP and proposed additional site-specific mitigation measures accordingly.
- Contractor’s environmental monitoring plan are included
- Commitments to carry out corrective actions when excessive pollution is determined, or when there are complaints about environmental pollution, social impacts from any stake holders

**4. Potential Impacts and Mitigation Measures for Dredging and Embankment lining**

Impacts and Description	Mitigation Measures
<b>AT DREDGING and TEMPORARY LOADING AREAS</b>	
<i>Odour and air pollution, nuisance</i>  Decomposition of organic matters under anaerobic conditions generates strong odour-generated gases such as SO <sub>2</sub> , H <sub>2</sub> S, VOC etc. When the muds are disturbed and excavated, these gases are released much faster into the air. Exposure to odour pollution affect the health of	<ul style="list-style-type: none"> <li>- Inform the community at least one week before dredging is started</li> <li>- Minimise the duration of temporary loading of dredged materials on-site</li> <li>- temporary loading materials must be transported to the disposal site within 48 hours</li> </ul>

Impacts and Description	Mitigation Measures
workers, local residents and cause public nuisance	<ul style="list-style-type: none"> <li>- Load the materials on-site tidily</li> <li>- Do not load the materials temporarily outside the construction corridor determined for each canal section</li> <li>- Avoid loading the sludge in populated residential areas or near public buildings such as kindergarten. Load the sludge as far from the houses and buildings as far as possible</li> <li>- Cover the temporary sludge loads when loading near sensitive receptors or longer than 48 hours unavoidable</li> </ul>
<p><i>Dust and nuisance</i></p> <p>Temporary loading of sludge at the construction site cause nuisance to the public</p> <p>Dry and wet mud may be dropped along the dredging area and on transportation route causing nuisance to the public and traffic safety risks</p>	<ul style="list-style-type: none"> <li>- Avoid temporary loading of dredged materials on-site</li> <li>- Dredged materials must be transported to the final disposal sites earliest possible and no later than 48 hours from dredging.</li> <li>- Use truck with water-tight tank to transport wet/damp dredged materials;</li> <li>- All trucks must be covered tightly before leaving construction site to minimise dust and mud dispersion along the road</li> </ul>
<p><i>Traffic Disturbance</i></p> <p>The placement and operation of dredging equipment and construction plants on the ground, temporary loading of the dredged materials may obstruct or disturb traffic and cause safety risks for the people travelling on the canal-side road, particularly on canal-crossing bridges which are usually very narrow</p>	<ul style="list-style-type: none"> <li>- Arrange worker to observe and direct excavators driver when traffic is busy</li> </ul>
<p><i>Social Disturbance</i></p> <p>Concentration of workers and equipment, construction plants, temporary loading of materials and wastes, traffic disturbance, dusts and odour pollution etc. will disturb daily activities and the lives of local residents</p> <p>Conflicts may also be arisen if workers, waste, materials, equipment etc. are present outside the construction corridor</p>	<ul style="list-style-type: none"> <li>- Inform the community at least one week before construction is started</li> <li>- Monitor to ensure that physical disturbances are within the construction corridors only</li> <li>- Contractor recruit local labours for simple works, brief them about project environmental and safety requirements before started working</li> <li>- Contractor register the list of workers who come from other localities to the commune at the construction site</li> <li>- Led the water leaked from wet/damp dredged materials going back to the river, not to affect garden or agricultural land</li> <li>- Keep the areas to be disturb minimal</li> <li>- Enforce workers to comply with codes of conducts</li> </ul>
<p><i>Landslide and soil subsiding risks at dredging area</i></p>	<ul style="list-style-type: none"> <li>- During field survey for the preparation of CDMP, the contractor in coordination with the Environmental Officer of PMU and the</li> </ul>

Impacts and Description	Mitigation Measures
<p>Relative deep excavation or cut and fills on the embankments that create slopes may lead to landslide and soil subsiding at the slopes or excavated areas, particularly in rainy weather</p> <p>Deep excavation also cause risks to the existing buildings nearby, particularly the weak structures or located too close to the deep excavation area.</p>	<p>Environmental Consultant of the CES identify weak structures that may be at risk and determine appropriate mitigation measures accordingly</p> <ul style="list-style-type: none"> <li>- Consider and select appropriate dredging method that allow minimising soil subsiding risks, for example carry out stepped excavation, stabilise slopes in parallel to dredging</li> <li>- Apply protective measures such as sheet piles at risky locations</li> </ul>
<p><i>Water Quality Degradation</i></p> <p>Turbidity in water will be increased when the mud is disturbed; Water leaked from dredged material and surface runoff through disturbed ground also contain high solid contents. Muddy water entering irrigation ditch will cause sedimentation. Aquatic lives in the canal would also be affected by turbid water.</p>	<ul style="list-style-type: none"> <li>- Build coffer dams surrounding the dredging area and pump the water out before starting dredging</li> <li>- If dredging is carried out directly onto the water, dredge at intervals to allow suspended materials to resettle before continuing. Observe water colour at 20 m upstream and stop dredging when water colour there started to change</li> </ul>
<p><i>Increased Safety risk for the Public</i></p>	<ul style="list-style-type: none"> <li>- Place stable barriers along the construction corridor boundary to separate the site with nearby structures</li> <li>- Place warning signs and reflective barriers along the construction area, at dangerous locations and within sensitive receptors</li> <li>- Ensure adequate lighting at</li> </ul>
<p><i>Health and Safety risk to the workers</i></p> <p>The health of workers may be affected due to exposure to odour and other contaminants from sludge</p> <p>Risk of being drown</p>	<ul style="list-style-type: none"> <li>- Within two weeks before dredging is started, the contractor will coordinate with local authority to identify good swimmers or those who can dive in the locality, and hire at least one of them at each canal construction site deeper than 3 m and there are workers working on or near water surface.</li> <li>- Provide and enforce the workers to use masks. If and when working in the water, protective cloths, rubber boots, gloves and hats must be wore.</li> </ul>
<p><i>Others</i></p>	<ul style="list-style-type: none"> <li>- Other relevant measures specified in ECOP or proposed by the contractors as necessary</li> </ul>
<p><b>MATERIAL LOADING AND TRANSPORTATION</b></p>	
<p><i>Dust and nuisance, traffic safety risks</i></p> <p>Dust or wet materials may be dropped along the transportation route</p>	<ul style="list-style-type: none"> <li>- Use water-tight tank trucks for transporting wet/dam materials</li> <li>- Cover the materials tightly before leaving the construction site</li> <li>- Do no overload material on the trucks</li> </ul>
<p><b>AT FINAL DISPOSAL SITE</b></p>	

Impacts and Description	Mitigation Measures
<p><i>Landslide and soil subsiding risks at final Disposal site</i></p> <p>Landslide and subsiding risk may happen on slopes created at the final disposal site of dredged materials if the slopes created are too high, steep or unstable</p>	<ul style="list-style-type: none"> <li>- Level the materials after being disposed off</li> <li>- Slopes of the dumps will not be steeper than 45o</li> <li>- Build/create the walls to protect slopes</li> <li>- Create and maintain drainage at the foot of each dump higher than 2 m</li> </ul>
<p><i>Soil and Water Quality Pollution</i></p> <ul style="list-style-type: none"> <li>- The disposal of salty soil would not affect the existing soil quality</li> <li>- No risks of subsidence and landslide for residential areas around this area</li> <li>- No impacts on river water quality.</li> </ul>	<ul style="list-style-type: none"> <li>- Apply measures that ensure rainwater onto the materials is not mix with the surface runoff from the surrounding to overflow uncontrolled at the site; rainwater will be infiltrated onto the ground on-site. This can be done by the following mitigation measures:                             <ul style="list-style-type: none"> <li>+ Build drainage ditches surrounding the designated disposal area</li> <li>+ Use impermeable materials to cover the walls surrounding the materials to isolate it with the surrounding</li> <li>+ Other measures proposed by the contractors to meet pollution control targets</li> </ul> </li> </ul>

### 5. Specific Guidance for Dredging at Cai Nhuc Canal, 62 Canal and Tam Giac Lake

- Identifying the available land for disposing the dredged materials. The plan should also identify the possible lands to be appropriated for the disposal of dredged materials. Public land, land for construction of rural roads, public works, private land, etc. may be used, with an agreement with the project affected households. It should also meet local plans for land use.
- Preparing for a transportation plan. In case, the dredge disposal area is far away from the dredged sites, the DMP shall set out a transportation plan including: (a) methods of transportation (pipeline, barges, hopper barges) and uploading to the disposal area. If trucks are used, indicate proposed route of the transport from the dredged site to the disposal area, (b) time of operation, (c) type of vehicles/trucks and proposed measures to reduce the leakage of the dredged materials from the transport trucks, (d) contractors’ responsibilities for cleaning the roads and carry out remedial works if necessary, and (e) a communication plan for the nearby communities including contact number for possible complaints.
- Plan for managing the disposal areas including: (a) plan for reducing the drainage, (b) construction of the perimeter dykes, (c) construction of sub-containment area, if applicable, (d) planned thickness of the dredged materials (typically less than 1.5 meters), (e) any measures to protect ground water and soils (e.g., installation of PVC membrane).
- Designing the Draining for Disposal lands. As the dredged materials are in the state of mud at first and soil particles are suspended for 24 to 48 hours. All drainage water from disposal land shall be driven to the drains and discharged back to the river. In order to limit the negative impacts of mud (produced by dredging) on the environment as well as the water quality of the canals, the dredged sediment will be transported to a containing area which is appropriately located and properly design with an adequate size. The

dredged spoil will be pumped to the disposal land and then overflow to a settlement pond, where turbidity and total suspended solids are settled. After some time, effluent is returned to the river. A typical design of the dike around each disposal may be as follows: Height: 2m, Footing width: 5 m, and Surface width: 1m. The plan should set out a basic layout.

- Monitoring the Disposed Dredged Materials. A plan for monitoring the dredged materials as well as water quality of effluent would be required. As stated before, an intensive monitoring would be required if the dredged materials contains higher content of the heavy metals and other harmful materials than the national thresholds.
- In order to mitigate the issue of turbidity during dredging operation, the DMP shall set out dredging equipment and/or techniques suitable to the particular site. On laying dredging machines on a barge, contractors can use a proper mud –stopping net for enclosing the dredging site and keeping back mud on land, not to let it goes back to the canal. If the disposal site for dredge materials is located far away from the dredger, a suction dredger should be used to transfer all the mud and soil in water to the disposal sites. The length of dredging sections should be limited less than 1 km and the dredging should be done one by one.
- At the completion of the contract, carry out an assessment on dredged materials, and determine the use of the dredged materials for activities such as: (a) construction (roads and dykes), (b) basis for individual houses, and (c) gardening

## APPENDIX 2 - DUE DILIGENCE REVIEWS

Due diligence reviews related to Vi Thanh sub-project include (1) Hau Giang Solid Waste treatment plant in Hoa An Commune, Phung Hiep District, Vi Thanh City ; (2) Wastewater collection and treatment system of Vi Thanh city; (3) Development of Resettlement Area in Ward 4; (4) Development of resettlement area in Vi Tan Commune. Table below present DD reviews of Linked Vi Thanh sub-project of SUUP project.

<b>01. Project name</b>	<b>Hau Giang Solid Waste treatment plant in Hoa An Commune, Phung Hiep District, Vi Thanh City</b>
Description	<p>Hau Giang Solid Waste treatment plant in Hoa An Commune, Phung Hiep District with 230,665 m<sup>2</sup> and design capacity of 195 tons/day (phase 1).</p> <ul style="list-style-type: none"> <li>- The project owner: Greenity Hau Giang one-member CO., LTD.</li> <li>- Capital source: Investor Budget</li> <li>- Total investment amount: 266,698,429,000 VND</li> <li>- Type of waste: domestic waste and waste from agriculture</li> <li>- Project objective: Treatment of domestic waste and waste from agriculture</li> <li>- Scale: investment for infrastructure, plant, equipment installation</li> </ul> <p><u>Relationship with the SUUP project:</u> When Tan Tien landfill will be overloaded, solid waste of SUUP project will be transported to Hoa An for treatment.</p>
Current status of EIA/EMP	Already approved at the Decision No. 831/QD-UBND of Hau Giang Province People’s Committee dated 03/6/2016 on approval of the Hau Giang Solid waste treatment plant project at Hoa An Commune, Phung Hiep District
Accumulated impact assessment	Solid wastewater from SUUP project will be collected and treated to Hau Giang WTP. Wastewater from SUUP project will not overburden the 195 ton/day.night capacity of the PTWTP because this flow had been included in the design of the PTWT project.
Due Diligence review	The land acquisition and site clearance has been implemented since 2016 and completed in January, 2017. To date, the project has not received any claim from affected households. Survey results showed that livelihoods of affected households have been restored. The affected people have been compensated and supported in full accordance with related provisions of Vietnam laws
<b>02.Project name</b>	<b>Wastewater collection and treatment system of Vi Thanh city</b>
Description	<ul style="list-style-type: none"> <li>- Total investment: 11.1 Mil Euro (315.2 billion VND)</li> <li>- Financial source: Credit loan from Denmark Government (DANIDA) account 81.33% and Vietnam Government of 18.6%.</li> <li>- Project duration: 2017-2020</li> <li>- Investor: Hau Giang water supply and sewerage - projects urban JSC</li> <li>- Scope of work: Construction of wastewater collection and treatment system for wards 1, 3, 5 of Vi Thanh City with capacity about 3,5000 m<sup>3</sup>/day, expected to serve 21,747 people, accounts for 90% of project population (to 2017). The treated waste water meet the national standard B (QCVN 14:2008/BTNMT) before go discharging into the environment</li> </ul> <p><u>Relationship with the SUUP project:</u> The Project is considered as an ancillary aspect of the Vi Thanh City subproject. The collected wastewater from LIAs (Lia 1, 2, 3, 7) and Resettlement Area under Vi Thanh subproject will be conveyed to and treated by DANIDA system.</p>

Current situation	The project is planned to be implemented from 2013-2017. However, due to the lack of financing source, the new construction period will be from 2017-2020.
Details of EIA/EMP	<p>The approved EIA report assessed the potential impacts and proposed mitigation measures during preparation, construction and operation phases, regarding following aspects</p> <ul style="list-style-type: none"> <li>• During preparation include: site clearance</li> <li>• During construction, impacts and mitigation measures regarding air pollution, noise and vibration; sediment and household wastewater; traffic and vehicles; materials, construction machines, warehouse; construction disposal and hazardous waste; management of worker camp, machine installation and project activities;</li> <li>• During operation, impacts and mitigation measures regarding:</li> </ul> <p>The EMP has been included in in the EIA report, it has mentioned about the role and responsibilities of related agencies in the EMP of this project.</p> <p>The environmental monitoring program has proposed in the EIA report, includes monitoring indicators, positions, frequency and standard application, in which:</p> <p>In construction phase</p> <ul style="list-style-type: none"> <li>• Monitor air environment quality and noise: 02 positions; 05 monitor indicators and monitor every 6 months.</li> <li>• Surface water quality: 02 position, 10 monitor indicators and monitor every 6 months.</li> </ul>
Assessment of accumulative impacts	<p>Wastewater from SUUP project will not overburden Vi Thanh City’s waste water collection and treatment because this flow had been included in the design of the DANIDA project. On the overall, impacts will be positive due to treatment of wastewater prior to discharge.</p> <p>Domestic waste water from LIAs (Lia 1, 2, 3, 7) is now freely discharge without treatment into the adjacent canals, causing environmental pollution. The wastewater from LIA 1,2,3 and 7 and future RA will be collected by drainage system under Vi Thanh subproject and then conveyed to and treated by DANIA system to the national standard before discharging into the environment. The overall cumulative impacts to the water quality of surface water in Vi Thanh will be positive.</p>
Due Diligence review	The land acquisition and site clearance has been implemented since 2015 and completed in November, 2016. To date, the project has not received any claim from affected households. Survey results showed that livelihoods of affected households have been restored. The affected people have been compensated and supported in full accordance with related provisions of Vietnam laws
<b>03. Project name</b>	<b>Development of Resettlement Area in Ward 4</b>
<b>Description</b>	<p>Development of resettlement area in Ward 4 (in Area 1 of Ward 4, Vi Thanh City):</p> <ul style="list-style-type: none"> <li>- Northeast: Bordering Vo Nguyen Giap Avenue (Hau Giang Road);</li> <li>- Northwest: Bordering reserved land area;</li> <li>- Southeast: Bordering Nguyen An Ninh Road and planned area for Provincial Committee HQ;</li> </ul> <p>Southwest: Bordering Road No. 6. As planned, in the project area there will be public structures (kindergarten, flower gardens nearby residential areas, row-house areas, traffic roads, domestic WW and storm-water drainage system, light system and waste collection system). SUUP relation: The</p>



	resettlement area in Ward 4, upon introduction into use, will receive displaced HHs of SUUP – Vi Thanh Sub-project. This resettlement area will have uniform, complete infrastructure with necessary public structures creating the most favorable conditions for residence of the HHs.
Current situation	Site clearance has been completed.
<b>EIA/EMP</b>	Vi Thanh PPC has already approved EIA Report.
<b>Due diligence review</b>	Compensation, support and resettlement for this project was completed in 2007 in accordance with the provisions of the Government of Vietnam and Hau Giang on compensation, support and resettlement when the state acquires land. The acquired land area for the project was 34.5 ha and 117 households were affected. Overall, the land acquisition and compensation in Lien Minh residential and commercial area complied with the relevant national/provincial policies; no complaint or dispute was noticed: all affected households received compensation, assistance, resettlement and handed over their land to the project. There is no legacy issues.
<b>04. Project name</b>	<b>Development of resettlement area in Vi Tan Commune</b>
<b>Description</b>	<p>Vi Tan Commercial and Residential Area has total area of 34.5ha (in Hamlet 6 of Vi Tan Commune, and a part of Area 4, Ward 4 of Vi Thanh Town): Bordering Le Hong Phong Road (PR 933) in the east; Bordering water canal in the west; bordering 19 August Road in the south; and bordering Cong Canal in the north.</p> <p>The following items have been completed for this residential area:</p> <ul style="list-style-type: none"> <li>- Commercial area: 10,863m<sup>2</sup>, consisting of market, refreshment area and self-production and self-consumption area adjacent to Le Hong Phong Road and internal roads;</li> <li>- Administrative area: Commune PC, commune culture house, and existing administrative structures of Vi Tan Commune; commune health station and commune public security HQ are included in this administrative area;</li> <li>- Educational structures include: existing primary school expanded to scale of 5,680m<sup>2</sup>, and kindergarten at existing location with total area of 5,944m<sup>2</sup>. These structures have maximal structure density of 35% and minimal greenery density of 40%;</li> <li>- Service structures: Post, multi-service/multi-utility/multi-functional structures;</li> <li>- Parks, flower gardens nearby residential areas and green tree lines along canal banks for good greenery balance of the residential areas;</li> <li>- Leisure, recreational service area: Consisting of leisure, hospitality, recreational, sporting structures.</li> </ul> <p>SUUP relation: The resettlement area in Vi Tan Commune upon introduction into use will receive displaced HHs of SUUP – Vi Thanh Sub-project. This resettlement area will have uniform, complete infrastructure with necessary public structures creating the most favorable conditions for residence of the HHs.</p>
Current situation	Site clearance has already been completed.
<b>EIA/EMP</b>	<i>Vi Thanh PPC already approved EIA Report.</i>
<b>Cumulative impact review</b>	<p>Infrastructure system of the resettlement area will be completed in 2004. So, activities during construction of resettlement area infrastructure items do not have cumulative impacts on construction activities of SUUP.</p> <p>Besides, Vi Tan Residential Area, with complete and uniform infrastructure</p>

	system with necessart public structures will provide good living environment for displaced HHs of SUUP. So, impacts on SUUP are positive.
<b>Due diligence review</b>	Compensation, support and resettlement for this project was completed in 2004 in accordance with the provisions of the Government of Vietnam and Hau Giang on compensation, support and resettlement when the state acquires land. The acquired land area for the project was 17.2 ha and 71 households were affected. Overall, the land acquisition and compensation in the Provincial administration residential and resettlement area complied with the relevant national/provincial policies; no complaint or dispute was noticed: all affected households received compensation, assistance, and resettlement and handed over their land to the project. There is no legacy issues.