

**PEOPLE’S COMMITTEE OF AN GIANG PROVINCE  
PEOPLE’S COMMITTEE OF LONG XUYEN CITY**

**THE VIETNAM SCALING UP URBAN UPGRADING PROJECT  
SUBPROJECT OF LONG XUYEN CITY, AN GIANG PROVINCE**

*(Draft Final)*

**REPORT ENVIRONMENTAL  
AND SOCIAL IMPACT ASSESSMENT**

**PEOPLE'S COMMITTEE OF AN GIANG PROVINCE  
PEOPLE'S COMMITTEE OF LONG XUYEN CITY**

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PROJECT  
SUBPROJECT OF LONG XUYEN CITY, AN GIANG  
PROVINCE**

**PROJECT OWNER**

**PEOPLE COMMITTEE OF  
LONG XUYEN CITY**

**CONSULTANT**

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

**LONG XUYEN – February 2017**

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## ABBREVIATION AND ACRONYMS

Ahs	Affected Households
AC	Asphalt concrete
CeC	Cement concrete
CSC	Construction Supervision 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
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ECOPs	Environmental Code of Practices
ESMP	Environmental and Social Management Plan
EMS	Environmental Management System
FS	Feasibility Study
IEMC	Independent Environmental Monitoring Consultant
LIAs	Low Income Areas
MOC	Ministry of Construction
NUUP	National Urban Upgrading Program
ODA	Official Development Assistance
PMU	Project Management Unit
PPU	Project Preparation Unit
PSC	Provincial 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 Environmental Company
VMD	Vietnamese Mekong Delta
WB	World Bank

## **CHAPTER 1. INTRODUCTION AND PROJECT DESCRIPTION**

### **1.1. BACKGROUND AND OBJECTIVES OF THE PROJECT**

#### **1.1.1. General Background of the Vietnam Scaling Up Urban Upgrading Project (SUUP)**

The Mekong Delta (MD) is the coastal area of the Mekong River Basin, one of the fertile plains, which comprises 12 provinces and 01 city. The total area of the region 40,500 km<sup>2</sup>, with 17.5 million people accounting for about 20 % of the country's population. MD is a national hub of food security and exporting agricultural products. It has many economic potentials and advantages of land and surface water, and therefore, it is considered a hub of regional food production, fisheries, fruits and other agricultural products. This is evidenced by the Decision No.939 MD/QĐ-TTg dated 19/07/2014 by the Prime Minister approving the master plan of socio-economic development of Mekong Delta region towards 2020. Accordingly, the Government of Vietnam (GoV) oriented to: (i) construct a comprehensive infrastructure system for socio-economic development; and (ii) promote the Mekong Delta becoming a driving force of the country's economic development. In spite of such advantage, the MD has a high poverty rate with approximately 8 % compared with national poverty rate 8.4 %. This high poverty rate can be attributed to a lack of basic infrastructure and services.

Like other municipalities across the country, the MD has undergone the rapid urbanization process with the rate of about 25 %. The municipalities have changed towards civilization, modernization and better recreational opportunity with new urban spaces. These are providing better environmental quality for living and working. However, the process of urban expansion in the MD also revealed a number of limitations, including: a) Poor and low income residential areas, which are undergoing challenges due to fast urbanization and migration; b) Recklessly developed and unplanned infrastructure systems; c) Incompatible and overloaded technical and social infrastructure facilities; d) Obsolete and degraded urban drainage systems causing local inundations; e) Increasingly serious environmental pollution due to untreated solid waste and wastewater.

Along with urbanization, MD is being challenged by climate change impacts in which urban areas are highly prone to sea level rise. Consequently, this region has witnessed more severe droughts and stark floods with increasing intensity, high temperature and extreme weather events take place regularly. Moreover, the urbanization in low-lying, flooding prone areas increases the vulnerability of urban population to flood risks.

In order to overcome the above mentioned challenges, Vietnam set comprehensive goals, including: (i) developing urban areas to be synchronous and modern infrastructure systems, sustainable and adaptive to climate change; (ii) enhancing connectivity between municipalities, ensuring the comprehensive development of technical and social infrastructure, urban landscape, utilizing resources economically and efficiently, creating a better living environment for residents to gradually narrow the gap between urban and rural areas. Accordingly, the Government of Vietnam (GoV), with the assistance of the World Bank, has deployed two urban upgrading projects in the period from 2004 to 2017, including: Urban Upgrading Project in Vietnam (VUUP 1-4 was deployed in Nam Dinh, Hai Phong, Ho Chi Minh City, Can Tho), Urban Upgrading Project in the Mekong Delta Region (MDR-UUP, was conducted in 6 cities of Can Tho, Cao Lanh, My Tho, Tra Vinh, Rach Gia and Ca Mau). These two projects have brought effectiveness significantly and changed urban infrastructure facilities perceptions of urban project management practices for participating cities. According to GoV, sustainable urban development of cities in the MD should be a vital of concern due to the level of vulnerability and water-related risks. This requires a comprehensive urban management practice to enhance city resilience. Therefore, the proposal of the participation of remaining 7 cities in the MD (including Tan An, Ben Tre, Vinh Long, Long Xuyen, Soc Trang, Bac Lieu and Vi

Thanh) in the urban upgrading project is totally appropriate. This will help enable a gradual move towards comprehensive and sustainable urban development for these cities as well as improve their resilience through technical assistance to strengthen the capacity building at provincial level.

### **1.1.2. Project objectives**

The Project Development Objective is to improve access to infrastructure in priority city areas and improve urban planning in the participating cities.

#### **a. Overall objectives**

- (i) Improving the accessibility of people to basic urban infrastructure service in low-income areas;
- (ii) Enhancing connection to the main infrastructure network; and
- (iii) Building the capacity of municipalities on urban planning to climate change adaptation.

Urban upgrading in low-income areas will be implemented through a multi-sectoral package of investment civil construction works of primary and secondary priority infrastructure to strengthen the connection of infrastructure network.

The project will promote green infrastructure development and climate change adaptation, increase accessible public spaces and improve the capacity of municipalities on urban planning, land management and climate change resilience.

#### **b. Specific objectives**

- Promoting sustainable growth, equity and social participation.
- Building flood protection infrastructure, enhancing drainage and improving living conditions, sanitation conditions and improving living quality to remove poverty in municipalities.
- Developing urban transport infrastructure modernization, strengthening of inter-regional transport links between areas in the city in order to facilitate socio-economic development and increase the accessibility of the people in the low-income area to social infrastructure services of the city.
- Improving urban management capacity (technical infrastructure and operational units, strengthening the planning, scheduling, coordination mechanisms, risk management of natural disasters, urban management and finance management of the city) to deliver high performance for the integrated management of urban and ensure the sustainable development of cities.

### **1.1.3. Project Components**

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

#### ***Component 1: Tertiary Infrastructure Upgrading in Low Income Areas (Bank financing: 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 Area***

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. LEGAL AND TECHNICAL BASIS FOR ESIA PREPARATION**

The Sub-project complies with the Vietnamese and Donor's institutional frameworks, legislations and applicable regulations on environmental protection, include:

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

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

##### ***Administrative framework on Environmental Assessment***

Law on Environmental Protection (No.55/2014/QH13) dated June 23, 2014 and Decree on Environmental Protection Planning, Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Plans (No. 18/2015/ND-CP) dated February 14, 2015 are key legal frameworks for environmental management in Vietnam. Law on Environmental Protection (LEP) provides statutory provisions on environmental protection activities; measures and resources used for the purpose of environmental protection; rights, powers, duties and obligations of regulatory bodies, agencies, organizations, households and individuals who are tasked with the environmental protection task. LEP is applicable to regulatory bodies, public agencies, organizations, family households and individuals within the territory of the Socialist Republic of Vietnam, including mainland, islands, territorial waters and airspace. LEP is on regulating strategic environmental assessment, environmental impact assessment and environmental protection commitment.

Furthermore, the law also indicated to consultation on, inspection and approval of the planning for environmental protection (Article 11, chapter II) as well as the list of entities subject to strategic environmental assessment in appendix I and II of the Decree No. 18/2015/ND-CP dated February 14, 2015 of the Government.

The Article 13 of the Decree (No. 18/2015/ND-CP) explains the requirement of the pertaining ESIA agencies. Clause 1: the project owner or the advisory organization conducting ESIA must meet all requirements – (a) there are staff members in charge of ESIA meeting requirements prescribed in Clause 2 of this Article; (b) there is specialist staff members related to the project obtaining at least Bachelor's degrees; and (c) there are laboratories, inspection and calibration devices eligible for performing measurement, sampling, processing and analysis of environmental samples serving the ESIA of the project; if there is not any laboratory with decent equipment for inspection and calibration, it is required to have a contract with a unit capable of carrying out inspection and calibration. Clause 2: the staff members in charge of ESIA must obtain at least Bachelor's degrees and Certificate in ESIA consultancy and Clause 3: the Ministry of Natural Resources and Environment shall manage the training and issuance of Certificates in consultancy of ESIA.

The project does not involve wetlands and natural protected areas, neither does it relate to emission of persistent organic pollutants or international trade in endangered species of wild fauna and flora. Therefore, no relevant international environmental agreements to which Vietnam is a party would apply.

- 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 11/22/2013;
- 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. 44/2014/ND-CP of 15 May 2014 of the Government on land valuation;
- Decree No. 45/2014 / ND-CP dated 05/15/2014 of the Government on collection of land use fees;
- 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;
- Decree No. 179/2013/ND-CP dated 11/14/2013 of the Government on sanctioning of administrative violations in the field of environmental protection;
- Decree No. 25/2013/ND-CP of 29 March 2013 of the Government on environmental protection charges of waste water;
- Decree No. 174/2007/ND-CP of 29 November 2007 of environmental protection charges for solid waste;
- Decree No. 59/2007/ND-CP of 09 April 2007 of the Government on solid waste management;
- Decree No. 149/2004 / ND-CP dated 07/27/2004 of the licensing regulations for exploration, exploitation and use of water resources, waste water discharge into water
- 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 hazardous 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. 19/2011 / TT - BYT dated 06/6/2011 of the Ministry of Health guidelines occupational health management, health workers and occupational diseases
- Circular No. 22/2010/TT-BXD of 03 December 2010 of the Ministry of Construction on labor safety in civil construction works;
- 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) Vietnam's Applicable Standards and Regulations***

During the preparation of this environmental and social impact assessment, some following Vietnam's regulations are applied:

✓ **Water quality**

- QCVN 01:2009/BYT - National technical regulation on drinking water quality.
- QCVN 08-MT:2015/BTNMT - National technical regulation on surface water quality.
- QCVN 09-MT: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-MT:2015/BTNMT – 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.
- 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 Subproject***

- Decision No.1581/QĐ-TTg dated October 9, 2009 by the Prime Minister on approving the construction of the Mekong Delta Master Plan up to 2020 and vision up to 2050;
- Decision No.245/QĐ-TTg dated February 12, 2014 by the Prime Minister on approving the Master Plan of socio-economic development for the key economic region Mekong Delta up to 2020 and vision up to 2030;
- Decision No.939/QĐ-TTg dated July 19, 2014 by the Prime Minister on approving the Master Plan for the socio-economic development in the Mekong Delta up to 2020;
- Decision No.1810/QĐ-TTg dated October 4, 2013 of the Prime Minister on approving the orientations and criteria that use WB capital for the period of 2014 to 2018 and the subsequent years;
- Decision No.2268/QĐ-UBND dated December 19, 2011 of the People's Committee of An Giang province on approving the Master Plan for socio-economic development of Long Xuyen city up to 2020;

- Decision No.505/QD-UBND dated April 3, 2012 of the Province People's Committee on approving the scheme on adjusting the general planning on the construction of Long Xuyen city, An Giang Province up to 2025;
- Decision No.2085/QD-UBND dated October 5, 2015 of the Prime Minister on approving the adjustment of the general planning for building Long Xuyen city up to 2025;
- Mission Memorandum of World Bank on identifying projects on expanding and upgrading Vietnamese urban from March 21 to March 29, 2016.

***d) Documents and Data Prepared by the Subproject Owner***

- The feasibility study report description of the project "The Vietnam Scaling Up Urban Upgrading Project sub-project of Long Xuyen City". The report was prepared by the People's Committee of Long Xuyen City in conjunction with the consultant.
- The designs of the project "Viet Nam Scaling Up Urban Upgrading project - sub-project of Long Xuyen City"
- The relevant legal documents provided by People's Committee of Long Xuyen City.

**1.2.2. World Bank's Safeguard Policies**

The ESIA is carried out in compliance with the World Bank Environmental and Social Safeguard Policies. 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>
- Involuntary Resettlement (OP/BP 4.12)<sup>2</sup>
- Natural Habitats (OP/BP 4.04)<sup>3</sup>

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

<http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEOL/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/EXTSAFEOL/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/EXTSAFEOL/0,,contentMDK:20543920~menuPK:1286576~pagePK:64168445~piPK:64168309~theSitePK:584435.00.html>

- 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 LONG XUYEN SUBPROJECT

Long Xuyen city is the economic, political and cultural center affiliated to An Giang Province. In its orientation to 2020, Long Xuyen will become the Grade 1 City under An Giang province and a open economic trade hub between Mekong Delta provinces and Cambodia (Phnom Penh) and ASEAN countries. The development objectives of Long Xuyen city as identified in the orientation of economic and social development period 2016-2020 include the active integration, realization of potential and advantages and economic development associated with environmental protection and sustainability. To drive to this end, the improvement of basic infrastructure and development and expansion of urban space are of crucial importance.

However, the urban space of the city of Long Xuyen is mainly developing north-south direction along the Hau River and Highway 91 axis (Tran Hung Dao Street) that is considered the only main city outward route. Therefore, this route has become overloaded with current urban development, frequent traffic jams at rush hour resulting in traffic inconvenience and trading and business interruption. Besides, the sanitation in the Long Xuyen city is becoming worrisome due to sedimentation and obstructed flow of the main drainage canals in the inner areas such as Cai Son canal, Ong Manh canal and Ba Bau canals ... subsequently causing serious environmental pollution and increasing spread of diseases. In addition, the city of Long Xuyen is also severely affected by climate change (local flooding, river erosion ...).

In Long Xuyen city, the proportion of poor and near-poor population accounts for about 10-30% of the total population in low-income areas. The key and obvious challenges in low-income areas are closely associated with limited roads, drainage systems, sanitation and solid waste management. The limited transport connections between low-income areas (narrow,

<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).



meandering, unconcretized or partially concretized) with other areas and the rural-to-urban migration are exercising increasing pressure on the minimum living conditions in the low income residential areas.

The problems mentioned above directly affect the speed of urban development of Long Xuyen city at present and in the future. Henceforth, to contribute to the construction and development of Long Xuyen city as one of the regional centers, the investment project “*The Vietnam Scaling Up Urban Upgrading Project – Sub-project of Long Xuyen city*”, is entirely consistent with the direction of urban development in general and Vietnam's Mekong Delta region in particular. The project will contribute greatly to the development of the city and help the city achieve the development goals in the future.

### **1.3.1. Subproject location**

Long Xuyen City, An Giang province, is located to the right of Hau River, in central Mekong Delta (MD), with geographical coordinates: 10°22'22 "N - 105°25'33" E with the following boundary:

- North: bordering Chau Thanh District.
- South: bordering Can Tho City and Thanh Hung District of Dong Thap Province.
- East: bordering Hau River and Cho Moi District
- West: bordering Thoai Son District.

By 2015, the city's natural area is 115.22 km<sup>2</sup> with a population of 280,862 people; the average population density of 2,438 persons/km<sup>2</sup>. Long Xuyen City have 11 administrative units as wards and communes including wards of My Long, My Binh, My Xuyen, Binh Duc, Binh Khanh, My Phuoc, My Quy, My Thoi, My Hoa, My Thanh, Dong Xuyen and 2 communes of My Hoa Hung, My Khanh.

The proposed project components in Long Xuyen City are expected to be implemented in 07 wards of My Binh, My Long, My Xuyen, Dong Xuyen, My Hoa, My Phuoc and My Quy.



Figure 1.1: The location of Long Xuyen city in Mekong Delta Region

### 1.3.2. Detailed Description

The subproject includes 4 main components: (i) Component 1: Upgrading tertiary infrastructure in low-income areas (LIAs); (ii) Component 2: Upgrading primary and secondary infrastructure priorities; (iii) Component 3: Resettlement; (iv) Component 4: Capacity building, implementation and technical support. The details of investment construction works are summarized as follows:

Table 1.1: Main investment items in the subproject

No.	Investment Item	Description
1	<b>Component 1: Upgrading Tertiary Infrastructure in 4 LIAs (No.1, 3, 5, 6), covering an area of 74.78 ha and 24,936 people</b>	
	Upgrading infrastructure in LIA 1, 3, 5, 6	<b>Main construction works:</b> <ul style="list-style-type: none"> <li>- Expanding 3-4 m wide alleys to concrete alley with minimum width of 4 m and total length of 7.65 km.</li> <li>- Upgrading existing 2 – 3 m wide alleys to concrete alleys total length of 7.04 km.</li> <li>- Constructing concrete drainage pipe culvert D400-800 with total length of 10.5 km.</li> <li>- Installing water supply pipelines D63 – 100 with total length of 19.9 km.</li> <li>- Provision of lighting and waste bins.</li> </ul>
2	<b>Component 2: Upgrading roads connecting to LIAs; Reconstruction of Inner City Canals</b>	



2.1	Constructing the extension of Hung Vuong Street	<ul style="list-style-type: none"> <li>- Constructing new Hung Vuong Street with width of 24 m, 1.2km long</li> <li>- On the road alignment, constructing a 60.2 m long, 13.0 m wide bridge at the intersection with Tam Bot Canal (Km0+87.67) and a culvert box p2.000, 28.0 m long at km0+910.72.</li> <li>- Installing drainage system: (i) rainwater drainage D600 reinforced concrete pipe in 2.4 km long; (ii) wastewater collection pipe UPVC 220, 2.4 km long.</li> <li>- Provision of lighting and tree planting along the road.</li> </ul>
2.2	Constructing Tran Quang Dieu Street	<p>Construction of new road with the following main items:</p> <ul style="list-style-type: none"> <li>- Construction of road with 20.5 m in width and 0.9 km in length.</li> <li>- On the road alignment, constructing a 40.2 m long, 15.0 m wide bridge (over Ong Manh Canal) and a 12.0 m long, 20.5 m wide bridge at Km0+366.53 (over Ba Bau Canal)</li> <li>- Installing drainage system: (i) rainwater drainage D600 reinforced concrete pipe in 1.8 km long; (ii) wastewater collection pipe UPVC 220, 1.8 km long.</li> <li>- Installing technical infrastructure: drainage and lighting systems, and planting (greenery space).</li> </ul>
2.3	Rehabilitating Long Xuyen Canal	<ul style="list-style-type: none"> <li>- Embankment with rubble stone for the proposed canal section of 2.34 km long, 2.5-3.0 m high, including 03 sub-sections: <ul style="list-style-type: none"> <li>(i) Section 1 (0.6 km) from Nguyen Du Street– My Binh Ward, slope embankment with rubble stone, 2.5 m high, 1:1 slope; 5m wide operation road with 5m wide sidewalks.</li> <li>(ii) Section 2 (0.44 km) from Le Thi Nhien Street – My Long Ward: vertical embankment, reinforced concrete, 2.5-3.0 m high; 4m wide operation road</li> <li>(iii) Section 3 (1.3 km) from Nguyen Thai Hoc Bridge to Ton Duc Thang Bridge: slope embankment with rubble stone, 2.5 m high, 1:1 slope; 5 m wide operation road with 5 m wide sidewalks</li> </ul> </li> <li>- Installing drainage system: <ul style="list-style-type: none"> <li>▪ Rainwater sewage pipeline of reinforced concrete D600 along the pavement, 4.6 km long.</li> <li>▪ Domestic wastewater collection pipeline UPVC D200, 2.3 km long.</li> </ul> </li> <li>- Installing lighting system and ornamental planting tubs in one road side.</li> </ul>
2.4	Rehabilitating Cai Son Canal	<ul style="list-style-type: none"> <li>- Dredging from the existing depth of 1.3 m-2.4 m to the design depth of 4.0 m in the current width of 12 m-23 m, 1.5 km long;</li> <li>- Embanking Cai Son Canal with hard and soft structure combination: <ul style="list-style-type: none"> <li>▪ Vertical embankment with reinforced concrete, 2.0 m high from the canal bed</li> <li>▪ Soft soil embankment, 1.4m high, slope 1:1, 0.6 m wide, grass planting</li> <li>▪ Green planting 0.4 m high slope 1:1.25, 0.6 m wide, tree planting.</li> </ul> </li> <li>- Constructing operational roads both sides of the canal, 3-4 m wide, 3.0 km long.</li> <li>- Domestic wastewater collection pipeline UPVC D200, 1.5 km long.</li> <li>- Ornamental planting in one road side.</li> </ul>
2.5	Rehabilitating Ong Manh Canal	<ul style="list-style-type: none"> <li>- Dredging from the existing depth of 1.2 m-2.4 m to the design depth of 4.0 m in the current width of 8 m-27 m, 1.6 km long;</li> <li>- Embanking Ong Manh Canal with hard and soft structure combination <ul style="list-style-type: none"> <li>▪ Vertical embankment with reinforced concrete, 2.0 m high from the canal bed</li> <li>▪ Soft soil embankment, 1.4 m high, slope 1:1, 0.6 m wide, grass planting</li> <li>▪ Green planting 0.4m high slope 1:1.25, 0.6 m wide, tree planting</li> </ul> </li> <li>- Constructing operational roads both sides of the canal, 4 m wide, 3.2 km long.</li> <li>- Domestic wastewater collection pipeline UPVC D200, 1.6 km long.</li> </ul>

2.6	Rehabilitating Ba Bau Canal	<ul style="list-style-type: none"> <li>- Dredging from the existing depth of 1.9 m-2.8m to the design depth of 4.0 m in the current width of 5.6 m-17 m, 1.0 km long;</li> <li>- Embanking Ba Bau Canal with hard and soft structure combination <ul style="list-style-type: none"> <li>▪ Vertical embankment with reinforced concrete, 2.0 m high from the canal bed.</li> <li>▪ Soft soil embankment, 1.4 m high, slope 1:1, 1.4 m wide, grass planting.</li> <li>▪ Green planting 0.4 m high slope 1:1.25, 0.6 m wide, tree planting.</li> </ul> </li> <li>- Constructing operational roads both sides of the canal, 4 m wide, 2 km long.</li> <li>- Domestic wastewater collection pipeline UPVC D200, 1.0 km long.</li> </ul>
<b>3</b>	<b>Component 3</b>	<b>Construction of resettlement site</b>
	Resettlement site	<p>Constructing a 4 ha resettlement site, including:</p> <ul style="list-style-type: none"> <li>- Internal roads with width of 10 m-15 m and length of 1,769 m;</li> <li>- Installing water supply pipeline D63, 3,537 m long.</li> <li>- Installing drainage system: <ul style="list-style-type: none"> <li>▪ Rainwater sewage pipeline of reinforced concrete D600, 3,537 m long.</li> <li>▪ Domestic wastewater collection pipeline UPVC D200, 1,769 m long.</li> </ul> </li> <li>- Provision of lighting and tree planting along the road.</li> <li>- Constructing basic social infrastructure: kindergarten school, clinic etc.</li> </ul>

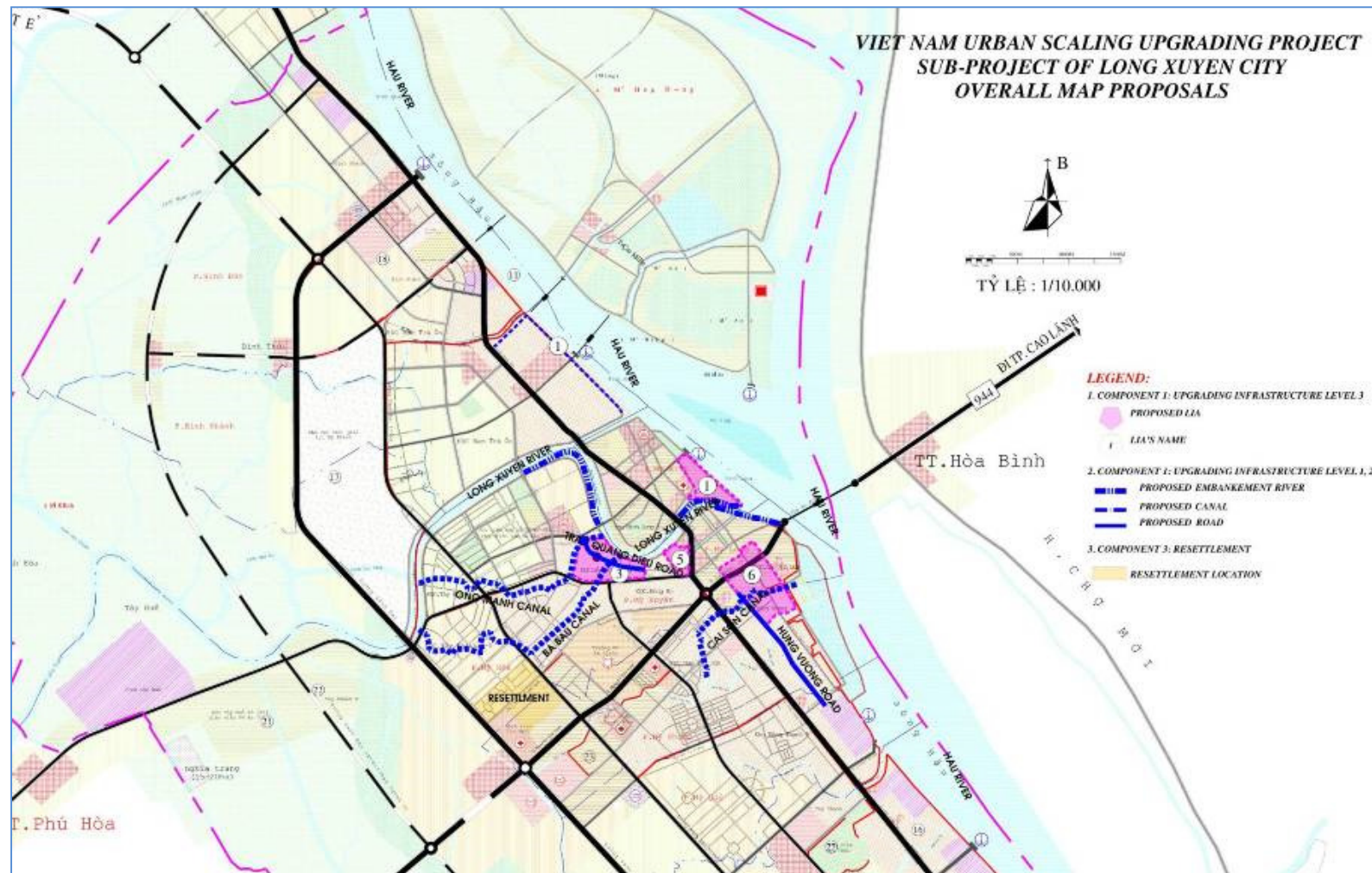


Figure 1.2: Map of investment items of Long Xuyen Subproject

### **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:

##### **1. 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.

##### **2. 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).

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

#### ***a. Construction of embankment***

- The pilling test
- Casting the test pile to the designed length;
- Excavating foundation to the designed elevation; positioning the test pile;
- Installating 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;
- Installating rebar, formwork and the bottom, and the embankment vertical wall;
- Casting concrete floor and wall embankment.

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

- Constructing drainage system and other underground structures
- Installating the embankment fence
- Constructing sidewalks, planting flower tubs, lighting systems, decorative lights.

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

Depending on the capacity of contractors for each component, construction machineries and equipment will be mobilized based on actual construction conditions as presented in Table 1.2.

**Table 1.2: List of Machineries and Equipment**

Machines	Component 1				Component 2						Component
	LIA 1	LIA 3	LIA 5	LIA 6	Hung Vuong street	Tran Quang Dieu street	Long Xuyen canal	Cai Son canal	Ong Manh	Ba Bau canal	Resettlement area
Excavators with one bucket, bucket capacity of 0.8m <sup>3</sup>	-	-	-	-	3	2	5	2	3	5	3
Bulldozers 108 CV	-	-	-	-	3	2	5	2	3	5	3
Scraper 1.20m <sup>3</sup>	-	-	-	-	-	-	-	2	2	2	-
Self-propelled graders 108 CV	-	-	-	-	2	1	4	1	2	4	2
Excavator 2m <sup>3</sup>	-	-	-	-	2	1	4	1	2	4	2
Road roller 10T	-	-	-	-	3	2	6	2	3	7	2
Wheeled Compactors 16T	-	-	-	-	2	2	3	2	3	3	2
Watering truck 5m <sup>3</sup>	1	1	1	1	2	2	4	2	3	4	2
Crane 130T	-	-	-	-	2	2	3	2	2	4	2
Mortar mixers	-	-	-	-	4	3	6	3	6	6	7
Water pumps	1	1	1	1	3	2	3	2	3	3	2
Asphalt machines	-	-	-	-	2	1	3	2	3	3	2
Pile presses	-	-	-	-	-	-	1	1	1	1	2
Generator	-	-	-	-	1	1	1	1	1	1	1
Tipper truck	3	3	2	3	5	3	6	3	6	8	6
Bending mowers	3	3	3	3	4	4	8	4	8	8	6
Electric welding machines	3	3	3	3	4	2	6	2	6	6	5
Welding transformers	1	1	1	1	4	2	2	2	2	2	4
Toad compactor	5	5	5	5	5	4	6	4	5	6	5
Concrete Drill	3	3	3	3	4	1	2	1	2	2	2



### 1.3.5. Demand for Raw Materials, Fuel and Disposal Site

#### 1.3.5.1. Demand for raw materials

##### ❖ Quantity

The demands for raw materials for civil construction works of the subproject are presented in Table 1.3.

**Table 1.3: Type and quantity of main raw materials**

Items	Quantity					
	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> )
LIA 1	541,905.28	618.99	1,191.87	-	-	1,507.20
LIA 3	1,203,754.57	1,374.98	2,647.56	-	-	3,348.00
LIA 5	1,678,353.14	1,917.09	3,691.40	-	-	4,668.00
LIA 6	1,678,353.14	1,917.09	3,691.40	-	-	4,668.00
Hung Vuong street	46,272.60	1,253.60	1,217.83	351,358.96	3,456.00	7,200.00
Tran Quang Dieu street	-	-	-	-	2,592.00	4,725.00
Long Xuyen canal	-	-	-	-	-	8,050.00
Cai Son canal	115,681.50	638.37	708.99	144,007.20	-	6,000.00
Ong Manh canal	-	-	-	-	-	6,400.00
Ba Bau canal	77,121.00	507.06	552.46	119,436.60	-	4,000.00
Resettlement area	501,286.50	8,101.93	8,003.84	2,671,050.38	14,040.00	58,500.00
<b>Total</b>	<b>5,842,727.73</b>	<b>16,329.11</b>	<b>21,705.35</b>	<b>3,285,853.13</b>	<b>20,088</b>	<b>109,066.20</b>

##### ❖ Supply sources

- Stone is transported from quarries in provinces of Dong Nai and An Giang by waterways.
- Sand is transported from mines in Tan Chau (An Giang) to the construction sites by waterways.
- Soil will be transported from soil mines in Long Xuyen city to the construction sites by road.
- Iron, steel, cement,..... are purchased at retail outlets or construction material stores near the construction site.

The conditions of raw materials supply to serve the construction activities of the project categories are summarized in Table 1.4. In the future, the selection of specific mine of construction materials supply will be proposed by contractors based on the specific technical requirements. Bidding and contract documents should ensure the material mines proposed by contractors must meet the technical requirements, certificate of permits of environmental protection and mining licenses.

**Table 1.4: Location and distance of supply material sources**

No.	Parameter	Materials		
		Rock quarry	Sand	Soil
1.	Location	Tan Chau (An Giang)	Tan Chau (An Giang)	Near the construction route
2.	Distance	68 km	68 km	10 km
3.	Capacity	2.000 m <sup>3</sup> - 5.000 m <sup>3</sup>	2.000 m <sup>3</sup> - 5.000 m <sup>3</sup>	2.000 m <sup>3</sup> - 5.000 m <sup>3</sup>

No.	Parameter	Materials		
		Rock quarry	Sand	Soil
4.	Transportation	Waterway	Waterway	Roadway
5.	Licensing requirement	Licensed	Licensed	Licensed

The above-mentioned mines and quarries are licensed by Provincial People's Committee of An Giang. They do not only provide construction materials for this subproject, but also for other projects of neighbouring provinces. Demand for construction materials of the Long Xuyen Subproject will not require opening of any new quarry.

#### **1.3.5.2. Fuels demand**

##### **❖ Power and fuel supply**

- The national electricity grid system already covers the entire Long Xuyen city, and therefore, the accessibility of power source for construction activities and operation management is quite easy.
- In addition, standby generators will be arranged for ensuring smooth construction and operation activities in the case of power failure.
- Oil and gas for the operation of construction machineries provided by local businesses.

##### **❖ Water supply**

Water for construction activities: Water can be used directly from domestic water sources of residents or to be transported to construction sites by tankers.

#### **1.3.5.3. Waste disposal sites**

Construction activities of the sub-project will generate wastes such as excavated soil, dredged sediment, domestic solid wastes and hazardous wastes, specifically:

- Excavated soil: according to FS consultant, the total of excavated soil is about 142,168 m<sup>3</sup>. This excavated soil does not contain hazardous substances (according to soil analysis presented in Chapter 2), and therefore, it can be reused for ground leveling. Waste spoils disposal sites will be surveyed for capacity, distance to the subproject area and agreement with the local authorities. The possible spoil disposal sites will be indicated in the Bidding document.
- Dredged sediments: 92,250 m<sup>3</sup> of sediments from dredged work in 03 canals. According to the analyses, the sediments from the canals and lake dredged work are not hazardous, with the levels of heavy metals lower the national standards. However, it has high amount of organic compounds and pathogenic microbial (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 perennial crops or planting tree for urban landscape purpose, based on the actual needs of local people. Otherwise, it will be transported to An Giang SWTC.
- Domestic solid waste: Solid waste generated at the site will be collected in the containers with lid, and transported by An Giang Urban Environment Company Limited (An Giang URENCO) to An Giang SWTC.
- Hazardous waste will be collected and temporarily stored in storage houses in the construction sites. They then will be transported by an contracted company (possibly An Giang URENCO or other licensed companies as regulated by the Circular 36/2015 dated 30/6/2015 of Ministry of Natural Resources and Environment on hazardous waste management) to the industrial and hazardous waste treatment plant.



**An Giang Solid Waste Treatment Complex (SWTC), capacity of 245 tons/day**

According to Decision No. 1873/QĐ-TTg dated 11/10/2010 of the Prime Minister on approval the construction plan of solid waste treatment plant in key economic area of Mekong Delta region towards 2020, the solid waste in Long Xuyen will be transported to An Giang Solid Waste Treatment Complex.

An Giang Solid Waste Treatment Complex invested by An Giang Urban Environment Company is located in Binh Hoa commune, Chau Thanh district, 13km from the project area. It has an area of 22.46 ha with capacity of 245 tons/day.

The complex includes 2 items:

- Landfill for domestic solid waste, capacity 245 tons/day, constructed in..., for operation in September 2016. The landfill is using hygienic technology for domestic waste, industrial waste and normal medical waste.
- Domestic waste treatment plant with capacity of 245 tons/day. It is being prepared and expected to run in 2018. Upon its operation, the landfill will be operated only when the plant is suspended for technical reasons or the amount of waste input exceeds the plant's capacity. The plant will receive and treat domestic solid waste, industrial waste and conventional medical waste using aerobic composting technology and incinerators. Waste is transported to the plant and segregated before processing. Organic waste will be treated by high speed aerobic composting technology to produce fertilizers. Other wastes that can not be used for production and recycling will be burned.

Due Diligence on disposal site is included in Annex 1.

**1.3.6. Area of Influence**

During the environmental and social assessment of a project, it is important to define the area for that environmental and social impacts are being considered. The investments of Long Xuyen city sub-project aims to improve access to basic infrastructures in low-income areas, improve connectivity to main infrastructure system and enhance the ability for the city in integrated planning in response to climate change. The project area covers 07 wards in Long Xuyen City and will also influence the whole city, An Giang Province and other adjacent provinces.

The specific influence area is presented below:

- My Binh ward: affected due to the construction of Long Xuyen canal embankment, and upgrading LIA 1.
- My Long ward: affected due to the construction of Long Xuyen canal embankment, construction of Hung Vuong road, upgrading Cai Son canal, and upgrading LIA 6.
- My Xuyen ward: affected during the construction Tran Quang Dieu road, Long Xuyen canal embankment; upgrading Cai Son canal, LIA 3 and LIA 5.
- Dong Xuyen ward: affected during construction Tran Quang Dieu road, construction of Long Xuyen canal embankment; upgrading of Ong Manh canal and LIA 3.
- My Hoa ward: affected during the construction of Long Xuyen canal embankment, and Tran Quang Dieu road; upgrading Ong Manh canal and Ba Bau canal.
- My Phuoc ward: affected during the construction of Hung Vuong road, and resettlement area; upgrading of Cai Son canal, and LIA 6.
- My Quy ward: affected during construction Hung Vuong road.

Environmental and social impacts of the project investments will also relate to some areas outside the city and project area as indicated above. These include the routes for transportation

of construction materials and waste disposal such as Provincial Road 943 and Highway 91. Residents and properties along these routes will be impacted.

In addition, several other projects have been implemented or will be implemented on the territory of the city of Long Xuyen can also generate indirect influence for this project. The related projects are presented below:

**a. Project title: Construction of wastewater sewage and treatment system of Long Xuyen city**

- Capital source: Korean ODA (35.6 million \$US); government budget (7.1 million \$US).
- Investor: An Giang Utilities JSC.
- Project progress: under construction from 08/2015, estimated to completed by 12/2017.
- Capacity: 30,000 m<sup>3</sup>/day.
- The purpose of the project is to collect and treat wastewater from 09 wards of Long Xuyen city. The project area includes two main investments:
  - Wastewater treatment plant No.1 of 10,000 m<sup>3</sup>/d capacity in an area of 2.9 ha in Binh Duc Ward, serving the northern area of the city (including My Binh Ward, Binh Khanh Ward, Binh Duc Ward).
  - Wastewater treatment plant No.2 of 20,000 m<sup>3</sup>/d capacity with 08 pumping stations, 69.2 km long wastewater collection pipeline, in an area of 5.6 ha in My Hoa Ward, serving the southern area of the city.

Relationship with Long Xuyen city sub-project: Wastewater from the beneficial area from Long Xuyen sub-project will be collected, conveyed and treated by the two WWTPs under this project. Concretely, WWTP from LIA 1, Long Xuyen canal will be connected and treat by WWTP at Binh Duc ward. WWTP from LIA 3, 5, 6, Hung Vuong street, Tran Quang Dieu street will be connected and treat by WWTP at My Hoa ward.

**b. Project title: Construction of solid waste treatment complex in An Giang (SWTC), capacity 245 tons/day**

- Capital source: government budget (2.8 million \$US)
- Investor: An Giang Company Limited Urban Environment
- Project progress: WTC includes 2 items: (i) Solid waste landfill sanitary capacity 245 tons/day: being constructed, estimated to completed by 12/2016; and (ii) waste treatment plant capacity of 245 tons/day: had the investment policy in accordance with Decision No. 267 / QD-Committee of the Provincial People's Committee dated 21/02/2012, estimated to completed by 2018.
- Project objective: to collect and treat solid waste from Long Xuyen City, Chau Thanh district, Phu Hoa town (Thoai Son district) and part of Chau Phu district.

SWTC is located in Binh Hoa - Chau Thanh with a total of 22.46 ha, capacity of 245 tons/day, includes 2 phases: Phase 1: investment in building complexes (leveling, roads, electricity, lighting, leachate treatment plant, auxiliary facilities (cafeteria, garage, analysis stations, ...) and landfill; phase 2 will investment in treatment plant of solid waste.

- Phase 1: investmen of solid waste landfill sanitary capacity 245 tons/day. This item was applied sanitary landfill technologies to handling domestic waste, industrial waste and medical waste for Long Xuyen city.
- Phase 2: Waste treatment plant, capacity of 245 tons/day: receiving and handling domestic waste, industrial waste and medical waste for Long Xuyen city. When the waste treatment

plants in operation, sanitary landfills using backup only when factories suspend operations because of technical reasons or the total of garbage greater than expected capacity.

- Solid waste is transported to plant and classified by manual and mechanization. Then, the organic waste is put into aerobic fermentation with high speed to produce fertilizer. Non-productive waste and recyclable waste is burned or buried.

***Relationship with Long Xuyen city-sub-project:*** All domestic solid waste, medical waste, construction waste generated from construction activities of the 4 zones LIA (LIA 1, 3, 5, 6), 2 roads (Hung Vuong extended and Tran Quang Dieu street) as well as dredged mud of 4 canals (Long Xuyen, Cai Son, Ong Manh, Ba Bau) will be collected, transported and processed at solid waste treatment complex in An Giang.



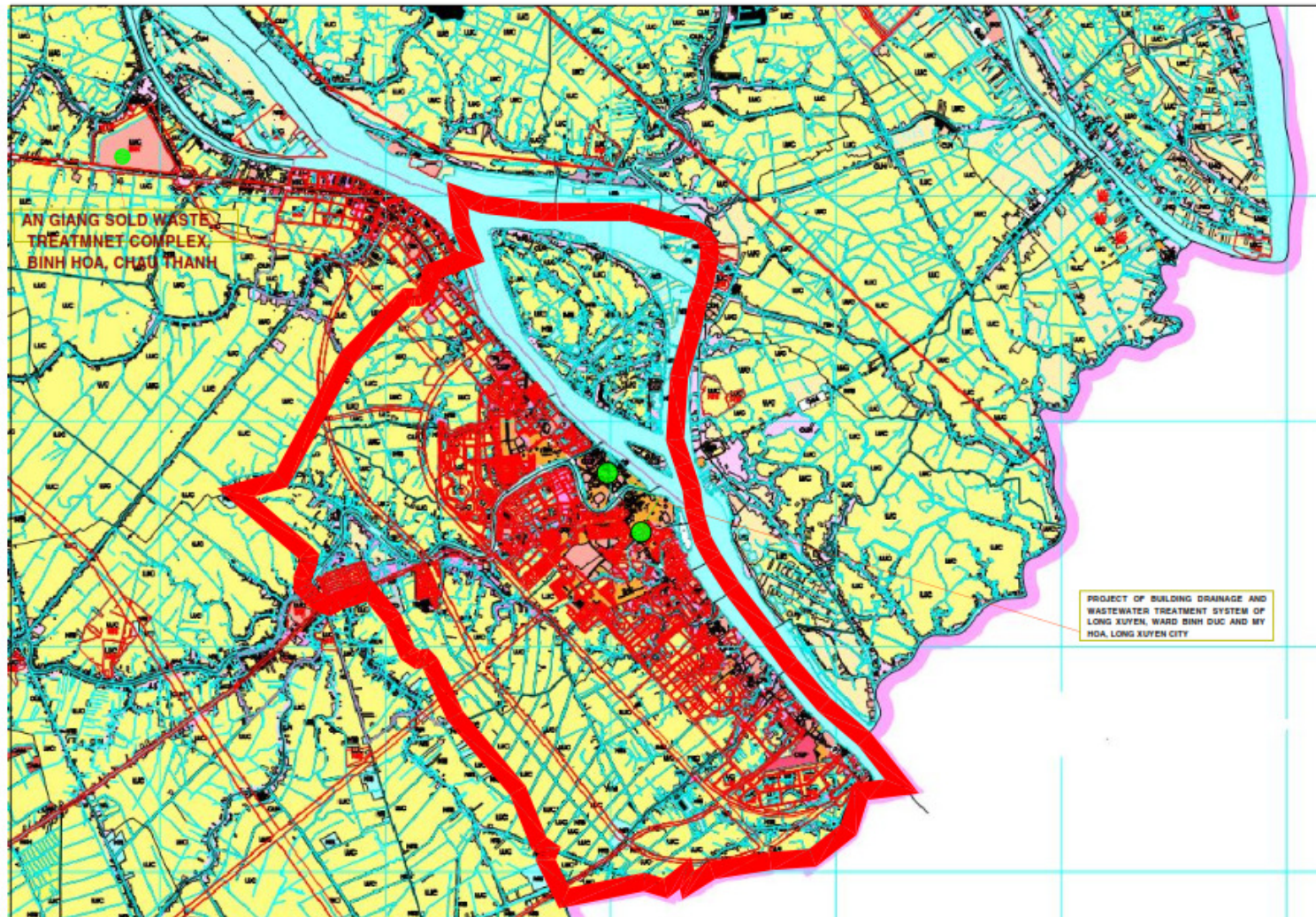


Figure 1.3: Map of linked project of Long Xuyen SUUP





Figure 1.4: The affected area expected for transporting raw materials and waste

### **1.3.7. Human resource and implementation management**

#### **❖ Government of Vietnam and World Bank**

The Government of Vietnam and the donors are agencies that manage, monitor and supervise the project implementation process through the following tasks: Monitoring and supervising the management and implementation of the project; supporting the ODA disbursement; solving problems that are not under the jurisdiction of management agency.

#### **❖ People's Committee of Long Xuyen Province**

- Coordinating with the Ministry of Planning and Investment, line ministries and relevant agencies to develop strategy, attractive plan and use of ODA; develop policies, measures for coordinating and improving the efficiency of ODA in province and towns;
- Coordinating with the Ministry of Planning and Investment to submit to the Government the signing of specific international agreements on ODA for the programs and projects corresponding to their responsibilities;
- Ensuring the quality and efficiency of ODA under direct management and implementation of local administrative agencies;
- Taking responsibility for land acquisition, clearance, implementation of policies on compensation and resettlement for the provincial programs and projects in accordance with legal regulations.
- Organizing and directing the effective implementation of provincial urban upgrading projects, managing in accordance to the approved plan, reporting periodically to the Ministry of Construction.
- Approving the feasibility study report for each project component in Long Xuyen Province.

#### **❖ Sub-project owner - People's Committee of Long Xuyen City**

The outputs from ESIA (mitigation measures and ESMP) will be incorporated in to the bidding documents, but not excluded:

- Implementing bidding practices in accordance with current legal regulations. ESMP will be incorporated into the bidding documents to ensure that mitigation is carried out effectively;
- Providing parties with documents and related information on the contracts and consultation with the establishment and implementation; responsible for the legal basis and the reliability of provided document and information on the program and project in accordance with legislations;
- Taking comprehensive and continuous responsibility for the management of investment capital from preparation, implementation to operation phases, revoking and repaying ODA (for the case of lending);
- Conducting the project monitoring, evaluation and management;
- Taking comprehensive responsibility for erroneous of the management practices that causes harmful consequences on economy, society, ecology, environment and national prestige;
- Taking responsibility, in accordance with legal regulations, for possible compensation of economic damages or making change in project owner if slow deployment and improper investment and approval decision of project, causing loss, waste and corruption, affecting the objectives and overall efficiency of the project;
- Keeping the rights and other responsibilities as regulated by legislation.

### 1.3.8. Investment Fund and Implementation Schedule of the Subproject

#### ❖ Investment fund

Total investment fund of the project is US\$ 48.6 million, of which:

- ODA fund: US\$ 40.0 million
- Counterpart fund: US\$ 8.6 million

#### ❖ Implementation schedule

Estimated implementing period: 6 years, from 2016 to 2021. The construction phase will be started from 2017 to 2022.

### 1.4. ESIA METHODS

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 Long Xuyen 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 Au Viet Center.
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 BASELINES OF THE SUBPROJECT AREA

### 2.1. GEOGRAPHICAL SETTINGS

#### 2.1.1. Topographical and Geological Conditions

##### 2.1.1.1. Topography

Long Xuyen city's terrain is generally quite flat with average ground elevation 1.0 – 2.5 m. The elevation of inner areas such as My Long ward, My Binh ward, and along Highway 91 is about 2.0 - 3.0 m. The elevation of the areas along Hau River, Long Xuyen canal, and roads varies from 1.5 - 2.5 m. The elevation of low-lying agricultural fields is less than 1.5 m.

Because of the low topography, the areas are flooded annually except downtown area. This situation should be taken into serious consideration in site selection and solution design for flooding prevention.

##### 2.1.1.2. Geology

Geology in Long Xuyen city is divided into the following stratigraphic units:

- Kind of aged Trias deposit –Dau Tieng Formation: Compositions of lower layer mainly include quartz sand-stone with gray or red color, thick subclasses; compositions of upper layer include medium and rough grains, multi-mineral components, sometimes it gets babbly with rock lenses.
- Kind of aged Creta deposit – Phu Quoc Formation: Compositions mainly include quartz sand-stone - fenspath which is white, sometime pinkish, subclasses from medium to denseness, alternates with babbly- rocks.
- Kind of aged Pleistocene deposit divided into the following stratigraphic units:
  - + Type of cross-sections of ancient offshore bench: Its essential deposit component is the kind of sand of rough grain which has a degree of bad choice confounding little powder and rolling blocks of origin rock.
  - + Type of cross- sections of the coastal shallow sea: The essential deposit composition is powder, clay, and a few coarse gravel lying in an adjoining part to bottom of the sea.
- ✓ Type of aged Holocene deposit: divided into the following layers:
  - + Medium Holocene has the origin of sea deposit: divided into 2 following cross-section types:
    - The cross-section type of the sea bench with essential component is sand with grains of sand are medium and smoothy mixing up little powder of clay and contains little coarse gravel.
    - The cross-section of deposit type of the shallow sea, estuaries, bays. It has just been seen in drill holes with their depths from 2- 3 m that changes from 2-3 m to more 10 m. The essential deposit is powder, sand, clay of smoothness, without much cascajo here, there are places where shells focus in the form of ranges (reef).
  - + Medium Holocene has the deposit origin of the sea - river: This group of deposit always reveals extensively on the face, holds the most area of An Giang province in the form of plains. This kind of deposit has transitive relation with the sea deposits of mid aged Holocene, its essential component is clay, powder clay, powder's colour is livid till brown, yellow, etc.
  - + Medium-upper Holocene, the under part has the origin of the sea deposit: The deposit composition consists of clay, packsand and there are not much cascajo here.

- + Medium-upper Holocene, the upper part has the origin of river marsh deposit: The deposit component consists of clay, powder, plant remains decomposed badly, brown coal.
- + Upper Holocene is divided into two different forms of deposit:
  - River-marsh deposit: This layer's essential component is brown coal, plants dead body, very little clay...which filled up ancient river-bed.
  - Deposit of rivers: Deposit of rivers is still called new alluvium deposit. The composition of deposit is mainly powder of clay and pack sand. Belonging to the composed conditions and environment, they were divided into types of deposit:
    - Deposit of natural dykes: is a range of land being pretty high, develops along two sides of banks of a river, the large irrigation pitch which was built up by materials of floods. Natural dyke strips have width of dozens of meters to several kilometers. Natural dyke has become residential land, residential area or roads.
    - Deposit of marsh after dykes: always occurs after dykes or in the middle of natural dykes, is a place where it has the terrain slightly hollow, the essential deposit materials are clay, powder.. The marsh after dykes is the area that is usually used for planting rice, is easy to be muddy and flooded.
    - Deposit of flooded fields (alluvium field): This is annually flooded area. Because the face of the earth extends, the flooded time lasts for long time so flooded fields are huge tanks where alluvium of silty grain of a river was deposited. The more the deposit alluvium layer is far from a river the better grains of alluvium are silty, which are less and less.
    - Deposit of slushy marshes and Trap: are small hollow areas, lying far from a river, the land has not conditions to get absorbent and flows out so the humidity maintains during the year. This is the adjoined place between low flooded field and the alluvium bench of foot of mountain. Deposit is mainly plants dead bodies living in marsh environment when dying they became an organic layer that is dense of 1-2 m, exceeds 20 % composition in the ground. Muddy marsh was called the land of Trap.

## **2.1.2. Climatic, Hydrological and Oceanographical Conditions**

### **2.1.2.1. Climate**

Long Xuyen City within An Giang Province is located in a tropical climate – monsoon area, which is hot and humid all year. It has 2 rainy and dry seasons, with relatively high and stable temperature, high and seasonally distributed rainfall.

#### **❖ Temperature**

The average annual temperature is 27.7 °C and seasonally change, but amplitude is small. The months during the dry season show the largest difference in temperature, about 1.5 °C – 3 °C. The temperature difference during rainy season is about 1 °C. The average daily temperature range is 3.4 °C, but the amplitude is quite large, from 8 to 12 °C. The highest average temperature during the dry season is 35 - 36°C. The lowest average during the rainy season is 20 – 21°C.

#### **❖ Rainfall**

Rainfall is affected by two windy seasons. The fluctuation of rainfall is relatively complex but the magnitude is not high. The annual rainfall is concentrated in rainy season from May to November, accounting for 90% of the total rainfall amount. The average annual rainfall is 908 - 1,260 mm; of which 750 – 1,047 mm is in rainy season, mostly concentrated in the month of October.

### ❖ Humidity

The evaporation in Long Xuyen city is seasonally changed. During the dry season water evaporation is quite high, usually accounting for about 2/3 of the evaporation of the year. The annual average evaporation is 1,200 mm - 1,300 mm/year, of which the highest amount is in March and April (over 160 mm/month). The lowest average evaporation is in September and October (about 80 mm/month). Air humidity seasonal variations, the average humidity dry season months of the year reached approximately 78.0 %, 75 % the lowest monthly gain and the highest 81 % month; in the rainy season the average monthly humidity over the years was over 82 %. The average humidity over the years was over 79 %/year. The basic data about the humidity of Chau Doc as follows:

- Average annual humidity:  $U_{bq} = 79.1 - 81.2 \%$ .
- The wettest month in September, reaching an average moisture content 84.0 %.
- The driest month is March, reaching an average moisture content 77.4 %.

### ❖ Sunshine

The average number of sunshine hours of Long Xuyen City is relatively high and equal in months. The total average sunshine hours is 2,703.7 hours in 2015, with the lowest is in July (164.1 hours), and the highest is in May (255.1 hours).

### ❖ Wind, Storm

The wind regime in An Giang province is largely homogeneous with two distinct monsoon. From May to October, the Southwest monsoon brings steam to rain; from November to April, the Northeast monsoon is characterized by coldness and dryness; the average wind speed is about 3 m/s.

An Giang is not located in the areas affected by storms; the tornado phenomenon has occurred in the rainy season but with a low frequency so the degree of influence is not high.

In summary, with high annual temperature, a lot of sunny and less storm, weather conditions in An Giang is very favorable for the development of agriculture and intensive cultivation that could increase crop yields on large scale and over time.

#### *2.1.2.2. Hydrological and Oceanographical Conditions*

### ❖ River systems

Long Xuyen city has 2 major rivers:

- Hau River originates from the Mekong River upstream (starting at the side of the Kingdom of Cambodia): the river flows through some locations: An Phu - Tan Chau town - Phu Tan - Chau Phu - An Giang province's Cho Moi and to Long Xuyen city. Then, the river continues to flow to Dong Thap province, Can Tho province, Vinh Long province, Soc Trang province and Tra Vinh province before flowing into the sea under the Dinh An estuary, forming a continuous waterway that links those provinces together. Hau River sections flowing through the territory of Long Xuyen City that has 15 km in length, an average width of 800 to 1,000 m. Hau River is a source of fresh water for the provinces as well as acts as the important national and international transportation point of the Mekong Delta region.
- Long Xuyen canal is one of the biggest canals in An Giang province. Long Xuyen canal originates from the Hau River in My Binh ward, Long Xuyen city (the section in the city is 11 km long) and flows Northeast - Southwest with a length of about 18 km, connects with Thoai Ha canal (Dong Phu Commune, Vinh Trach Commune, Thoai Son District) passing by Sap Mountain, and finally flowing into the West Sea in Rach Gia, Kien Giang. Long



### ❖ Flood

Every year during the flood season, Long Xuyen is less affected than other areas in the province due to the average high topography of the city (the average elevation of 1.1 m - 2.5 m) and the main infrastructures are mostly being completed, except for My Hoa Hung commune where erosion in some areas happens during flood season.

### 2.1.3. Natural resources

#### ❖ Land resources

According to reports of land plan in Long Xuyen city period 2011 - 2020, there are 03 main types of land:

- Alluvial soil: 8,358 ha, accounts for 72.46 % of the total natural area. Currently, most of this type of land area in Long Xuyen City is used for agriculture purposes (rice cultivation, aquaculture, perennial plants) and the rest is used for residential housing, public works (roads, schools, stations, etc.).
- Riverside inking soil : 1,284 ha, accounts for 11.14 % of the total area, mainly in My Hoa Hung commune. This type of soil with clay composition is higher than the other riverside soil types.
- River, ditch, canal land: Long Xuyen has approximately 1,900.93 ha of this land, accounting for 16.40 % of the total natural area, providing sufficient surface water for production needs and daily activities for people.

In fact, despite some limitations, the soil of Long Xuyen city is relatively good in overall and it is suitable both for investment and agricultural and non-agricultural development.

#### ❖ Water resources

##### *Rain water*

According to data of the 2015 Statistical Yearbook of the city, from May to November, rainfall in Long Xuyen city is abundant, accounting for 81% of annual rainfall with a total average annual rainfall of 916 mm. However, the current rainwater is not clean, because of dust in the air and bacteria due to human and production activities. Rainwater must be settled and filtered before use.

##### *Surface water*

Surface water of Long Xuyen city is provided mainly from Hau River systems flowing through the territory of Long Xuyen with a length of about 15 km. Hau River average flow is 18,000 m<sup>3</sup>/s which is able to supply water into inner canals for production needs even in the dry season. Surface water is now considered a major source of water for irrigation for most of the cultivated area of the city. In addition to providing for agricultural production and other manufacturing sectors, surface water serves as a primary source for domestic uses, for the seafood processing plants, aquaculture cages. While it is abundant, it is faced with harmful effects of urbanization, industrialization in the city and An Giang province in general, especially pollution, especially in urban areas densely populated, the seafood processing plants and aquaculture sector.

In general, the flow and volume of surface water in Long Xuyen, mostly freshwater, is quite abundant and favorable for the city to develop agriculture and industries of the non-agricultural sector. Besides the exploitation and use of surface water, the city also needs to have policies to manage water resources more closely in order to navigate to a pure environment and sustainable.

##### *Groundwater*

According to the research of many experts, the ground water of Long Xuyen is of very large volume, used for many purposes. According the survey of Water Resources Administration, An



Giang is one of the provinces where groundwater resource is relatively abundant but highest infected with arsenic Mekong Delta provinces. Many recent surveys show that groundwater quality in the city of Long Xuyen is declining, infected with Coliform, E.coli, etc. This situation exposes potential risks to the health for people and therefore corrective measures to the groundwater resources of the city should be taken for more efficient and hygienic uses (especially the water supply plant) and to relieve the pressure on surface water, which is also polluted.

#### ❖ Biological resources

According to Decision No. 1107/QĐ-BTNMT dated 12/05/2015 of the Ministry of Natural Resources and Environment on the list of protected areas, An Giang province has 4 protection areas:

**Table 2.1: Protected Areas in An Giang province**

No.	Name	Area (ha)	Management organization
1	Nui Sam	171	People's Committee of An Giang province
2	Thoai Son	370.5	People's Committee of An Giang province
3	Tra Su	1,050	People's Committee of An Giang province
4	Tuc Dup	200	People's Committee of An Giang province

Sam Mount, Tuc Dup Hill: 50km from the project area westward, belongs to Bay Nui forest ecosystem (33 hills linking together, but also some freestanding hills, surrounded by the plains) are considered areas of high biodiversity. Bay Nui forest in An Giang province is rich and diverse; survey results show that there are about 815 species of plants (116 species of large trees, 149 species of woody plants, 208 species of shrubs, 105 vines, 178 herbage species, 34 species in Psilotophyta, 25 species of parasitic and, epiphyte plants).

Thoai Son Mount (as also known as Sap Mount): is located in the town of Nui Sap, Thoai Son district, An Giang province. It is home to Sap Mount resort at the elevation of 85 m with a circumference of 3,800 m, 29 km far from Long Xuyen City along Provincial Road 943, and other tourism projects such as Phao Dai, Cay Da, Hang Doi and some pagodas such as Linh Son pagoda, Phap Hoa monastery with the Maitreya Buddha statue of 8 m high, Duyen Phuoc pagoda as the most beautiful at the highest position on the mountain. Recognizing the special value of tourism resources from Thoai Son, People's Committee of An Giang Province has issued regulations banning the exploitation of mineral resources for building stones containing potassium and sodium in this area.

Tra Su forest is 45 km from the project area to the Northwest in an area of 845 ha, hosts a natural ecosystems of highly scientific significance, serving as a food source and habitat for many animals, especially birds. 11 species of mammals and 70 species of birds have been identified in this area. Notably indian stork and darters are listed in the Vietnam Red Book; there are 20 species of reptiles and five species of amphibians. Tra Su forest has about 23 species of fish, of which 10 species are found throughout the year (alum resilient fish) and 13 species appearing in the flood season (not alum resilient fish).

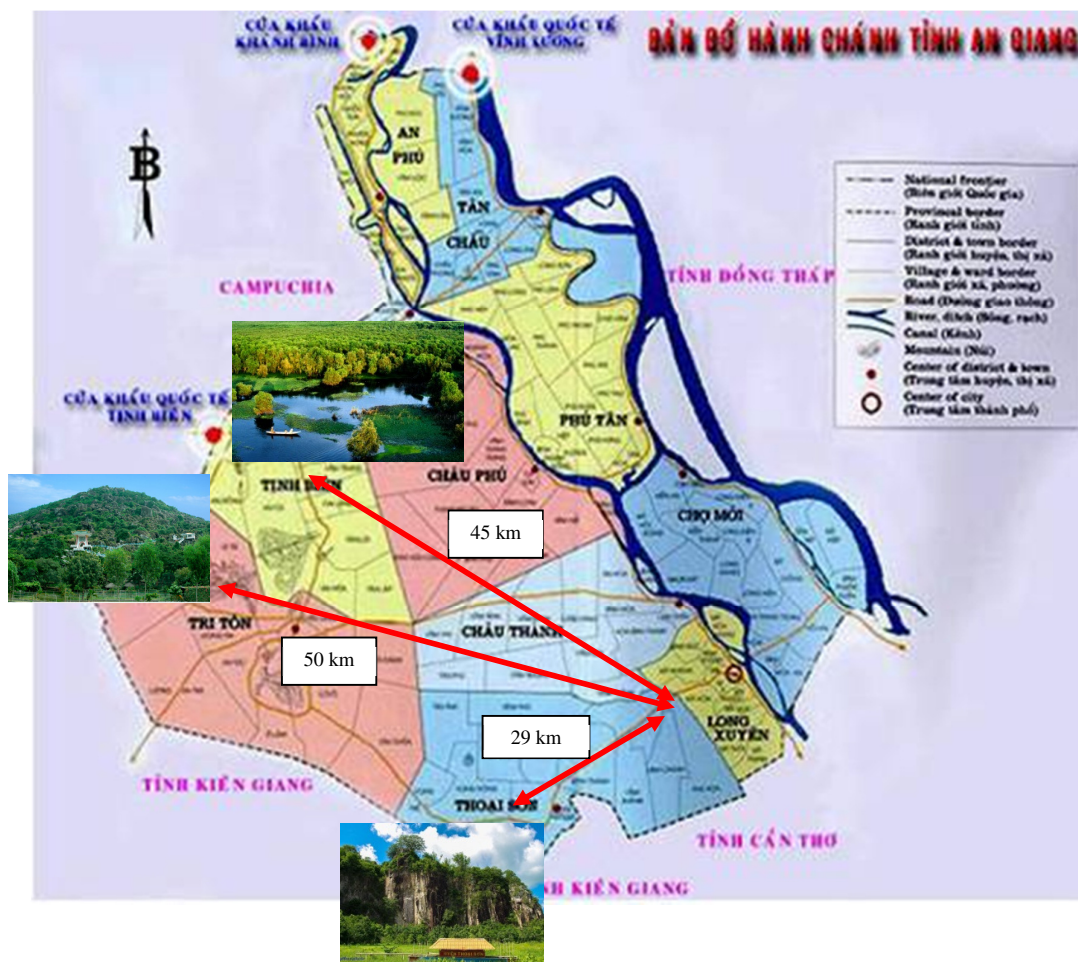


Figure 2.2: Location of the Long Xuyen city and protected areas

#### **Ecological conditions in the project area:**

- The observation of the current status of the project area shows:
- Terrestrial ecosystem: there is no wildlife or animal threatened by extinction in 7 wards in the project area. The project area mainly consists of agricultural and residential land. The vegetation within the project mostly contains of some fruit trees (mango, jackfruit, water coconut, ...), vegetables (okra, spinach, vegetables, ...), Timber (bamboo, eucalyptus,...). Some shrubs are also found such as chamber bitter, purple taro, pistia, sedge, ... and weeds. In the area, there are other animals such as frogs, clones, reptiles, insects, birds, ... that live along the banks of the canal to be dredged.
- Aquatic ecosystem: The survey over the project site show that the aquatic ecosystem is found in basin of Ba Bau canal, Ong Manh canal, Cai Son canal and Long Xuyen canal. Aquatic species include mostly natural ones such as eel, black carp, tilapia, barp and some other crustaceans such as shrimp, snail and some molluscs. In addition, some species of aquatic plants are also found such as spinach (cultivated by the people), hyacinth, common water hyacinth... None of them is considered rare species listed by international and Vietnam Red Books.

#### **❖ Mineral resources**

In the Long Xuyen city, according to the survey results of the project "Urban Geology Survey of Long Xuyen" conducted by the Southern Geological and hydrological Union in 1997 shows that, the city's mineral resource is not abundant as only 2 key minerals are identified:



- Clay: concentrating in two large mines.
  - A mine located in Northwest of Binh Duc ward, 6km from the center of Long Xuyen city, has reserves about 18,700,000 m<sup>3</sup> and the exploitable volume is 9,000,000 m<sup>3</sup>;
  - Another mine located in My Thanh Ward, 5.5 km from the center of Long Xuyen city to the Southeast, has reserves about 25,500,000 m<sup>3</sup>, and the exploitable volume is 12,500,000 m<sup>3</sup>. These two largest clay mines in Long Xuyen are barely operational at the moment. Apart from these mines, clay also distributed in some other areas but not of significant reserve and quality.
  - Sand: sedimated with Hau River flow and largely concentrated in the Hau River section in My Phuoc Ward.. This underwater sand bar locates on the right riverside, extending over 1 km towards the northeast – southwest with estimated volume of about 1,500,000 m<sup>3</sup>.

Overall, in Long Xuyen city, mineral resources include only clay and sand. While the potential and exploitation conditions are promising and analysis of socio-economic efficiency and environmental adverse changes should be taken into account.

## **2.2. ENVIROMENTAL QUALITY BASELINES IN THE PROJECT AREA**

In order to assess the status of environmental components in the project area, the project owner and consultant, in collaboration with Au Viet Center for Environmental Analysis, carried out site investigations, sampling and collecting relevant information on environmental status conditions. Collected samples were transported to the laboratory for analyzing in accordance with Vietnamese standards. Detailed results of each sampling site are shown in Appendix 3. The map of monitoring sites for baseline environmental quality is presented in Appendix 3.

### **2.2.1. Air quality**

The subproject's owner and consultant conducted monitoring, sampling and analyzing 21 air samples in the subproject area.

Sampling date: 27 and 28 August 2016;

Weather conditions: sunny, light windy; air temperature was 29-34<sup>0</sup>C, air humidity was 60-80%.

The results shows that the air quality of all samples are within the national permissible limits (see Table 2.2).

**Table 2.2: Analysis Results of Air Quality**

Code	Name	Location	Measurement and Analysis Indicators					
			Dust <sup>(*)</sup>	NO <sub>2</sub> <sup>(*)</sup>	SO <sub>2</sub> <sup>(*)</sup>	CO	Noise <sup>(*)</sup>	Vibration
			µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	dBA	dB
A1	LIA 1	Alley near intersection of Chau Van Liem and Nguyen Du street	118	23	26	5,120	63,2	32,04
A2		The end point of Khom Alley on Nguyen Du street	101	25	22	5,310	58,9	32,04
A3	LIA 3	Intersection of Ngo Van So street and expected Tran Quang Dieu street	104	18	21	<5,000	59,2	36,90
A4	LIA 5	In front of Long Xuyen Bishop court	114	23	19	5,045	63,0	35,56
A5		Intersection of Phan Liem street and Highway 91	125	34	35	5,330	69,8	35,56
A6	LIA 6	Intersection of Ly Thai To and Thoai Ngoc Hau street near Quang Te Pagoda	143	38	36	5,250	72,7	33,98
A7		Alley on Chau Thi Te street near Cai Son canal	98	23	27	5,180	64,2	36,90
A8	Tran Quang Dieu street	Intersection of expected Tran Quang Dieu street and Nguyen Thai Hoc street	107	19	21	<5,000	67,4	36,90
A9	Hung Vuong street	Exist Hung Vuong street, near factories	129	38	42	5,460	69,4	38,06
A10		Intersection of Expected Hung Vuong street and Trieu Quang Phuc	105	25	28	5,140	57,6	36,90
A11	Long Xuyen canal	Intersection at O Moi ferry terminal	132	34	36	5,350	63,6	33,98
A12		On Bui Van Danh street, near Phuoc Hau Pagoda	106	24	26	5,050	57.9	36.90
A13		On Bui Van Danh street, near Ton Duc Thang bridge	121	21	23	5,070	67.3	36.90
A14	Cai Son canal	The bridge spans Cai Son canal, near Son Binh Dan Hospital	87	28	30	5,327	73.6	32.04
A15		The bridge over Cai Son canal, on Kenh Dao street	92	19	22	5,015	64.6	33.98
A16	Ong Manh canal	Intersection of Ong Manh canal and Hoang Ha Ho street	136	34	35	5,025	60.3	35.56
A17		The end point of Ong Manh canal, near Bat Nha monastary	102	30	33	5,021	63.6	35.56
A18	Ba Bau canal	The begin point of Ba Bau canal and Ha Hoang Ho street	116	21	25	<5,000	48.7	35.56
A19		The end point of Ba Bau canal	118	18	22	5,005	48.5	35.56
A20	Resettlement area	Field borders the resettlement area	81	17	19	<5,000	58.7	36.90
A21		Existing residential area in the resettlement area	95	24	27	5,240	48.2	36.90
QCVN 05:2013/BTNMT (Average 1 hour)			300	200	350	30,000	-	-
QCVN 26:2010/BTNMT			-	-	-	-	70	-
QCVN 27:2010/BTNMT			-	-	-	-	-	75

Notes:

- QCVN 26:2010/BTNMT: National technical regulation on noise
- QCVN 27:2010/BTNMT: National technical regulation on vibration
- (\*): analysis parameter is certified by Vilas

Remarks:

- At the short dead-end concreted alleys (samples A7, A14, A15, A20, and A21): dust level is lowest varied within the range of 81 – 98  $\mu\text{g}/\text{m}^3$  due to low traffic flow.
- At the small earth alleys near the canals (samples A2, A3, A12, A17, A18 and A19) (type 2): the dust levels are varied in the range of 100 – 120  $\mu\text{g}/\text{m}^3$ , higher than those dead-end alleys. The alleys at this positions are not concreted completely causing the distribution of dust in the air.
- At the intersection and at of big roads (samples A5, A6, A9 and A11), dust levels are highest due to high traffic density. Nevertheless, it is noted that for those positions, the dust levels are within the permissible limits.

**2.2.1. Water Quality****2.2.1.1. Surface water**

Sampling sites and monitoring results of surface water quality are shown in Table 2.3.

**Table 2.3: Monitoring Results of Surface Water Quality**

Code	Sampling time	Measurement and Analysis Parameters													E.coli
		pH (*)	DO	TSS (*)	COD (*)	BOD <sub>5</sub> (*)	P-PO <sub>4</sub> <sup>3-</sup> (*)	N-NH <sub>4</sub> <sup>+</sup> (*)	N-NO <sub>2</sub> <sup>-</sup> (*)	N-NO <sub>3</sub> <sup>-</sup>	Cl <sup>-</sup>	Fe	Surfactant	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	
SW1	ST	7.55	6.72	84	2.56	1.82	0.009	ND	ND	0.15	77.9	1.3	ND	90	0
	NT	7.32	5.17	75	5.56	3.17	0.011	ND	ND	0.14	111	1.0	ND	30	0
SW2	ST	7.35	<b>3.62</b>	<b>106</b>	<b>76.8</b>	<b>42.1</b>	0.090	<b>2.19</b>	0.005	1.87	75.6	1.42	0.15	<b>48×10<sup>3</sup></b>	30
	NT	7.40	4.05	<b>85</b>	<b>64</b>	<b>36.2</b>	0.072	<b>1.67</b>	0.003	1.24	75.8	0.87	0.11	<b>36×10<sup>3</sup></b>	18
SW3	ST	7.50	6.77	<b>92</b>	1.6	1.01	ND	ND	ND	0.08	81.5	1.5	ND	1.8×10 <sup>2</sup>	0
	NT	7.39	5.80	<b>65</b>	5.12	3.22	0.015	ND	ND	0.11	77.5	0.69	ND	2.7×10 <sup>2</sup>	0
SW4	ST	7.45	4.75	<b>136</b>	25.6	15.7	0.024	0.28	ND	0.57	78	0.71	0.06	2.4×10 <sup>3</sup>	120
	NT	7.47	4.25	<b>400</b>	12.8	7.12	0.018	0.17	ND	0.16	75.6	0.99	0.01	1.2×10 <sup>3</sup>	180

Code	Sampling time	Measurement and Analysis Parameters													E.coli
		pH (*)	DO	TSS (*)	COD (*)	BOD <sub>5</sub> (*)	P-PO <sub>4</sub> <sup>3-</sup> (*)	N-NH <sub>4</sub> <sup>+</sup> (*)	N-NO <sub>2</sub> <sup>-</sup> (*)	N-NO <sub>3</sub> <sup>-</sup>	Cl <sup>-</sup>	Fe	Surfactant	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	
SW5	ST	7.45	<b>3.05</b>	<b>62</b>	<b>70.4</b>	<b>38.9</b>	0.17	<b>1.57</b>	ND	0.97	78.8	1.20	<b>0.98</b>	<b>21×10<sup>3</sup></b>	<b>150</b>
	NT	7.50	4.18	<b>120</b>	28	<b>16.3</b>	0.092	0.87	ND	0.65	78.5	0.95	0.09	6×10 <sup>3</sup>	60
SW6	ST	7.50	4.63	<b>141</b>	<b>83.2</b>	<b>42.2</b>	0.051	<b>2.27</b>	0.008	1.85	75.1	<b>1.70</b>	0.35	<b>69×10<sup>3</sup></b>	<b>120</b>
	NT	7.42	5.73	<b>74</b>	<b>224</b>	<b>142.1</b>	0.182	<b>2.87</b>	0.010	2.41	76.2	0.77	0.17	<b>74×10<sup>3</sup></b>	<b>180</b>
SW7	ST	7.30	<b>2.94</b>	12	<b>96</b>	<b>52.4</b>	0.154	<b>2.55</b>	0.007	2.17	126	0.91	0.25	<b>36×10<sup>3</sup></b>	<b>2,700</b>
	NT	7.25	<b>2.28</b>	<b>107</b>	32	<b>18.4</b>	0.077	0.68	ND	0.57	256	<b>1.55</b>	0.13	4.8×10 <sup>3</sup>	<b>120</b>
SW8	ST	7.25	<b>2.99</b>	15	<b>60.8</b>	<b>32.5</b>	0.132	<b>0.95</b>	0.008	0.68	122	0.88	0.38	<b>52×10<sup>3</sup></b>	<b>270</b>
	NT	7.45	<b>2.04</b>	<b>193</b>	<b>51.2</b>	<b>29.2</b>	0.071	0.87	ND	0.62	123	0.75	0.32	<b>12×10<sup>3</sup></b>	<b>180</b>
SW9	ST	7.27	4.92	<b>143</b>	3.2	1.9	0.008	ND	ND	0.11	82	1.34	ND	3.3×10 <sup>3</sup>	0
	NT	7.45	<b>2.12</b>	32	<b>83.2</b>	<b>43.1</b>	0.122	<b>2.19</b>	0.005	1.85	320	<b>2.0</b>	<b>0.51</b>	6.3×10 <sup>3</sup>	<b>120</b>
SW10	ST	7.20	4.70	<b>92</b>	32	<b>17.8</b>	0.115	0.71	0.003	0.67	80.3	<b>1.70</b>	0.17	<b>39×10<sup>3</sup></b>	90
	NT	7.43	<b>2.35</b>	30	<b>64</b>	<b>35.8</b>	0.275	1.14	ND	1.09	200	<b>1.60</b>	0.28	<b>51×10<sup>3</sup></b>	<b>210</b>
SW11	ST	7.45	4.53	<b>74</b>	1.92	1.15	ND	ND	ND	0.03	75.3	0.59	ND	1.2×10 <sup>2</sup>	0
	NT	7.36	5.55	<b>154</b>	12.8	6.92	0.042	0.15	ND	0.10	74.1	0.87	0.05	2.4×10 <sup>2</sup>	0
SW12	ST	7.55	4.66	<b>69</b>	<b>70.4</b>	<b>36.5</b>	<b>0.324</b>	<b>2.73</b>	0.006	2.62	76	1.21	<b>0.92</b>	<b>27×10<sup>3</sup></b>	<b>210</b>
	NT	7.45	4.32	<b>244</b>	<b>108</b>	<b>53.7</b>	<b>0.572</b>	<b>2.65</b>	ND	2.54	79	1.37	<b>0.51</b>	<b>63×10<sup>3</sup></b>	<b>240</b>
SW13	ST	7.30	4.69	<b>69</b>	3.2	1.9	0.003	0.12	ND	0.08	75.5	0.90	ND	2.7×10 <sup>2</sup>	0
	NT	7.41	5.125	<b>169</b>	32	<b>17.5</b>	0.158	<b>0.92</b>	ND	0.87	77.5	0.71	<b>0.62</b>	3.9×10 <sup>3</sup>	3
SW14	ST	7.23	<b>2.82</b>	<b>79</b>	<b>70.4</b>	<b>36.9</b>	0.275	<b>2.25</b>	0.008	2.07	<b>362</b>	1.2	<b>0.86</b>	<b>33×10<sup>3</sup></b>	<b>210</b>
	NT	7.52	<b>2.58</b>	<b>53</b>	64	<b>35.2</b>	0.238	<b>1.62</b>	ND	1.47	295	0.95	<b>0.64</b>	<b>15×10<sup>3</sup></b>	<b>120</b>
SW15	ST	7.29	4.87	<b>247</b>	2.56	1.89	ND	ND	ND	0.09	122	0.89	ND	2.7×10 <sup>2</sup>	0
	NT	7.30	<b>3.10</b>	7	2.56	1.92	ND	ND	ND	0.05	104	0.9	ND	4.5×10 <sup>2</sup>	0

Code	Sampling time	Measurement and Analysis Parameters													E.coli
		pH (*)	DO	TSS (*)	COD (*)	BOD <sub>5</sub> (*)	P-PO <sub>4</sub> <sup>3-</sup> (*)	N-NH <sub>4</sub> <sup>+</sup> (*)	N-NO <sub>2</sub> <sup>-</sup> (*)	N-NO <sub>3</sub> <sup>-</sup>	Cl <sup>-</sup>	Fe	Surfactant	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	
QCV N 08-MT:2015/BTNMT	Class A2	6-8,5	≥ 5	30	15	6	0,2	0,3	0,05	5	350	1	0,2	5.000	50
	Class B1	5,5-9	≥ 4	50	30	15	0,3	0,9	0,05	10	350	1,5	0,4	7.500	100
	Class B2	5,5-9	≥ 2	100	50	25	0.5	0.9	0.05	15	-	2	0.5	10,000	200

SW1: At Hau River, bordering Nguyen Du embankment, distance to Long Xuyen canal about 350 m;

SW2: Intersection Long Xuyen canal and Hau River;

SW3: Long Xuyen canal, near Ong Manh bridge;

SW4: Hau River near An Hoa ferry (distance about 30 m);

SW5: Long Xuyen canal, between Duy Tan bridge and Hoang Dieu bridge;

SW6: Long Xuyen canal, Ton Duc Thang Street Bridge toward upstream 150 m;

SW7: Cai Son canal, near Cai Son bridge crossing with Tran Hung Dao street;

SW8: Cai Son canal, distance to Hau River about 350 m;

SW9: Ong Manh canal, distance Ong Manh bridge about 200 m;

SW10: Ong Manh canal (not crowded), distance to Bui Van Danh about;

SW11: At Long Xuyen canal, the distance to the end of Ong Manh canal about 300 m;

SW12: Long Xuyen canal, distance to TL943 about 100 m;

SW13: Long Xuyen canal, distance to endpoint of Ba Bau canal about 300 m;

SW14: Ba Bau canal crossing with Hoang Ha Ho street;

SW: Ba Bau canal, distance to endpoint about 250 m.

Notes: ND: Not Detected LOD: level of detection ST: Spring-tide NT: Neap-tide

- QCVN 08-MT:2015/BTNMT: National Technical Regulation on Surface Water Quality.
- Class A2: Regulating water sources using for domestic water supply and must be properly treated; aquatic animals and plants conservation or other purposes as classes B1 and B2.
- Class B1: Regulating water sources using for irrigation or other purposes with similar quality requirement or other purposes as class B2.
- Class B2: Navigation/inland waterways and other purposes with the requirement of low water quality.

**Remarks:**

- There is a significant difference between the water quality at high flow (at Hau River) and at small flow water courses (canals). Most of parameters at high-flow stream reached national technical regulation for water used for water supply purpose (QCVN 08:2008/ BTNMT, class A2).
- 05/15 water samples at high tide are more polluted than at low tide. There are some reasons for this result:
- The sampling time was at beginning tides, so the deposition of pollutants at low tide are strongly disturbed and diffuse back in the water.
- The canals are affected by semidiurnal tidal regime and when the tide is low pollutants in the flow are not going away. In high tide, part of this pollution resonates with the pollution in the tide, making the initial water quality is unstable. At the highest tide the pollutants are possibly diluted by the flow and thereby making the water quality more stable.

The surface water quality of each water sources is presented below:

**Water quality of Hau River**

The project will conduct the rehabilitation for Long Xuyen Canal at the intersection with Hau River. Samples in Hau River were collected at the upstream (SW1); downstream (SW4); and at the intersection with Long Xuyen canal at both high and low tides.

- At the upstream (SW1): all indicators are within limits except for TSS exceeding 2.5 - 2.8 times; Fe exceeding 1.3 times;
- At location SW2: DO is lower than the allowable limits by 1.2 – 1.3 times; TSS exceeds 2.8 – 3.5 times; COD exceeds 4.3 - 5.1 times; BOD<sub>5</sub> exceeds 6.0 - 7.0 times; N-NH<sub>4</sub><sup>+</sup> exceeds 5.6 - 7.3 times; Fe exceeds 1.4 times; Coliform exceeds 7.2 - 9.6 times. The water quality of Hau River at the intersection is more polluted than the upstream, which could be explained by the pollution from Long Xuyen canal.
- At the downstream of Hau River (SW4): DO is lower than the allowable limits by 1.05 -1.18 times. TSS exceeds 4.5 - 13.3 times; COD exceeds 1.7 times; BOD<sub>5</sub> exceeds 1.1 - 2.6 times; E.coli exceeds 2.4 - 3.6 times. Thus, compare the water at the intersection, the pollution trends is decreased. This can be explained that the pollutant have been diluted due to the high flows between the sampling points.

**Water quality of surface water of Long Xuyen canal**

Long Xuyen canal flow rate is greater than those in Cai Son canal, Ong Manh canal and Ba Bau canal. However, the canal is polluted by directly discharged waste from households living along canals. The surface water quality in Long Xuyen canal is reflected by the parameters analyzed in location SW6 as follows: TSS exceeded 1.4 times; COD exceeded 1.4 to 4.5 times; BOD<sub>5</sub> exceeds 1.7 to 5.7 times; N-NH<sub>4</sub><sup>+</sup> exceeded 2.5 to 3.2 times; Coliform exceeds 6.9 to 7.5 times.

**Water quality of Ong Manh, Ba Bau and Cai Son canal**

The results clearly indicates that water of the canals are polluted by organic matters (TSS exceeds 1.0 – 4.0 times; COD exceeds 1.7 – 7.4 times; BOD<sub>5</sub> exceeds 1.2 – 9.5 times; NH<sub>4</sub><sup>+</sup> exceeds 1.0 – 3.2 times; Coliform exceeds 2.0 – 9.7 times; E.Coli exceeds 1.2 – 27.0 times). This results from the waste littering from trading and living activities from markets and residential areas.

The monitoring on surface water quality in Long Xuyen city (at Hau River, Cai Son Canal, Ong Manh Canal and Long Xuyen Canal) could be referred to those conducted by provincial DONRE. According to the DONRE's data from 2013 to 2015, Hau River's water quality is good as for domestic water supply. Water quality in the canals is heavily contaminated.



### ***2.2.1.2. Groundwater quality***

The clean water supply system is gradually improved in Long Xuyen City. Most households and production facilities are using water supplied from local water supply schemes for domestic and production uses. Groundwater mainly is used for car washing, livestock and farming. The surrounding area the project area is densely populated without agricultural and farming activities. Therefore, it is not possible to collect the ground water samples.

The data on ground water quality in Long Xuyen city could be referred to those monitored by provincial DONRE. According to the DONRE's data from 2010 to 2014, the ground well water quality did not meet national standards (QCVN 09:2008/BTNMT) for TS, N-NH<sub>3</sub>, hardness and Coliforms. The results of groundwater monitoring also showed that the instability of the parameters. Specifically, TS values in shallow wells were much higher than those in the deep wells and tended to decrease over years; N-NH<sub>3</sub> values reduced over years, and nearly reached the standard. Hardness in groundwater tends to rise from 2010 until now. Coliforms are detected in the water with high density. As a result, the ground water could only be used for production, washing; but not for eating and drinking.

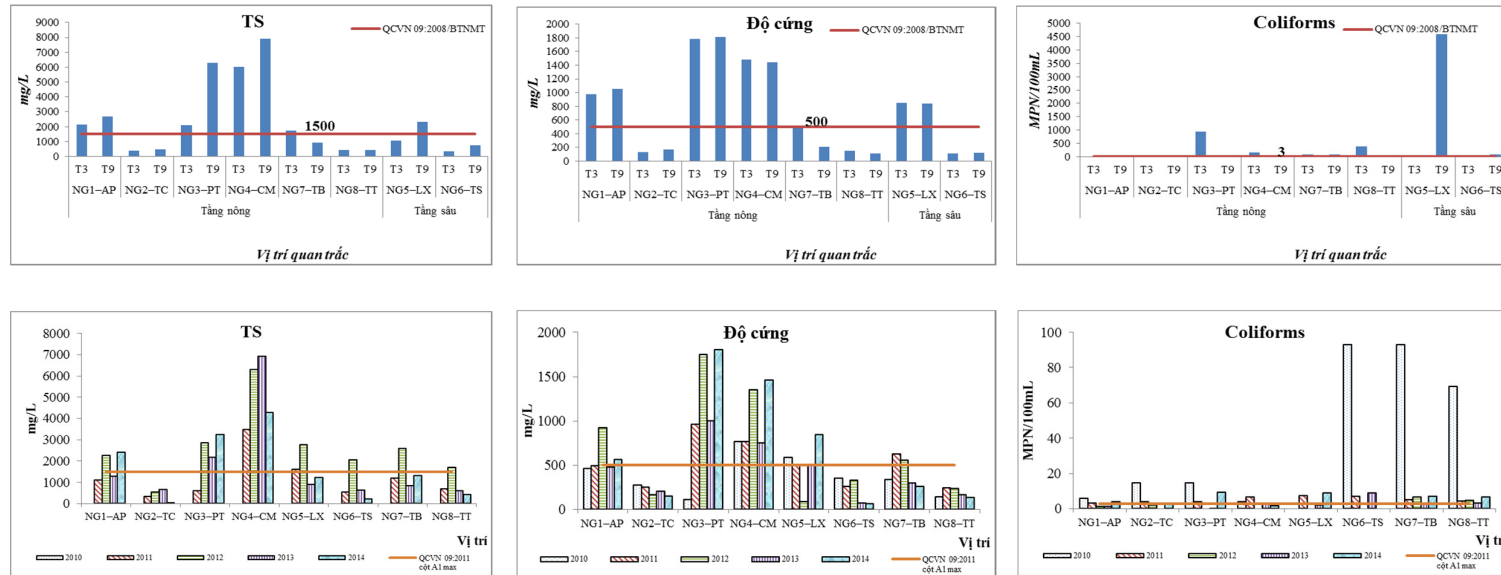


Figure 2.3: Charts of groundwater quality in 2014 (A) and the period 2010 – 2014 (B)

### 2.2.1.3. Domestic Wastewater Quality

Sampling sites and monitoring results are depicted in Table 2.4.

Table 2.4: Monitoring Results of Wastewater Quality

Code	Sampling location	Measurement and analysis indicators										
		pH (*)	BOD <sub>5</sub> (*)	TSS (*)	S <sup>2-</sup> (per 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>	Total Coliform	Grease	Surfactant
		-	mgO <sub>2</sub> /l	mg/l	mg/l	mgO <sub>2</sub> /l	mg/l	mg/l	mg/l	MPN/100 ml	mg/l	mg/l
WW1	Centralized sewage of residential area on Nguyen Du	7.5	148.5	95	0.034	300.8	2.83	21.5	2.31	16×10 <sup>5</sup>	4.35	0.156
WW2	Wastewater in the fisheries sector at Long Xuyen market	7.44	76	208	0.019	320	3.28	25.4	3.24	3×10 <sup>6</sup>	5.53	0.234
WW3	Domestic wastewater of the population living on Long Xuyen canal, distance O Moi ferry about 200m	7.55	34	56	0.027	288	1.98	18.6	1.96	24×10 <sup>5</sup>	3.98	0.315
QCVN 14:2008/BTNMT, Class B		5 – 9	50	100	4	-	10	50	10	5,000	20	10

*Note:* QCVN 14: 2008/BTNMT: National Technical Regulation on Wastewater Quality

**Remarks:** Analytical results showed that wastewater from the activities of the people living in Long Xuyen city have some indicators exceeded allowed limits, specifically: Coliform 320 - 600 times, BOD<sub>5</sub> exceeded 1.5 – 3.0 times; TSS at area of seafood market exceeded 2.0 times. Because the wastewater does not have pre-treatment stage, so the concentration of pollutants is much higher than the national standards.

### 2.2.2. Soil quality

The report has collected 21 samples to determine the soil quality in the project area to evaluate the impact of construction. Based on that, the proposed measures are implemented for the excavated soil. Sampling locations and results of the soil samples are presented in Table 2.5.

**Table 2.5: Monitoring Results of Soil Quality**

Code	Items	Sampling location	Measurement and analysis parameters				
			As	Cd	Zn	Cu	Pb
			mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK
S1	LIA 1	Land in the alley near the intersection of Nguyen Du and Chau Van Liem street.	0.090	0.273	<b>335.61</b>	19.28	ND
S2		Land at the end of the alley on Nguyen Du street.	0.052	0.105	79.57	6.22	0.195
S3	LIA 3	Intersection Ngo Van So street and Tran Quang Dieu street.	0.024	0.047	44.87	1.93	ND
S4	LIA 5	Soil samples in embankments on Bui Van Danh street	0.167	0.457	200.04	61.63	5.12
S5		Soil samples for public tree planting at the intersection Phan Liem and Highway 91.	0.247	0.610	<b>310.59</b>	252.10	74.95
S6	LIA 6	Soil samples for public tree planting at Ly Thai To street.	0.127	0.751	247.01	87.96	45.83
S7		Alley at Chau Thi Te street near Cai Son canal.	0.072	0.372	62.75	52.78	0.92
S8	Tran Quang Dieu	Endpoint of Tran Quang Dieu street expected to cross Nguyen Thai Hoc Street.	0.061	0.630	95.72	29.72	0.37
S9	Hung Vuong	Hung Vuong street	0.086	0.541	83.67	6.72	2.79
S10		Intersection Hung Vuong street and Trieu Quang Phuc street	0.075	0.317	67.92	8.94	0.43
S11	Long Xuyen canal	Long Xuyen canal land	0.038	0.224	<b>559.71</b>	165.73	57.77
S12		Bui Van Danh street near Phuoc Hau pagoda	ND	ND	ND	ND	ND
S13		Bui Van Danh street near Ton Duc Thang Bridge	ND	0.082	72.76	1.94	ND
S14	Cai Son canal	Cai Son canal, cross to Tran Hung Dao street	0.048	0.314	132.8	17.82	0.62
S15		Garden land border to Hau River	0.032	0.473	258.92	9.73	24.87

Code	Items	Sampling location	Measurement and analysis parameters				
			As	Cd	Zn	Cu	Pb
			mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK	mg/kg TLK
S16	Ong Manh canal	Ong Manh canal croos to Hoang Ha Ho street	0.072	0.210	183,52	13.41	0.67
S17		At endpoint of Ong Manh canal near Bat Nha monatic	0.086	0.117	112.87	14.20	0.52
S18	Ba Bau canal	Ba Bau canal cross to Ha Hoang Ho street	0.062	0.183	68.45	5.82	0.182
S19		At endpoint of Ba Bau canal	0.057	0.149	56.40	10.86	ND
S20	Resettlement area	Fields bordering Resettlement Area	ND	ND	80.19	56.75	20.12
S21		In existing residential areas of resettlement area	ND	ND	89.23	43.17	12.25
QCVN 03- MT:2015/BTNMT		Industrial purpose	25	10	300	300	300
		Agricultural purpose	15	1.5	200	100	70
		Residential purpose	15	2	200	100	70

Notes:

- ND: Not Detected.
- QCVN 03-MT:2015/BTNMT: National technical regulation on the allowable limits of heavy metals in the soils.

Remarks: The monitoring results show that:

- The result of analysis shows that the concentration of matters such as Pb, Zn, As, Cd, Zn of 18/21 samples under the standard of QCVN 03-MT: 2015/BTNMT- national technical regulation about the limits of heavy metals in land used for industrial purposes; 3/21 samples (S1, S5, S11) has the level of zinc exceeding an acceptable level of the NTR 03-MT: 2015/BTNMT standard from 1 to 1.9 times for the industrial land.
- The failure to meet the standard from the analysed samples can be explained by the use of fertilizers, pesticides and these are the isolated cases which should not cause a significant impact on the environment. Also, all locations with heavy metal content exceeding QCVN 03-MT:2015/BTNMT- national technical regulation about the limits of heavy metals in the soil used for industrial, agricultural, residential purposes not to be exceeded the hazardous waste according to NTR 07:2009/BTNMT.
- The construction activities of the sub-project will generate a large volume of excavated soil. 50% of them are used for ground filling, 50% is transported for disposal. It is feasible due to the quality of reused land for ground filling being able to achieve the standard for industrial and domestic purposes. The disposed soil is treated as ordinary wastes because the soil quality has not reached the hazardous level. It can take advantage of the disposal soil for the agricultural activities such as plant cultivation because the soil quality achieves the standard to use for agricultural purposes.

### 2.2.3. Sediment quality

The project will carry out the dredging process in the canals such as Long Xuyen canal, Ong Manh canal, Ba Bau canal. The dredged material will be transported to the wastelands. Therefore, in order to evaluate the impact of the materials on the environment, the analysis of sediment quality is essential. For the basis of evaluation, the report has collected the sediment samplings in the project areas. The analytical results are shown in Table 2.6.

**Table 2.6: Monitoring Results of Sediment Quality**

Parameter	Result								QCVN 07:2009/ BTNMT (ppm)	QCVN 43:2012/B TNMT (mg/kg)	QCVN 03- MT:201 5/BTNM T (mg/kg)
	SM1	SM2	SM3	SM4	SM5	SM6	SM7	SM8			
Sample location	Long Xuyen canal, crossing between Hau River and Long Xuyen canal	Long Xuyen canal, distance Ton Duc Thang bridge about 150 m	Cai Son canal, Cai Son bridge cross Tran Hung Dao Street.	Cai Son canal, distance Hau River about 350 m	Ong Manh canal, distance Ong Manh bridge about 200 m	Ong Manh canal, distance to Bui Van Danh street about 250 m	Ba Bau canal cross to Hoang Ha Ho street	Ba Bau canal, distance to endpoint about 250 m			
	<i>Heavy metal</i>										
As	0.252	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	40	17	15
Pb	<5	<5	<5	<5	<5	<5	<5	<5	300	91.3	70
Cd	0.204	0.181	0.252	0.633	0.378	0.233	<0.15	<0.15	10	3.5	1.5
Zn	39.756	32.411	17.989	9.515	16.019	25.007	8.656	13.230	5,000	315	200
Cu	<6	<6	<6	<6	<6	<6	<6	<6	-	197	100
Total carbonhydrate	2.7	3.4	1.9	1.2	1.6	<0.6	2.5	3.1	-	100	-
	<i>Plant protection chemicals (Organic Chlor)</i>										
Aldrine	<0.03x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	10	-	-
α-BHC, β-BHC, γ-BHC, δ-BHC	<0.045x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	6	-	-
Endosulfan-I, Endosulfan-II	<0.045x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	4	-	-
Endrin, Dieldrine, Heptachlor	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	0.2	0.0067	-
p,p'-DDT	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	20	0.0048	-
Chlordane	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	0,6	0,0089	-

Heptachlor epoxide	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	0.01466	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	0,8	0,0027	-
DDE, DDD	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	20	0,0058	-
<b>Plant protection chemicals (Organic Photpho)</b>											
Malathion	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	2	-	-
Parathion	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	20	-	-

**Notes:**

- QCVN 07: 2009/BTNMT: National technical regulation on hazardous waste thresholds.
- QCVN 03-MT:2015/BTNMT: National technical regulation on the allowable limits of heavy metals in the soils.  
QCVN 43:2012/BTNMT: National technical regulation on sediment quality.
- (-): Not regulated.

**Remarks:**

Comparing the results of the analysis shows that all the samples and analysis parameters are under the acceptable standard of QCVN 07:2009/BTNMT. This shows that the heavy metal pollution does not occur in the rivers and canals of Long Xuyen city (the analysis indicators are below the stipulated ones many times).

Compared to the quality standards for freshwater sediments of QCVN 43:2012/BTNMT, all the parameters of 8 sediment samples achieve the regulated standard.

Compared to the standard of QCVN 03-MT:2015/BTNMT for land used for agricultural purposes, all the indicators of analyzed soil samples are below the threshold allowed by the regulations.

The analysis results that are under the standard of hazardous threshold allowed by NTR 07:2009/BTNMT and within the limits allowed by QCVN 03-MT:2015/BTNMT, allow the management of waste sludges much easier, sludge generated can be transported to the landfills to handle as conventional waste or a small amount be used as fertilizer for plant by households nearby the project.

Dredged sediments: 92,250 m<sup>3</sup> of sediments from dredged work in Ong Manh, Cai Son and Ba Bau canals. 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 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 perennial crops or planting tree for urban landscape purpose, based on the actual needs of local people. Otherwise, it will be transported to An Giang SWTC for treatment.



## 2.2.4. Aquatic environmental quality

Sampling sites are presented in Table 2.7 below.

**Table 2.7: Aquatic Sampling Sites**

Code	Location	Code	Location	Code	Location
AQ1	Hau River, bordering Nguyen Du embankment, about 350 m to Long Xuyen canal	AQ6	Long Xuyen canal, about 150 m to Ton Duc Thang bridge	AQ11	Long Xuyen cannal, about 300m to endpoint of Ong Manh canal
AQ2	Long Xuyen canal, crossing to Hau River and Long Xuyen canal	AQ7	Cai Son canal, Cai Son bridge cross to Tran Hung Dao street	AQ12	Long Xuyen canal (between Ong Manh canal and Ba Bau canal) distance to 943 road about 100 m
AQ3	Long Xuyen canal near Ong Manh bridge	AQ8	Cai Son canal, distance Hau River about 350 m	AQ13	Long Xuyen canal, distance to endpoint of Ba Bau canal about 300 m
AQ4	Near Hau River, An Hoa ferry about 30 m	AQ9	Ong Manh canal, distance Ong Manh bridge about 200 m	AQ14	Ba Bau canal cross to Hoang Ha Ho street. (Tides)
AQ5	Long Xuyen canal, between Duy Tan bridge and Hoang Dieu bridge	AQ10	Ong Manh canal, distance to Bui Van Danh street about 250 m.	AQ15	Ba Bau canal, distance Ba Bau canal about 250 m

### 2.2.4.1. Plankton

#### ❖ Zooplankton

##### Characteristics of species composition

The analysis results recorded 19 species and 3 larva are recorded at sampling sites. Copepoda are the dominant species accounting for 58.4 % of the species composition. Cladocera species account for 25.0 %, Rotatoria and Larva for 8.3 %.

- Most of the species collected are freshwater species.
- Indicative species for acidic water: *Chydorus sphaericus*, *Heterocypris anomala*, *Strandesia uenoi*.
- Indicator species for nutrient-rich water environment: *Philodina roseola*, *Rotaria rotaria*, *Rotaria neptunia*, *Brachionus angularis*, *Brachionus calyciflorus*, *Moina dubia*, *Mesocyclops leuckarti* and *Thermocyclops hyalinus*.

##### Number of individuals and dominant species

The density of Zootoplankton in the survey area ranges from 34 to 76 individuals per sample. *Philodina roseola*, *Ceriodaphnia rigaudi*, *Thermocyclops hyalinus* and *nauplius copepoda* are the dominant species. They are indicative species for nutrient rich environment or contaminated environment in canals.

#### ❖ Phytoplankton

##### Characteristics of species

In the completely freshwater environment, silicon algae account for 41.2 % of the total algae. The number of green algae increased by 26.4 % determines that the river environment of project areas is freshwater, but the percentage rate of silicon algae remains very high.

Indicative species for acidic water include *Silic Diatoma clongatum*, *Eunotia bigibba*, *Navicula phyllepta* and *Silic Ankishodesmus falcatus*, *Micas terias alata*.

Indicative species for nutrient-rich water environment including species of Cyanobacteria, Euglenida, *Silic Aulacoseira granulata*, *Synedra ulna*, *Nitschia acicularis*, *Nitschra filiformis* and Chlorophyta *Pandorina morum*, *Pediastrum duplex*, *Pediastrumsimplex*, *Scenedesmus acuminatus*, *Scenedesmus arcuatus*.

The number of plant plankton from 4,310-8,750 individuals per sample. Algae *Silica Aulacoseira granulata* that is indicative for nutrient-rich environment prevails in 6 sampling positions.

#### **2.2.4.2. River-bed Invertebrate (large size)**

##### Species composition

- There are 8 species observed at monitoring sites. These include 8 species (61.5 %) of *Gastropoda*, and 5 species (38.5 %) of *Bivalvia*. Species of *Gastropoda* are the dominant ones of the species composition,
- Most of the species collected are freshwater species.
- Indicative species for acidic water: *Filopaludina (Filopaludina) sumatrensis*, *Pomacea canaliculata*, *Melanoides tuberculatus*, *Lymnea viridis*.

##### Density and dominant species

The density of large benthic invertebrate in the survey area ranges from 4 – 37 individuals/sample. Dominant species are *Filopaludina (Filopaludina) sumatrensis*, *Scaphula pinna*, *Corbicula*.

**Conclusion:** According to the monitoring results of species composition, density, dominant species and indicative species, it can be seen that aquatic environment in the Project area is freshwater and nutrient-rich water bodies.

### **2.3. SOCIO-ECONOMIC CONDITIONS**

#### **2.3.1. Economic Development Situation**

With the advantage of a young city given high priority for development investment from the Party and Central and local governments, Long Xuyen City has achieved recent high GDP growth rate. The estimated GDP growth rate in period 2011 - 2015 was 10.31 % and the per capital income reaches 96.8 million VND per year. In which the trading-service sector accounted for 12.95 %, industry – construction reached 6.28 % and the agricultural sector reached 0.36 %.

##### **Trade and service**

Trading sector has experienced diversified development, especially in commercial activities, monetary, telecommunications,... The commodity market is well managed to ensure stability and diversity for meeting the needs of people. Infrastructure development is quite complete, the modern trading activities are formed, the courier agents and Internet agents operate all over the city (there are 23 markets, 09 supermarkets and shopping mall, 42 banks and branches, 13 courier and express agents, 270 internet agents, 174 broadcast stations), meeting the needs of citizens and business and production activities.

##### **Industry and construction**

The total value of industrial production in 2010- 2015 period reached 19,767 billion (constant 1994 prices), increasing 46.57 % in comparison with the period 2005-2010. The industry-handicraft sector continues to maintain and develop, many industries are expanding their

investment. Garment and textile, footwear, food processing, stationary paper...have growth rate of 10-20 % on average. Policy for development of vocation, handicraft villages has facilitated strengthening and developing of traditional craft villages, contributing to improve productivity, quality and diversity of local products.

Industrial promotion activities have positive changes, and continue to be promoted, vocational training for traditional handicrafts in rural area, commercial promotion, information, credit disbursement has yielded clear results. The commercial banks have lent over 64,000 billion for investment in goods, meeting market demand, especially in export markets.

### ***Agricultural sector***

Agricultural production develops with high productivity and safe quality for products, meeting consuming demand and supplying raw materials for processing for export. Average rice planting area reaches 11,500 ha (area of high-quality rice accounting for 36.2 %), annual food production reaches 74,500 tons of rice every year, 2,000 tons of poultry meat; aquaculture productivity of 42,000 tons. Agricultural economic structure has shifted positively, in 2014 cultivated land of paddy crop is 500ha, an increase of 274,4 ha in comparison with the year 2010, reducing the proportion of animal husbandry and aquaculture.

In implementation of Resolution No. 09-NQ/TU dated 27/06/2012 of An Giang Provincial Party's Committee on agricultural development with high-tech application, Long Xuyen city has stepped up propaganda, scaling up production chain link and consumption of safe agricultural products in the markets, restaurants, hotels and expanding catering services in the city. At the same time, continuing to guide farmers to maintain and expand safe vegetable production teams in My Hoa Hung commune, up to now there has been 12.69 ha of safe vegetable planting area with 43 participating households supplying for Co-op Mart supermarket and markets of My Long, My Binh, Khanh Binh, My Xuyen with amount of consumption of about 400- 500 kg/day.

New Rural development program has proved its efficiency for rural area, rural infrastructure is improved, material and spiritual life of people are improved.

### ***Science and Technology***

Activities of research, transfer and application of science and technology together with implementation of supporting policies for development of intellectual property and technological innovation are interested. There are 192 facilities and businesses having invested in technological innovation, 716 enterprises and establishments registering protection of intellectual property rights 15 scientific research projects at grassroots level, many initiatives and technological improvements having been recognized and applied into practical production, contributing to local economic development.

#### **2.3.2. Social Conditions**

In 1999, Long Xuyen was official graded as An Giang Province affiliate city. In 2009, the Government recognized Long Xuyen Grade as grade 2 city affiliated to An Giang City. At the present, Long Xuyen city has 13 administrative units (11 wards, 2 communes) with a population of 280,862 people, an area of 115.22 km<sup>2</sup>. The natural population growth rate is 0.98 %.

### ***Population***

The project area covers 8 wards, namely: My Binh, Dong Xuyen, My Xuyen, My Long, My Phuoc, My Quy, My Hoa, Binh Khanh with a total area of 36.08 km<sup>2</sup>, accounting for 31.3 % of the whole city area. In the project area, My Hoa ward has the highest population of 31,940 people with 7,867 households. My Long Ward has highest population density of 16,735 people/km<sup>2</sup>, followed by My Binh and Dong Xuyen Ward with density of 11,906 people/km<sup>2</sup> and 11,204 people/km<sup>2</sup> respectively. Areas with the lowest population density is My Quy ward with 3,337 people/km<sup>2</sup>. Household size of 4.4 people/household.

***Ethnic***

Results of the survey on the ethnic composition shows that, in the project area, there are mainly Kinh people. Kinh ethnic accounts for 99.4% and then Chinese accounts for 0.6%. According to observations of surveying group, there are ethnic Khmer living in the project area, but these households accounts for only a very small part and living scattered among the Kinh community.

***Gender***

To learn the role and responsibilities of gender as well as to assess gender situation in the project area, the social consultant team has conducted a survey on the role of women in activities such as housework, children caring, participating in community activities, joining in community organizations .... Results of the survey show that women still have major role in doing housework, cleaning the house and taking care of children. 53.2 % said women are the main heads of household, 74.6 % of women in charge of cleaning, 80.2 % of women in charge of taking care of children.

Some work with gender equality as: 67.3 % of households said that both husband and wife work together to decide on education for their children; 62.5% to decide on occupation, 58.4 % to decide on issues relating to bank loans, investment and business.

Property ownership issue has relatively equal levels of both 2 genders: 45.5 % HH said that they shared name on property ownership, 36.3 % having property ownership only for husbands, higher than the ratio that wives bearing ownership of the property (18.1 %).

***Vulnerable households***

From surveying 2,113 households in 8 wards, the percentage of households with female header is 27.3 %. In which, My Xuyen ward has highest percentage of (52.3 %), then My Binh ward (42 %); My Long ward having lowest percentage (16.5 %)

***Education and healthcare in the project area*****❖ Education**

Over the past years, Long Xuyen city has gained important achievements in education and training, forming good resources for development, education socialization contributing to diversifying scope of school, improving quality of education and training, being the leader of education of all levels in the province. Percentage of primary education over 98 %, secondary education over 99 %. 98.46 % of children go to kindergarten. Schools are invested in modern and sustainable manner, 20/55 schools recognized as national standard, reaching percentage of 36.36 %.

According to the survey results, among total of 2,113 people participated in the interviews, people with secondary level accounts for the highest rate of 33.9 %; people with primary level education accounts for 22.5 %. Graduates from college and university accounts for 19.9 %, still 2.3 % of the participants interviewed are illiterate. Educational attainment is the most common evaluation criteria of the participants interviewed.

Interacting and discussing with target interviewee groups in the project area show that community's participation and contribution of ideas for implementation of the project is diversified, abundant and realistic. Thus, during the propagation of content related to the project, as well as organizing community consultation on the proposed technical plans, it is still required to have right approach to make the whole community understand meaning and significance of the project as well as to mobilize the whole community to participate and support the project.

**❖ Health**

The survey showed that people have begun to realize the health care program, with 1,854/2,113 households (87.7 %) answered that their families have participated in health insurance. In

addition, there are still 259/2,113 (12.3 %) households not participating in the health insurance. When asked about the prevalence of the disease in the past two months, 30 % of households surveyed said there are sick member in their families.

Diseases/symptoms that people suffer the most in the past two months are dengue fever (30.2 %), followed by cold/fever (29.1 %), headache (12.9 %), diarrhea (1.9 %). Other diseases account for rather small proportion among the survey population.

Most people believe that the living environment is the causes of disease, in which environmental pollution is mentioned the most (44.5%). Then cause of flies and mosquitoes accounts for 32.2 %, lacking of food (6.4 %), cramped accommodation (5.2 %) and other reasons.

To improve community awareness about influence of environmental sanitation on health and knowledge about disease prevention, authorities and social organizations in the city regularly organize the propaganda campaign. 97.9 % of households being polled said that the government has organized the promulgation classes. 2.1 % of the remaining households had no ideas about this. This ratio reached 100% in My Long ward and My Xuyen Ward. My Binh ward has the lowest percentage (90.2 %). Thus, we can see that the authorities in Long Xuyen city has high interest and attention in the protection of public health.

### ***Labor force, occupation, income expenditure***

#### **❖ Labor force, occupation**

Household life depends very much on the occupation and stability of the main breadwinner in the family, especially the household heads. Most of the families are of trading/business group, and wage labor forces which have relatively stable income and stable life. And the average of poor households are usually job-less or have instable job, uncertain income, life is not stable. Therefore, the identification of occupation of the household head is very important in assessing the stability of the daily life of people.

Survey results show that, among 2,113 households participating into the interview survey, number of households working in trading/service sector accounts for the highest percentage with 25.4 %; followed by 20.9 % of hired employees, officers and employees 15.9 %, other occupations account for a small percentage.

#### **❖ Income - Expenditure**

##### ***Income***

When According to Decision No.59/2015/QĐ-TTg of the Prime Minister promulgating multidimensional poverty levels applicable during 2016-2020 and based on income standards set by the Ministry of Labour and Social Affairs for period 2016 - 2020, urban poor households are households with per capita income below 900,000 VND/person/month; nearly poor households are households with an average income of 900,000 ÷ 1,300,000 VND/person/month; and average households are those having income 1,300,000÷1,950,000 VND/person/month.

Average income in the project area is 7.5 million/month (on average, per capita is 1.7 million dong per month). Percentage of households with income lower than 4 million dong is 24.7 %; 4 ÷ 8 million dong is 46.9%; from 8 ÷ 13 million dong is 18.3 %; households having high income from 13 millions and above accounts for 10.1 %. My Hoa ward and My Binh ward have lowest income in the city.

Stability of the income play decisive role in living condition of the whole households. Assessment of stability of the households is considered vital criteria. Survey results show that, 76.4% surveyed households said that their income is rather stable. In the project area, household income has rather high stability.

### *Expenditure*

Average In general, expenditure of household in the project area accounts for 80 % of their income. Average expenditure of one household per month is 6 million dong for the whole project area. There is one great difference in average expenditure of poor households (2.3 millions/month) and rich households (12,9 million dong/month). Normally, households having high income will have high expenditure but also high savings. When assessing by living level, poor households are vulnerable ones because they do not have enough income to cover their basic needs, no saving, and getting risks of market when their job is not stable...Therefore, when implementing items of the project, it is required to pay appropriate attention to poor and vulnerable households because it is very difficult to restore income and living condition for them if they are resettled or relocated condition.

## **2.4. INFRASTRUCTURE CONDITIONS**

### **2.4.1. Traffic connection**

#### **2.4.1.1. External traffic**

##### ***Roadway***

Highway 91 is the external traffic routes and the main road of Long Xuyen city. It goes from North to South as the backbone route for the city. It has been upgraded, expanded to provide more convenient and safer transportation.

The Provincial Highway 943 connecting Long Xuyen city with Thoai Son has been renovated and upgraded, through the inner passage (Ha Hoang Ho street) has been extended in part to the pavement width (14m), thus improving traffic conditions on the route.

Currently, the provincial Ministry of Transportation and is preparing to build bridges (Hau River) located in Vam Co Dong (Already put markers) and Ho Chi Minh route which pass Long Xuyen City area. This road and the city ring road were built to ensure the traffic between Long Xuyen and other provinces in the Mekong Delta and Ho Chi Minh City, to improve traffic safety in the urban areas of the city.

##### ***Waterway***

East Long Xuyen city is located alongside the west of Hau River, this is the gateway to the Long Xuyen quadrangle. Hau River is the primary river with the width of 800 m and the depth of 15m and able to accommodate 5000 ton ships conveniently. My Thoi port located at the South of the city is one of the most active ports in the Mekong Delta.

##### ***Aviation***

In the south of the city has Long Xuyen airport which was built before 1975. At present, the airport was damaged, under the operation of the local military and used as a military training field.

##### ***The transport hub construction***

- *Inter-provincial bus station:* Long Xuyen Bus Station is located in the south of Cai Son bridge and the west of Highway 91, its area is about 4.0 hectares with the capacity of 55-60 vehicles/day, the average number of seats: 50 seats/vehicle, The average number of passengers: 3,500 passengers/day. At festival time at Sam Mountain, the amount of traffic from passenger increases by 50 %, but thanks to the efforts of local authorities of transport sector, the station is able to provide good services to match the needs of passengers.
- *My Thoi port:* The port is located between Cai Dung canal and Vam Cong ferry; its daily design capacity is about 4500 tons/day, its actual capacity is 250,000 tons/year, 3,000 tons ships can lift goods and stocks securely, the handling is handled by machine.



- *Vam Cong ferry*: Vam Cong ferry is an important traffic junction on Highway 80 connecting Long Xuyen quadrangle with other provinces in the Mekong Delta.
- The approach path to Vam Cong ferry has two lanes of 5.5 m wide, separated line between 1 m wide and 3.00 m wide sidewalks on each side, a total width of road about 18.00 m.
- *An Hoa ferry*: It is an important traffic hub in the city center, take on most of the passengers through the Hau River, a new ferry terminal on the West of Long Xuyen City was built in 1995 fully equipped, better service operator guests, but due to changes in the flow so eroded terminals (shore of Long Xuyen) caused landslides revetment wall abutments.

#### **2.4.1.2. Internal traffic**

##### ***Internal road network:***

Compared with cities and towns in the Mekong Delta, Long Xuyen city has an urban road network which is relatively well developed, with a total of 540 routes distributed evenly throughout the city. Nguyen Hue street and Hai Ba Trung street have the width of 44 m, giving the ventilated and spacious space for the city. The other streets have the average pavement width of 7-8 m, the speed on the internal downtown road can reach 4,7 km/km<sup>2</sup>. However, some current roads have not been completed and only renovated at some segments and it causes some part of the city are separated and the amount of vehicle traffic is still mainly concentrated in the main street.

##### ***The constructions to serve traffic:***

New bus station My Xuyen: serve passengers coming from the North routes of the city with the area of approximately 5000 m<sup>2</sup>. It is located in the North of Nguyen Trung Truc bridge and next to the Highway 91 and Tinh Bien border checkpoint.

Bridge system in the city is being upgraded and expanded to serve for the city's traffic. In 2003, the city has built Ton Duc Thang bridges across the Long Xuyen river to reduce the load on the Hoang Dieu bridge and Nguyen Trung Truc bridge on Highway 91.

#### **2.4.2. Supply-water network**

Currently, Currently, Long Xuyen city has the water supply system which is quite complete. The sources of water supply take directly from the Hau River, including the following water plants:

- Binh Duc Water Plant: the capacity of Phase 1 is about  $Q = 34,000 \text{ m}^3/\text{day}$ , is now overloaded and have planned to increase the capacity for phase 2 by 30,000 m<sup>3</sup>/day to reach the capacity of 60,000 – 70,000 m<sup>3</sup>/day.
- Long Xuyen water plant: the capacity  $Q = 9,000 \text{ m}^3/\text{day}$ .
- Ong Ho islet (My Hoa Hung commune) has 2 stations of water supply from Hau River:
  - My Hoa Hung I station (near memorial Uncle Ton):  $Q = 150 \text{ m}^3/\text{day}$ .
  - My Hoa Hung II station (funded by Germany):  $Q=150 \text{ m}^3/\text{day}$ .
    - The percentage of the city water supply: 80 %.
    - Loss ratio: 28 %.

The total length of water supply systems is about 309 km.

#### **2.4.3. Solid waste collection and treatment**

##### ***Collection***

Long Xuyen City has 2 ways to collect the garbage:

- An Giang Urban Environment Company Limited is responsible for collecting the garbage on the main roads, garbage collecting point and the temporary point on the herringbone routes. Garbage will be collected and transported within the day.
- The self managed community units: garbage will be collected in alleys and rural roads. Equipment for collecting is mainly handcarts, motorbikes. The quality of the equipment was degraded and the device is not properly matched the technical specifications as regulated.

After collected, the garbage will be transported to the assembly points/temporary assembly points in each ward. There are a total of 19 points distributing around the area of the ward of Long Xuyen city. An Giang Urban Environment Company Limited will collect all the garbages at the assembly points and transported to Binh Duc landfill for treating.

### ***Treatment***

Binh Duc landfill in Long Xuyen city. All urban waste (around 130-140 tons/day) is transferred to Binh Duc landfill for disposal. Binh Duc landfill is located in Binh Duc ward, Long Xuyen city, An Giang province. The landfill is responsible for receiving and handling all the wastes generated in Long Xuyen city including municipal wastes, sewage sludges and construction wastes.

In an area of 5.7 ha, Binh Duc landfill has been operating since 1983. Within the area, the old landfill of 2.2 ha was closed and clearanced into the pasture in 2000. The new landfill with area 3.5 ha has been expanded since 2000 and used until now. The landfill is designed for flood prevention and wastewater sewage.

Currently, the environment in Binh Duc landfill is seriously polluted. Odors, flies, emissions from the incineration, leachate emissions directly affect the surrounding environment. The capacity for receiving garbage of the landfill is 120 tons/day only and it can not meet the demand of Long Xuyen city (130-140 tons/day). Therefore, the designs of two biological sedimentation tank are insufficient for the amount of leachate generated and it causes the environmental pollution to reach the alarming stage. According to the roadmap to close landfills causing serious pollution in the 2016-2018 phase, Binh Duc landfill will complete the process of closure at the end of 2016.

Solid waste in Long Xuyen city in the closing period of Binh Duc landfill will be processed by means of sanitary landfills at An Giang Intergrated Waste Management Complex, Binh Hoa commune, Chau Thanh district. The complex is planned to operate in September 2016 and will receive waste from the project, which is estimated to commence in October 2017, for treatment.

#### **2.4.4. Electrical system**

Currently Long Xuyen city is powered primarily from the national power grid through a single circuit 110kV grid line Tra Noc - Thoi Thuan - Long Xuyen of 55 km long with AC-160 wire. Diesel power addition in Long Xuyen city is 2 units:

- GM 1500kW #1 Long Xuyen.
- GM 1500kW #2 Long Xuyen.

Lighting grid: built on the city's roads, lights are high-pressure mercury lamp with a capacity of 75 W – 300 W.

#### **2.4.5. Sewer and wastewater treatment**

Long Xuyen city does not build its dedicate waste water drainage system. Most waste water drains with drainage system for rain water or directly pour into the nearest rivers. Waste water is almost untreated or roughly treated and then discharged directly into sewers, rivers and canals, which causes environmental pollution, especially causing the pollution of water sources. As heavy rains happen with the surges, many streets become inundated.

Some handicraft establishments located along the Hau River, the slaughterhouses have no waste water treatment system so the discharged waste water flows directly into the rivers causing water pollution, especially for Long Xuyen canal.

Waste water generated in the city areas. Long Xuyen (including wastewater from 4 LIA areas and sewer system to collect waste water on the roads of the city) will be directed to two wastewater treatment plants of the "System of sewer and handling Long Xuyen wastewater" to handle.

### **Waterlogging**

Every year, during the rainy season, especially in the period of July to November, the local flooding occurs in the inner areas of the city. Flooding in Long Xuyen is increasingly widespread and prolonging.

Because the distribution of these factors is not similar to each other so the flood inundation is uneven throughout the city areas.

Flooding in the inner areas of Long Xuyen is mostly at mild to moderate level. The main flooded points are mostly concentrated in My Xuyen and My Phuoc ward, Dong Xuyen (accounting for 50% of the surveyed flooding points). In particular, the deeply flooded points are mainly focused in My Phuoc, My Binh and My Xuyen, the moderately flooded points (20-50 cm) and slightly flooded points (<20 cm), scattering in the wards. The frequently flooded areas are around My Phuoc, My Xuyen with the most frequently appeared waterlogging routes being Vo Thi Sau, Yet Kieu, Phan Dang Luu. This is the routes with the high level of flooding, ranging from ½ to entirely flooded route during heavy and prolonged rains. Besides the severe flooded routes, My Xuyen ward and My Phuoc ward also have some areas with mild to moderate level of flooding. The situation of local flooding in the city continued its trend in 2013 with the appearance of new flooded locations alongside the existence of the old flooded areas such as Ung Van Khiem, Trinh Hoai Duc.

## **2.5. ENVIRONMENTAL AND SOCIAL CONDITIONS AT THE PROJECT SITE**

The project includes 4 components: (i) Component 1: Upgrading Tertiary Infrastructure in 4 LIAs: LIA 1, LIA 3, LIA 5, LIA 6; (ii) Component 2: Upgrading roads connecting to LIAs; Reconstruction of Inner City Canals such as Long Xuyen, Cai Son, Ong Manh and Ba Bau canals; (iii) Component 3: Construction of resettlement site; (iv) Component 4: Capacity building and technical assistance.

Natural, socio-economic current status is very important data for environmental assessment. Therefore, Natural, socio-economic current status will be specifically presented by each investment item of these components.

**Component 1:** Upgrading the level 3 infrastructures in 4 LIA areas (LIA 1, LIA 3, LIA 5, LIA 6) including expansion of the main alleys with the minimum width of 4 m, upgrading the existing small alleys with a minimum width of 2 m; synchronous investment in the technical infrastructure including water supply, drainage, lighting, green trees and provision of trash bins.

### ***Upgrading LIA 1***

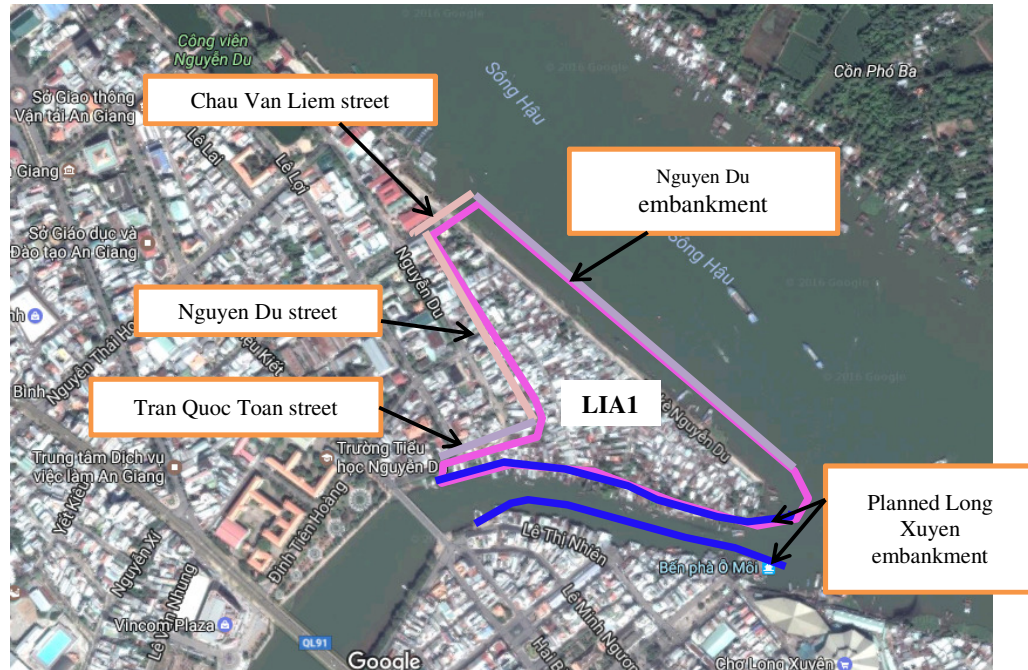
LIA 1 has a total area of 9.82 ha, located in My Binh Ward, bound by Long Xuyen Canal, Tran Quoc Toan Street, Nguyen Du Street, Chau Van Liem Street and Nguyen Du dyke. LIA 1 has a section of Long Xuyen canal running across. Population in LIA 1 is approximately 4,810,908 households, mainly including Kinh people.

Though situated in the city center, its current infrastructure is very poor. The sewer and lighting system is barely constructed. The narrow and degraded alleys with width of 1-2 m, serve as traffic and business and other purposes of the people. The households are densely distributed along these alleys.

Along the boundary streets of LIA 1 such as Tran Quoc Toan, Nguyen Du, the house structure is quite well built of class 2 and 3 serving as small vending places, leasing and offices. Houses in the deep alleys are mainly of class 4, the temporary houses, corrugated-iron houses with small area, spanning over Long Xuyen canal. Many are living on boat houses connected by small bridges. All untreated waste and wastewater are discharged into Long Xuyen canal polluting the environment and worsening urban landscape. Most people are unemployed or doing small business, as seasonal jobs workers with the difficult life.

No PCR or sensitive points are present within the area of alleys in LIA 1. However they are along material and waste transportation routes, see 2.6 for detailed description.

Main expected material and waste transportation route: Tran Hung Dao street → Nguyen Du street → An Giang Solid Waste Treatment Complex.



Location of LIA 1



Current status of alleys in LIA 1

### ***Upgrading LIA 3***

LIA 3 has a total area of 26.57 ha, located at Dong Xuyen and My Xuyen Wards, adjacent to Ong Manh Canal, Bui Van Danh Street, Ha Hoang Ho Street, Tran Quang Dieu Street and residential area along segment from Tran Quang Dieu Street to Bui Van Danh Street. In LIA 3,



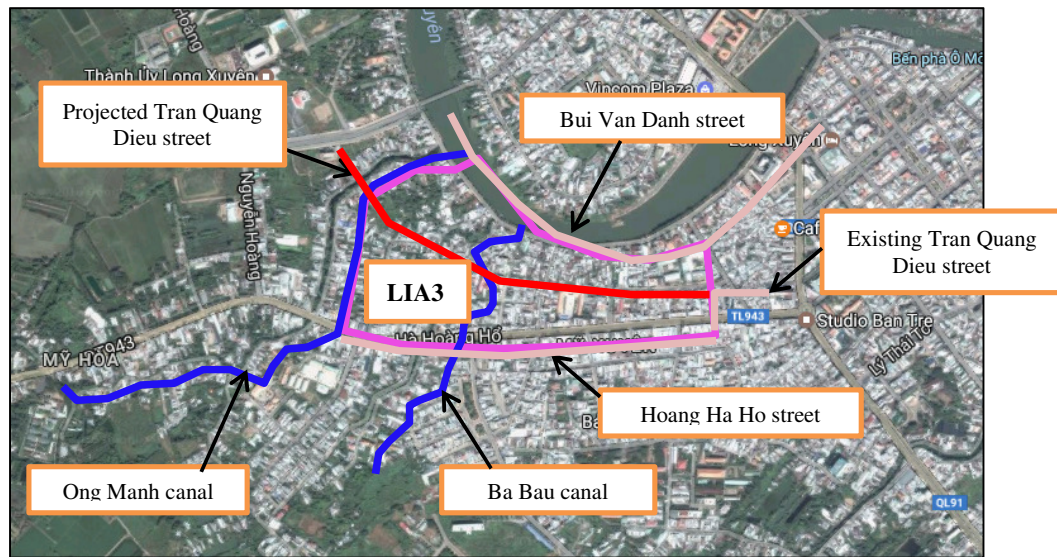
Ong Manh and Ba Bau canals cuts across at km0+420 and km0+670. Population in this LIA are 5,910 people, 1,182 households, mainly King people.

Similar to LIA 1, the basic infrastructure does not meet local people needs. The sewer and lighting system is barely constructed. The narrow and degraded alleys with width of 1-2 m, serve as traffic and business and other purposes of the people. The households are densely distributed along these alleys. Most people engage in seasonal works, small business and hired labor...

In the LIA 3, most houses are temporary ones, corrugated-iron or wooden houses spanning over the canals. Currently, waste is discharged directly from the households to the canal causing unsanitary environment and worsening urban landscape.

No PCR or sensitive points are present within the area of alleys in LIA 1. However they are along material and waste transportation routes, see 2.6 for detailed description.

Main expected material and waste transportation route: Tran Hung Dao street → Ha Hoang Ho street → An Giang Solid Waste Treatment Complex.



Location of LIA 3



Current status of houses and alleys in LIA 3

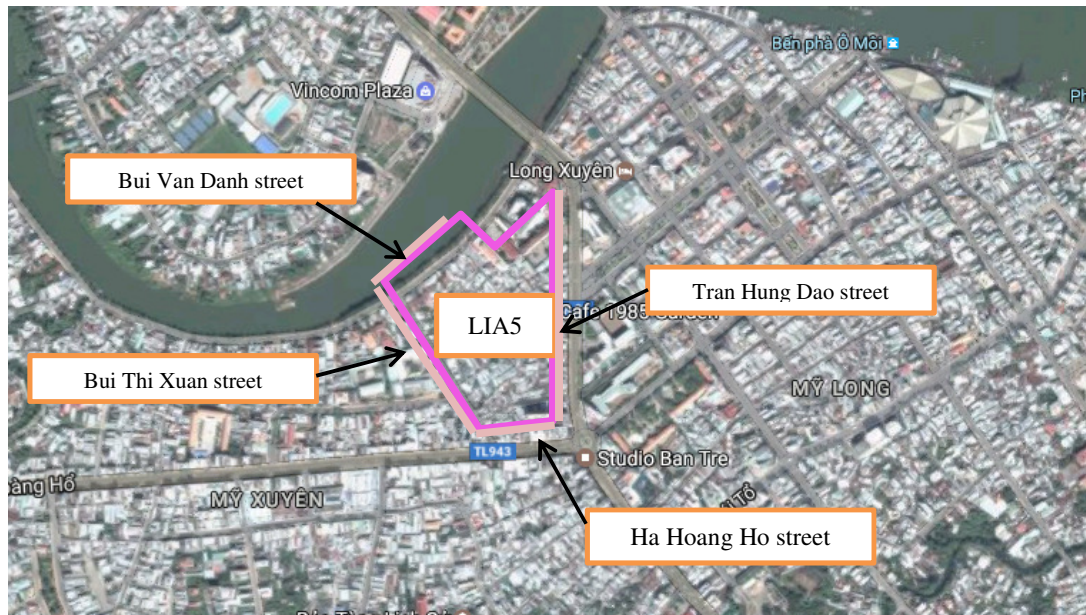
### Upgrading LIA 5

LIA 5 with a total area of 5 hectares is situated in My Xuyen Ward, bordered by streets of Ha Hoang Ho, Tran Hung Dao and Bui Van Danh streets. Population in LIA 5 is approximately 748 people, 153 households, mainly including Kinh people.

LIA 5 has been formed for a long time ago, residential components in the LIA 5 are mainly middle-aged employees and elderly people engaging in small business, seasonal and manual jobs. The technical infrastructure of the LIA has been deteriorated, concrete together with earth alleys are narrow with width from 1.5 – 3 m without drainage and light systems. Houses in this LIA are corrugated-iron houses, temporary and class 4 houses, distributed along alleys.

Along the alleys under scope of upgrading LIA 5, No PCR or sensitive points are present within the area of alleys in LIA 1. However they are along material and waste transportation routes, see 2.6 for detailed description.

Main expected material and waste transportation route: Tran Hung Dao street → Ha Hoang Ho street → Bui Thi Xuan street → Bui Van Danh street → National Highway No 91 → An Giang Solid Waste Treatment Complex.



Location of LIA 5



Current status of houses in LIA 5



### Upgrading LIA 6

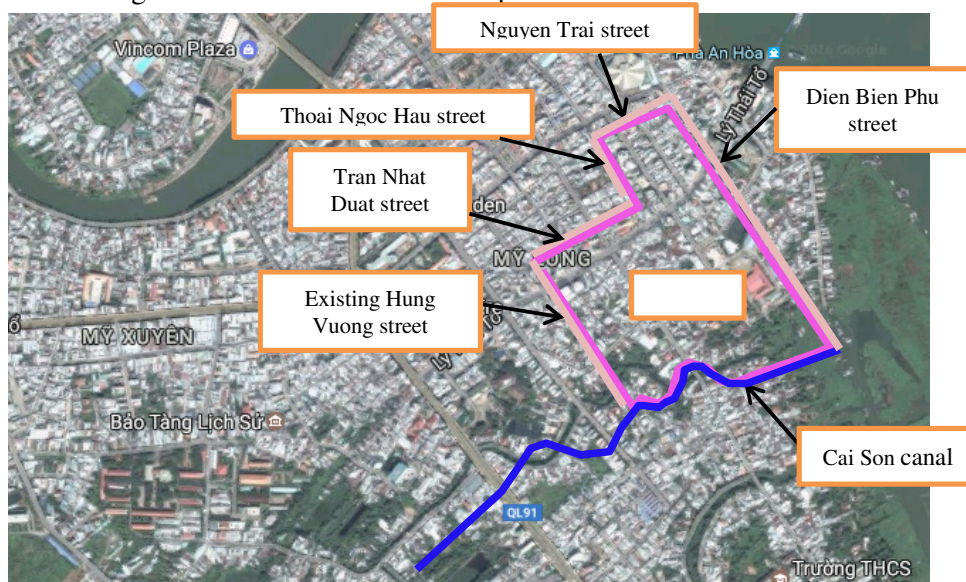
LIA 6 with a total area of 33.39 ha is located at My Long Ward and My Phuoc ward, adjacent to the Canal Cai Son and streets of Hung Vuong, Tran Nhat Duat, Tran Nguyen Han and Dien Bien Phu. Population in LIA 6 is approximately 12,928 people, 2,492 households, mainly including Kinh people.

Similar to other LIAs, the technical infrastructure in the LIA 6 is deteriorated and asynchronous. Some major roads crossing LIA are constructed with water supply and drainage systems, lighting, trees such as Ly Thai To Street, Thoai Ngoc Hau Street. Meanwhile, 80% of LIA 6 alleys is small concrete paths, 1 - 2 m wide and the rest is asphalted, 3 – 4 m wide without drainage and lighting systems. The existing drainage ditches are open, degraded, connected to the sewer system of the city.

LIA population is densely distributed along the alleys. They are facing living difficulties due to unstable income sources (hired labor, seasonal jobs, small business...). Houses in this LIA are corrugated-iron houses, temporary and class 4 houses.

Along the alleys under scope of upgrading LIA 6, No PCR or sensitive points are present within the area of alleys in LIA 1. However they are along material and waste transportation routes, see 2.6 for detailed description.

Main expected material and waste transportation route: Tran Hung Dao street → Ly Thai To street → An Giang Solid Waste Treatment Complex.



Location of LIA 6



Current status of alleys and houses in LIA 6

**Component 2:** This component supports the improvement of infrastructure network connectivity between LIA with downtown areas through a complete network of roads, and rehabilitation and improvement of drainage capacity for canals in the city center. The main investments include: construction of 02 new streets (extended Hung Vuong and Tran Quang Dieu streets) and renovation of 04 canals within the inner city (Long Xuyen canal, Cai Son canal, Ong Manh canal, Ba Bau canal). The current status of the project area for these items are described below.

***Item 2.1: Hung Vuong Street Extension***

Hung Vuong Street is divided into 4 sections:

- Section 1: from the junction with Tran Hung Dao to To Hien Thanh Street (from km0+00-km1+200) 1.2 km long, 12 m wide, 06 m wide sidewalks, constructed in 2002.
- Section 2: from km1+200 to km2+300, not constructed yet. This section is proposed for investment with length of 1.1 km, width of 12 m and 12 m width for each side of sidewalk.
- Section 3: from km2+300 to km02+900, going through the industrial zone and the port, 0.6 km long, 12 m wide, 12 m wide sidewalks, built in 2003.
- Section 4: from km2+900 to km3+00, not constructed yet. This section is proposed for investment with length of 1.1 km, width of 12 m and 12 m width for each side of sidewalk.

Section 2 and section 4 of Hung Vuong street will connect entire Hung Vuong street in accordance with revised planning of Long Xuyen city to 2025. Hung Vuong street is located in My Long, My Phuoc and My Quy wards.

Hung Vuong Street is currently home to dense residences and interspersed gardens. The technical infrastructure systems (drainage, lighting) have not been invested. At km km0+910.72 is the intersection between the planned Hung Vuong Street and a small drainage canal (about 2 meter width) in residential areas. During Long Xuyen project implementation, box culvert is designed at this intersection to ensure the drainage capacity. At the same time extended Hung Vuong section will cut across Tam Bot canal at km0+87.67. At this point, reinforced concrete bridge with length of 60.2 m and width of 13 m is designed across the canal.

The living condition in this area is relatively better than that in other LIAs. Houses structure is permanent; people's jobs include trade services, state employees, workers, ...

Identified PCRs and sensitive points include: My Phuoc Market (20 m from the project site), Dong Thanh pagoda (5 m from the project site), Bui Huu Nghia Secondary School and Trinh Hoai Duc Primary School (10 m from the project site). Besides, along material and waste transport routes, these works are present. See detailed description in section 2.6.

Main expected material and waste transport route: Tran Hung Dao street → Ly Thai To street → An Giang An Giang Solid Waste Treatment Complex.



Location of proposed Hung Vuong street



Existing Hung Vuong street

Location of proposed Hung Vuong street

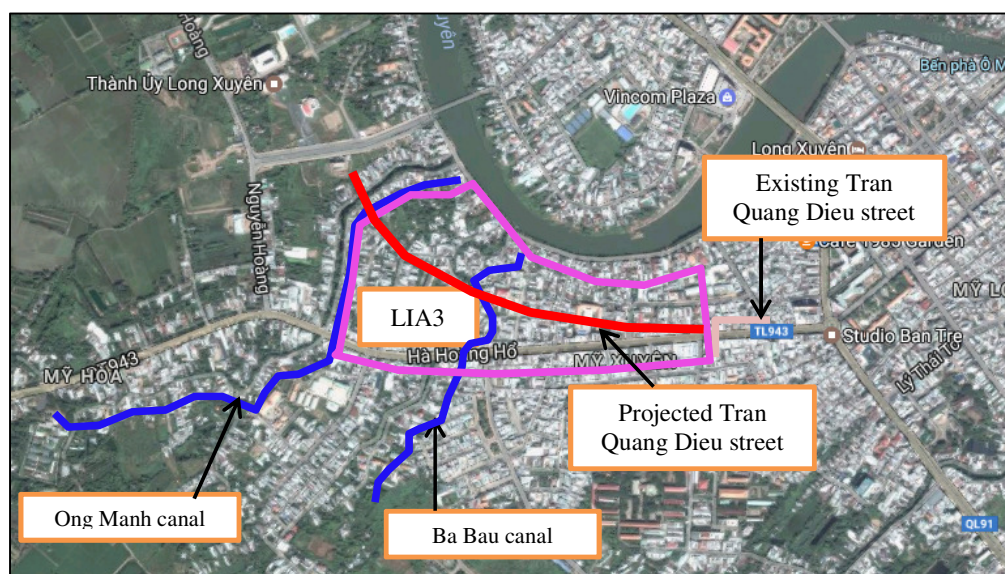
### ***Component 2.2: Tran Quang Dieu Street***

Tran Quang Dieu Street is proposed at My Xuyen, Dong Xuyen and My Hoa wards, starting from intersection with Ha Hoang Ho Street and ending at intersection with Nguyen Thai Hoc street. The route is 10.5 m wide, 10m wide sidewalks, 0.9 km long. Tran Quang Dieu street cuts across Ba Bau canal at km0+366.53 and cuts across Ong Manh canal at km0+91.73. Culvert across the route with length of 12 m, width of 20.5 m and reinforced concrete bridge with length of 40.2 m, width of 15 m are designed for intersections with Ba Bau and Ong Manh canals respectively. Tran Quang Dieu area is densely populated, mostly for temporary housing, corrugated iron houses and interspersed gardens. Part of the street goes through LIA 3, starting km0 - km0+670. Technical infrastructure systems (drainage, lighting) have not been invested in this area. All rain water, wastewater in the area will penetrate into land or flow by slope of terrain into lower areas, or surrounding canals (Ong Manh and Ba Bau canals).

Identified PCRs and sensitive points include: Vuong Tron Maternity Hospital (10 m from the project site). Besides, along material and waste transport routes, these works are present. See detailed description in section 2.6.

Main expected material and waste transport route: Tran Hung Dao street → Ha Hoang Ho street → An Giang An Giang Solid Waste Treatment Complex.





Location of projected Tran Quang Dieu street



Starting and Ending point of Tran Quang Dieu

### ***Item 2.3. Long Xuyen canal embankment***

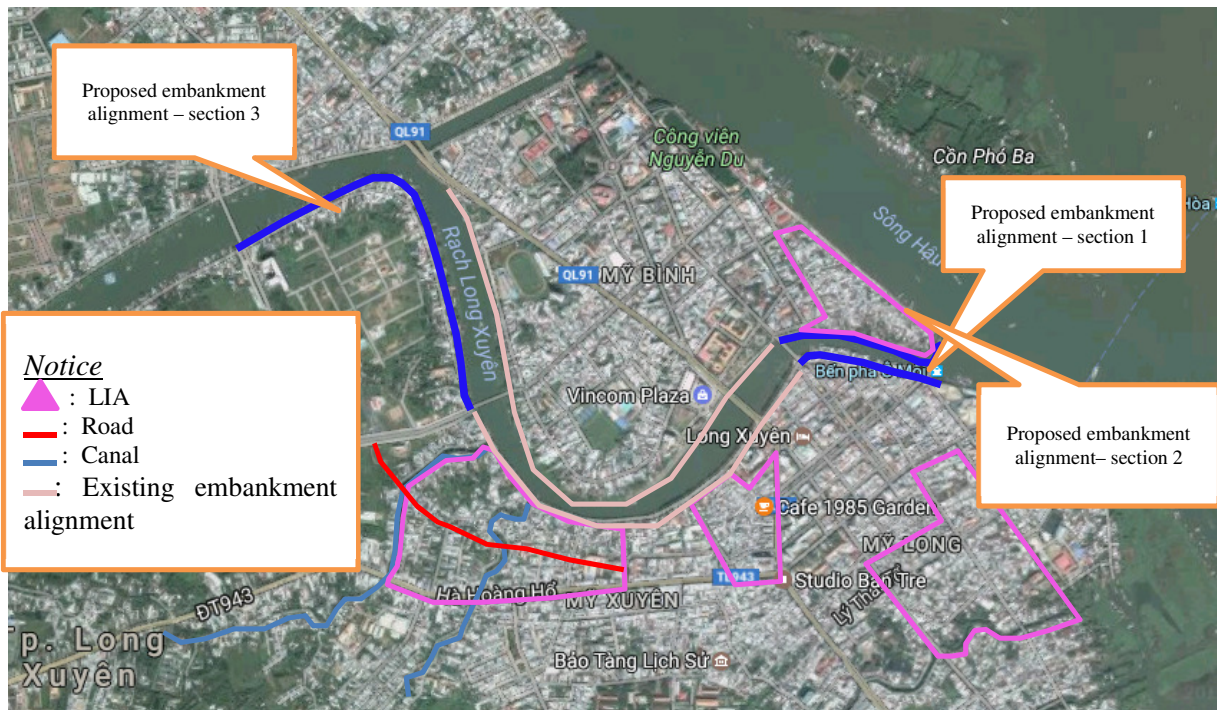
Long Xuyen canal embankment is divided into the following sections:

- Section 1 (left bank): starting from the intersection of Long Xuyen canal and Hau River (Nguyen Du cluster) to My Binh ward, 0.6 km long, not embanked. The project proposes to construct embankment in this Long Xuyen canal section.
- Section 2 (right bank): starting from Le Thi Nhen Street to My Long Ward, 0.4 km long. The project proposes to construct embankment in this Long Xuyen canal section.
- Section 3: in My Hoa ward, starting from Nguyen Thai Hoc bridge to Ton Duc Thang bridge, 1.3 km long, not embanked. The project proposes to construct embankment in this Long Xuyen canal section.

The rest of Long Xuyen Canal has been embanked with reinforced concrete structures. The project investment will help improve connection of all embankments.

The existing canal sections are densely populated, canal surface is encroached due to the unplanned construction of the people. Currently, waste is discharged directly from the households to the canal causing serious environmental and urban landscape problems.

Main expected material and waste transport route: Tran Hung Dao street → Bui Van Danh street → An Giang An Giang Solid Waste Treatment Complex.



### Location of Long Xuyen canal embankment



### Current status of residents spanning Long Xuyen canal

### Item 2.4: Cai Son canal

Cai Son canal will be dredged into design depth of 4.0 m (existing depth is 1.3 - 2.4 m), hard embankment in combination with soft embankment for 2 banks, construction of operation route for 2 banks with width of 3-4 m, length of 1.5 km and adequate technical infrastructure (wastewater collection, lighting systems and green trees). Cai Son canal under proposal of the project with starting point at intersection with Tam Bot and ending point at intersection with Hau river. Cai Son canal is the main drainage basin for streets of Hung Vuong, Dien Bien Phu and Thoi Ngoc Hau. It is located in wards of My Long, My Xuyen and My Phuoc, L = 1.5 km, average width of 12 – 23 m. The canal is highly sedimented and polluted by garbage from households discharged directly into the canal.



Houses are distributed along two canal sides (in a distance from 2 - 8 m), but not highly dense, including corrugated iron houses and grade 4 houses. Land along the canal is either vacant land, or garden land and interspersed housing land. Most of the households engage in services and trade, hired works, and some work as state staff. Along a short section (from km0+200 to km0+450, left side) population is relatively dense and distributed near the canal banks.

Identified PCRs and sensitive receptors include: Binh Dan Hospital (10 m from Cai Son canal) and General Hospital of Long Xuyen city (20m from the canal). Besides, along material and waste transport routes, these works are present. See detailed description in section 2.6.

Main expected material and waste transport route: Tran Hung Dao street → An Giang Solid Waste Treatment Complex.



Location of Cai Son canal



Existing Cai Son canal

### ***Item 2.5 Ong Manh Canal***

Ong Manh Canal is drainage route for the residential area of My Xuyen Ward length  $L = 1.6$  km and average width of 8 - 27 m. Ong Manh canal under proposal scope of the project has starting point at intersection with Long Xuyen canal and ending point at the culvert line across the provincial road 943. The canal is highly sedimented and polluted by garbage from households discharged directly into the canal. Technical infrastructure systems (drainage, lighting) have not been invested. The canal will be dredged to reach depth of 4.0 m (existing depth is 1.2 - 2.4 m), hard embankment in combination with soft embankment for 2 banks, construction of operation route for 2 banks with width of 4 m, length of 1.6 km and adequate technical infrastructure (wastewater collection, lighting systems and green trees).

Houses are distributed along two canal sides (in a distance from 2 - 4 m), with high density, interspersed garden land. Residents are encroaching the canal. However, temporary, wooden or corrugated iron houses are dominant. Most of the households engage in services and trade, hired works.

Identified PCRs and sensitive receptors include: Phuoc Minh Ni Pagoda (5 m from the canal). Besides, along material and waste transport routes, these works are present. See detailed description in section 2.6.

Main expected material and waste transport route: Tran Hung Dao street → Ha Hoang Ho street → An Giang Solid Waste Treatment Complex.





Location of Ong Manh canal



Existing Ong Manh canal



Houses spanning the canal

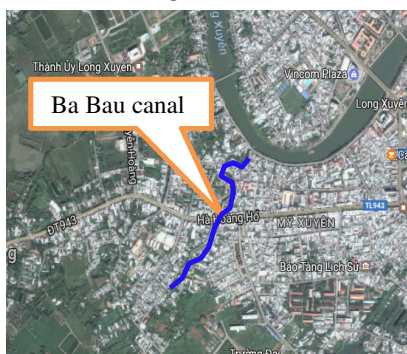
### Item 2.6 Ba Bau Canal

Ba Bau canal under proposal scope of the project has starting point at intersection with Long Xuyen canal and ending point at km1+00. Ba Bau Canal is also a drainage route for the residential area in My Xuyen Ward with length  $L = 1.0$  km, the average width of 5.6 – 17 m. The canal is highly sedimented and unable to drain water, causing stagnant water pitches and pollution. The canal will be dredged to reach depth of 4.0 m (existing depth of 1.9 – 2.8 m), hard embankment in combination with soft embankment for 2 banks, construction of operation route for 2 banks with width of 4 m and adequate technical infrastructure (wastewater collection, lighting systems and green trees).

Houses are distributed along the canal with high density, interspersed garden land. Residents are encroaching the canal. However, temporary, wooden or corrugated iron houses are dominant. Most of the households engage in services and trade, hired works.

Identified PCRs and sensitive receptors include: Buu vien monastic (40 m from the canal). Besides, along material and waste transport routes, these works are present. See detailed description in section 2.6.

Main expected material and waste transport route: Tran Hung Dao street → Ha Hoang Ho street → An Giang Solid Waste Treatment Complex.



Location of Ba Bau canal



Current status of the canal

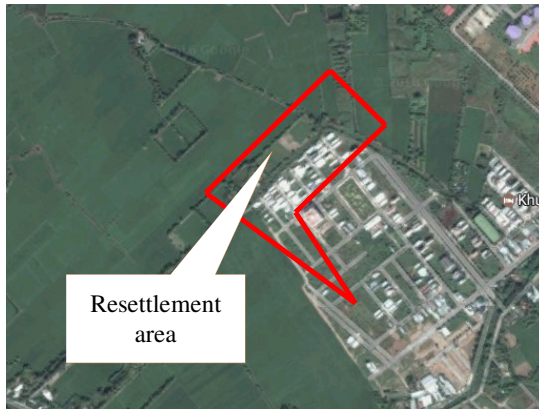
Residents spanning the canal

**Component 3:** Construction of 4 ha resettlement site with full technical infrastructure (transport, water supply, drainage, lighting and greenery)

The site with a total area of 4 ha situates in My Phuoc ward and My Hoa ward. The site is currently characterized with mostly vacant land, land for rice cultivation and the people are concentrated in the area near streets of Nguyen Van Linh and Le Trong Tan. The households live on small business, farming and hired jobs. Most houses are temporary and of grade 4.

Identified PCRs and sensitive receptors include: There are no sensitive receptors at and around the project area. See detailed description in section 2.6.

Main expected material and waste transport route: Tran Hung Dao street → Ha Hoang Ho street → An Giang solid waste treatment complex.



Location of resettlement area



Current status of land for resettlement area construction

## 2.6. SENSITIVE CULTURAL RESOURCES AND SITES IN THE PROJECT AREA

### 2.6.1. Long Xuyen Physical Cultural Resources

Long Xuyen City has three nationally rated monuments, which are the memorial house of the childhood of President Ton Duc Thang (My Hoa Hung Commune), My Phuoc Temple (now in My Long Ward). The characteristics of this project are described as follows:

- The memorial house for President Ton Duc Thang. The place is located on Ong Ho isle, My Hoa Hung Commune, Long Xuyen City, An Giang Province. This is one of 23 Vietnamese monuments rated as the national special monument (signed in May 10, 2012, announced in July 17, 2012). The construction is 2 km from the location of Long Xuyen Canal construction.
- My Phuoc Temple. The temple is about 300 m to the location of Long Xuyen Canal construction, about 300 m to LIA 6 and about 400 m to LIA 5. The temple is located in the center of My Long ward with the area of 3,800 m<sup>2</sup>. The temple is classified as the architectural art monument at national level. The temple gate is located on Le Minh Guom Street with crowded residences, small business and vending.
- Ong Bac Pagoda. The pagoda is located on Pham Hong Thai Street, My Long ward. The temple is a Chinese temple, built in the 19th century, and the first Chinese assembly hall in An Giang Province. The pagoda was recognized as a historical - cultural monument at national level in June 15, 1987, when this area still named Dong Xuyen, in My Phuoc village, Tay Xuyen district. Ong Bac Pagoda is not affected by the process of clearance in a distance of 70m to the location of Long Xuyen Canal construction and about 350 m to LIA 5.



Memorial house for President Ton Duc Thang



My Phuoc Temple



Ong Bac Pagoda







## 2.6.2. PCRs and sensitives points in the project area







During the implementation of the Subproject in Long Xuyen City, 27 graves will be relocated, in which along Tran Quang Dieu (5 graves), along Long Xuyen canal road (3 graves), along Cai Son canal road (4 graves), along Ba Bau canal road (2 graves), along Ong Manh canal road (1 graves), and in resettlement area (12 graves).







On the other hand, the transport of materials and waste disposal will also affect PCRs along the transport routes. Routes expected to be used for transport operations include: Tran Hung Dao Street, Ha Hoang Ho Street, Bui Van Danh Street, Nguyen Du, Ly Thai To Street, Bui Thi Xuan Street and Provincial Road 943.







The list of physical cultural resources in the project area and the transportation for building material and waste disposal is presented in Table 2.8.

**Table 2.8: List of Sensitive Sites in the Project Area and Transport routes**

Name/Figure	Work	Distance to work	Description
<b>PCR and sensitive receptors in project area</b>			
<b>Component 1:</b> Upgrading infrastructures in LIAs (LIA 1, LIA 3, LIA 5, LIA 6): <b>None</b>			
<b>Component 2:</b> Upgrading level 1 and 2 priority infrastructures (extended Hung Vuong Street, Tran Quang Dieu Street, Long Xuyen Canal, Cai Son Canal, Ong Manh Canal, Ba Bau Canal)			
 Dong Thanh Pagoda	Extended Hung Vuong Street	5	The pagoda is located in the alley, serving as a belief/religion place of the Buddhists in My Phuoc ward.
 My Phuoc market		20	The market is the central market of My Phuoc ward with crowded population and high traffic volume.
 Bui Huu Nghia secondary school and Trinh Hoai Duc primary school		10	High traffic volume, especially at schooling and after school hours.
 Vuong Tron maternity hospital	Tran Quang Dieu Street	10	Vuong Tron maternity hospital is 43m from the road junction between Ha Hoang Ho and Tran Quang Dieu Street. The population here is crowded, the amount of vehicle traffic through here is very high.

Name/Figure	Work	Distance to work	Description
 Ong Bac pagoda	Long Xuyen Canal Embankment	70	Built in the 19 <sup>th</sup> century, and is, the pagoda was recognized as a historical - cultural monument at national level. This serves as religious place for locals and visitors in a crowded and relatively high traffic volume area.
 Long Xuyen market		30	The area of Long Xuyen market is 1.8 ha with 1,033 stalls. The market is one of the busiest places in the area. The market is surrounded by crowded population and high traffic volume.
 Binh Dan general hospital	Cai Son Canal	10	As a Provincial level hospital, this serves Long Xuyen citizens and people in nearby districts. It is surrounded with crowded population, businesses such as restaurants, small stores, drug stores etc. and high traffic volume.
 General hospital of Long Xuyen city		20	As the primary hospital of the City, this serves Long Xuyen citizens and people in nearby districts. It is surrounded with crowded population, businesses such as restaurants, small stores, drug stores etc. and high traffic volume.
 Phuoc Minh Tai Pagoda	Ong Manh Canal	5	The Pagoda is not ranked. It is located at the end of Ong Manh Canal surrounded by several houses and fruit gardens. The population here is quite crowded, living on two sides of canal, encroaching the canal, littering and discharging waste water into the canal.
<b>Component 3: Constructing resettlement site: None</b>			
<b>Along transport routes for construction material and waste disposal</b>			
 Dong Thinh pagoda	LIA 1, LIA 5, LIA 6, Extended Hung Vuong Street, canals of Long Xuyen, Cai Son,	10	As an unranked pagoda, it is located on Tran Hung Dao Street, surrounded by crowded population and very high traffic volume.

Name/Figure	Work	Distance to work	Description
 Long Xuyen Cathedral	resettlement site	6	It is located on Tran Hung Dao Street, a main city road, surrounded by crowded population and very high traffic volume.
 An Giang Continuing Education Center		3	It is located on Tran Hung Dao Street, a main city road, surrounded by crowded population and very high traffic volume. There are small businesses, leased property etc.
 Chu Van An primary school	LIA 3, Tran Quang Dieu Street, canals of Ong Manh, Ba Bau, resettlement site	20	Located in Ha Hoang Ho Street, Crowded population and small businesses are concentrated around the school.
 Long Xuyen night market		10	About 25 m from the road junction between Ha Hoang Ho and Phan Ton to the east. The population here is quite crowded with mainly small businesses located around.
 Phap Hoa pagoda		5	As an unranked monument, it is located on Ha Hoang Ho Street, surrounded by crowded population and very high traffic volume.
 Hung Vuong secondary school		3	Located on Ha Hoang Ho Street, surrounded by houses and gardens with quite crowded population.

Name/Figure	Work	Distance to work	Description
 Long Xuyen Bishop	LIA 3, LIA 5, canals of Long Xuyen, Ong Manh and Ba Bau	0.5	As an unranked monument, it is located on Bui Van Danh Street, serves as riverside route in the park and therefore there is low traffic volume in this area.
 Hoa Lan Kindergarten		3	it is located on Bui Van Danh Street, surrounded by crowded population and high traffic volume.
 Quang Te Pagoda	LIA 6, extended Hung Vuong Street, Cai Son Canal	0.5	Located on Ly Thai To Street as an unranked, this Chinese pagoda is surrounded by crowded population and quite high traffic volume.
 Hospital of Opthamology – Ear,Nose,Throat - Odontostomatology		20	It is located in Nguyen Du Street, surrounded by crowded population and quite high traffic volume.
 Binh Minh nursery school	LIA 3, LIA 5, Tran Quang Dieu Street	3	Located on the front of Bui Thi Xuan street, the amount of vehicle traffic through here is moderate.
 Phu Hoa market	LIA 3, LIA 5, canals of Ong Manh and Ba Bau	25	Phu Hoa market is loated in Phu Hoa town, provides food for local and nearby people. The market is surrounded by crowded residences and small business households.



## CHAPTER 3. ANALYSIS OF ALTERNATIVES

This Long Xuyen city subproject is prepared in line with the national and regional master planning and policies, including:

- Decision No.2268/QD-UBND dated December 19, 2011 of An Giang People's Committee on approval of Long Xuyen city socio-economic development overall plan to 2020;
- Decision No. 505/QD- UBND dated April 03, 2012 of An Giang People's Committee on adjustment of general planning of Long Xuyen city to 2025;
- Decision No. 2085/QD-UBND dated October 05, 2015 of the Prime Minister on approval of a part of Xong Xuyen city construction general planning to 2025;
- Plan No. 122/KH-UBND dated October 20, 2014 on developing climate change response plan of construction sector during 2014 – 2020.

The analysis of the alternatives of the project plays an important role in the process of environmental and social impact assessment. This analysis activity includes the description, identification and comparison of design alternatives which are important to support the decision-making choice of construction activities in the Project area of Long Xuyen City. Accordingly, the selected activity is expected to be the fewest and lowest negative impacts while meeting feasible technical solutions and cost-benefits applied for the project. Further, alternative analysis practice will also minimize adverse impacts and maximize positive impacts in terms of environmental and social aspects.

This chapter presents analyses of scenarios for “without project” and “with project” and the analysis of engineering design alternative for each component in the case of “with project”. The results of these analyses are shown below.

### 3.1. EVALUATION OF “WITHOUT SUBPROJECT” AND “WITH SUBPROJECT

This section analyzes the alternatives - "Without Subprojectproject" and "With Sprject"

(i) **“Without Subproject”**: In the case of not implementing the project, the city continues to face existing challenges including:

- Traffic congestion in rush hours due to an inadequate and degraded urban transport network leading to the restrictions of local and regional transportation and trading activities;
- LIAs still suffer from the lack of road and waste management service, inadequate drainage and sanitation systems. Low connectivity between LIAs (narrow and zigzagging streets which are without or partially covered with concrete surfaces) and other areas of the city will pose persistent isolation for the poor in LIAs.
- The discharges into and encroachment of the main drainage canal in the City's inner area (Long Xuyen, Cai Son, Ong Manh, Ba Bau canals) will continue to pose and cause serious environmental pollution, stream blockage and spreading epidemic disease.
- In addition, the city of Long Xuyen city is being also severely affected by climate change impacts (local inundation, erosion of river banks, etc.).

(ii) **“With Project”**: When the subproject is implemented, it will bring about positive impacts including:

- Enhance the commuting conditions of local people, reduce traffic jam, and create force for economic development
- Increase the accessibility of LIAs to surrounding area
- Improve the living conditions of people via providing them access to basic technical and social infrastructure;

- Reduce local flooding, improved hygiene and sanitation conditions in project area through dredging, upgrading and renovating installing urban drainage systems.
- Improve urban landscape in the project area with the increase of green space; and thereby, facilitate tourism development
- These investment construction works will bring benefits for Long Xuyen City, aiming to become a resilient city to climate change impacts and to mitigate vulnerabilities due to sea level rise, flood risks, and landslides, etc.

The analysis results are shown in Table 3.1.

**Table 3.1: Analysis of Alternatives “WITHOUT PROJECT” AND “WITH PROJECT”**

Major Environmental and Social Issues	WITHOUT PROJECT	WITH PROJECT
<b>Environmental issues</b>		
<i>Air Pollution</i>	<p>Air pollution from the following sources:</p> <ul style="list-style-type: none"> <li>- Uncollected garbage and the backlog of solid wastes leading to the accumulation of garbage and causing bad odor in LIAs;</li> <li>- Incomplete and deteriorated roads, especially the internal roads in LIAs, causing traffic congestion is also an additional reason for air pollution.</li> </ul>	<p>The project aims to solve problems of environmental pollution, include:</p> <ul style="list-style-type: none"> <li>- The upgrading and expansion of alleys in LIAs will enable the accessibility of trucks for collecting garbage daily to avoid the backlog that causes environmental pollution;</li> <li>- Upgraded and renovated alleys and roads will increase efficient connectivity of transport links, which minimizes congestion during rush hours;</li> <li>- The implementation of the subproject will also causes environmental negative impacts on ambient air quality due to construction activities. However, these effects are short term and will cease when the construction phase is completed.</li> </ul>
<i>Water Pollution</i>	Canal water is seriously polluted by the direct discharge of domestic wastes and effluent from squatter households along the canals.	The quality of surface water will be improved by relocating squatters and households living along canals, and dredging canals for better flow conditions.
<i>Soil erosion</i>	Soil erosion risks are increased due to heavy rains, strong tidal surges, sea level rise and climate change consequences.	Soil erosion risks by new embankments protecting rivers' and canals' banks.
<i>Drainage Capacity</i>	Urban areas are still flooded by upstream floods, high tides and heavy rains.	Reducing flooding caused by rains and tides through the installation of drainage systems in 04 LIAs, 02 roads and upgrading 04 canals.
<i>Climate Change Adaptation</i>	<p>Long Xuyen city is severely affected by climate change consequences, including: abnormal changes in water flow regime, which results in severe floods in the wet weather; freshwater shortage, droughts and salt intrusion in the dry season; etc.</p> <p>Landslide events often occur and are complicated mainly in urban residential areas and main transport routes that</p>	<p>Rehabilitation of infrastructure in low income areas is facilitating technical infrastructure synchronization, promoting connectivity in urban development and climate change prevention</p> <p>Dredging canals in the city, constructing roads by planning codes in which climate change factor is taken into account will enhance water drainage capacity, minimize urban flooding, adapt to the situation of increasing rainfall, flood over years</p>

	damage people's property and lives.	Canal embankment's "hard in combination with soft structure" complies with the principle of respect for "river urban area" is also a factor to be adaptable to climate change.
<b>Social issues</b>		
<i>Land Acquisition and Resettlement</i>	Not affected by land acquisition and resettlement.	About 645 households are estimated to be affected, including 369 partially affected households and 276 fully affected households
<i>Disturbance of daily community activities</i>	No impacts on the lives and activities of local people in Long Xuyen city and community relationships.	Livelihoods and daily activities of local people as well as community's relations will be affected by relocation and construction activities.
<i>Accessibility of social infrastructure</i>	Local communities (LIAs) suffer from risks and incidents such as fires, natural disasters, diseases, etc. due to the limited accessibility to technical and social infrastructure.	Improved technical infrastructure (traffic, drainage, lighting, etc.) will enable the connectivity between areas and among areas of the region. Losses of lives and property will be minimized due to risks and incidents.
<i>Health and Sanitation Improvement</i>	Environmental sanitation conditions are exacerbated due to flooding and poor water quality which increase in epidemic disease.	Improved environmental sanitation conditions will minimize the spread of diseases, especially for households living along canals
<i>Increasing Land Value</i>	Low land value	Upgrading and renovation of roads will lead to the formulation of new residential areas and social infrastructure. This means that the value of land in these areas will be multiplied many times higher than the original value. Constructing the embankment of Long Xuyen, Cai Son, Ong Manh, Ba Bau canals will enable open space and better landscape.
<i>Urban Landscape</i>	Poor urban landscape without infrastructure improvement	Encroached households will be relocated, creating open space along the river banks with riverside landscape architecture, public spaces, planting and restoration of traditional architecture.
<i>Benefits</i>	None	About 40,000 and 152,078 people are direct and indirect beneficiaries. Additionally, living condition of households along canals will be stable.

### 3.2. “WITH PROJECT” ALTERNATIVES

This section will provide alternative analysis of technical options for the Project’s components, including: (i) Upgrading tertiary infrastructure in LIAs (Component 1) and (ii) Renovating Long Xuyen, Cai Son, Ong Manh, Ba Bau canals (Component 2). There is no alternative analysis for the investment items of road construction of Component 2 (sub-components 2.1 – 2.2) as they mostly in line with the plannings. However, with the proposed civil construction works of these components, a wide range of benefits and advantages were recognized in the above-mentioned in Section 3.1. The alternatives analyses are conducted considering a combination of technical, economic, environmental, and social criteria

#### 3.2.1. Component 1: Upgrading Tertiary Infrastructure in Low Income Areas

The construction activities of investment items for tertiary infrastructure in LIAs are mainly the construction works of upgrading and expanding main alleys and branch lanes with full technical infrastructure services such as electricity, water supply and drainage systems, etc. For this civil construction works of Component 1, there are three (03) proposed construction options as follows:

- Option 1: Upgrading with extension of alleys and lanes within alley to the minimal width of 4 m in width. The centerline of the alleys/lanes remain the same.
- Option 2: Upgrading without extension of existing alleys/lanes within the LIA
- Option 3: Combining Option 1 and Option 2. In LIAs, widening main alleys with minimum width of 4m; small branch alleys will be upgraded to the minimal width of 2 m

These options will be analyzed and evaluated in terms of technical, social and environmental aspects to select the most suitable option.

**Table 3.2: Alternative Analysis of Component 1**

<b>Content</b>	<b>Option 1</b>	<b>Option 2</b>	<b>Option 3</b>
<b>Description</b>	<ul style="list-style-type: none"> <li>Expanding all alleys in LIAs with 4 m wide. The expansion will be made toward both sides from the current centerline.</li> <li>Technical infrastructure will be installed coupled with road expansion, including: elevation and surface concrete, installation of sewerage and lighting systems, and trees).</li> </ul>	<ul style="list-style-type: none"> <li>Upgrading and improving existing alleys/lanes with current width of 2 – 3 m.</li> <li>Installing technical infrastructure, including: water supply, drainage and lighting systems, and trees.</li> </ul>	<ul style="list-style-type: none"> <li>Widening main alleys with minimum width of 4 m will be prioritized; small alleys will be improved based on current status with the width is more than 2 m.</li> <li>Installing technical infrastructure, including: elevating and surfacing with concrete, installing drainage and lighting systems and trees.</li> </ul>
<b>Technical assessment</b>	<ul style="list-style-type: none"> <li>The 4 m wide alley is adequate to arrange technical facilities which enable the traveling of fire fighting trucks and ambulances.</li> <li>Construction activities may be delayed due to high compensation and site clearance.</li> <li>Good landscape, wide alley and easy travel.</li> </ul>	<ul style="list-style-type: none"> <li>The narrowness of alley width is difficult to arrange technical infrastructure and obstruct the travelling of fire trucks and ambulances.</li> <li>It is easy for construction activities as in line with the current baseline.</li> <li>Poor landscape because the alleys are narrow.</li> </ul>	<ul style="list-style-type: none"> <li>The 4 m wide alley is adequate to install technical facilities which enable the traveling of fire trucks and ambulances.</li> <li>Small lanes and alleys can be easily connected with main roads.</li> <li>Ensuring landscape and public amenities.</li> </ul>
<b>Social assessment</b>	<ul style="list-style-type: none"> <li>Living conditions of local people are significantly improved because of convenient and easy accessibility to social infrastructure services.</li> <li>Involve highest scale of land acquisition and resettlement.</li> <li>Causing disturbance of daily activities and livelihood for local people due to great volume of land acquisition.</li> <li>It could result in conflicts and compensation complaints during the pre-construction phase as the amount land acquisition is highest.</li> </ul>	<ul style="list-style-type: none"> <li>Living conditions of local people are not much improved due to the alleys are still narrow.</li> <li>No land acquisition and resettlement is required.</li> <li>Low disturbance of local daily and livelihood activities as the construction work is simple and no land acquisition.</li> <li>Conflicts and grievance will be minimized as construction works are in line with current baselines.</li> </ul>	<ul style="list-style-type: none"> <li>Living conditions of local people are improved.</li> <li>Involve moderate scale of land acquisition and resettlement.</li> <li>Moderate impact on social disturbance as the construction work and volume of land acquisition is moderate.</li> <li>Conflicts and grievance will be moderate since there is moderate amount of land acquisition.</li> </ul>



Content	Option 1	Option 2	Option 3
<b>Environmental sustainability</b>	<ul style="list-style-type: none"> <li>Urban environmental hygiene and sanitation conditions are improved substantially.</li> <li>Better landscape and waste management.</li> <li>Urban flooding is eliminated because stormwater runoff and wastewater will be collected.</li> <li>Construction related impacts (noise, dust, debris and construction solid wastes) is highest due to highest volume of demolition and construction activities.</li> <li>Accessibility will be greatly enhanced.</li> </ul>	<ul style="list-style-type: none"> <li>Environmental hygiene and sanitation conditions are improved substantially.</li> <li>Landscape and environmental management would not be much improved.</li> <li>Urban flooding will no longer occur because stormwater and wastewater will be collected.</li> <li>Construction related impacts (noise, dust, debris and construction solid wastes) is lowest due to lowest volume of demolition and construction activities.</li> <li>Accessibility would be difficult for emergency, fire safety, evacuation or waste collection purposes.</li> </ul>	<ul style="list-style-type: none"> <li>Urban environmental hygiene and sanitation conditions are improved substantially.</li> <li>Better landscape and waste management.</li> <li>Flooding is eliminated because stormwater and wastewater will be collected.</li> <li>Construction related impacts (noise, dust, debris and construction solid wastes) is moderate due to moderate volume of demolition and construction activities.</li> <li>Accessibility will be relatively enhanced.</li> </ul>
<b>Investment effectiveness</b>	<ul style="list-style-type: none"> <li>The price of land and house will be rapidly boosted.</li> <li>Compensation and resettlement costs are higher due to more affected households.</li> <li>High cost for a large amount of construction works.</li> </ul>	<ul style="list-style-type: none"> <li>Land and house values are not much boosted because of insignificant improvement of small alleys.</li> <li>Compensation and resettlement costs are minimized.</li> <li>Low costs for construction.</li> <li>High effectiveness of investment because of short alleys.</li> </ul>	<ul style="list-style-type: none"> <li>House and land values increase rapidly.</li> <li>Compensation and resettlement costs are higher due to more affected households. However, these costs are higher than Option 2 and lower than that of Option 1.</li> <li>Construction cost will be higher than that of Option 2 but lower than Option 1.</li> </ul>
<b>Evaluation</b>	<p>Overall, the analysis show that:</p> <ul style="list-style-type: none"> <li>Option 1 will significantly enhance the landscape, accessibility and local travel within LIA. However, it has the highest cost of investment and land clearance.</li> <li>Option 2 has the lowest cost of investment and land clearance. However, this option does not thoroughly address environmental problems, i.e uncollected solid waste still remains due to narrow alleys limiting the accessibility of collection trucks.</li> </ul> <p>Option 3 is the presents more advantages which are overwhelming Option 1 and Option 2 because of reasonable cost for investment and land clearance. In addition, the factors on land scape, accesibilty, local travel are improved to a certain level. Therefore Therefore, Option 3 is selected.</p>		

### **3.2.2. Component 2: Priority Primary and Secondary Infrastructures**

#### ***3.2.2.1. Alternatives of Long Xuyen embankment structures***

As the flow of Long Xuyen river is relatively high, and there is waterway traffic in the river, therefore, soft structure is not considered for Long Xuyen embankment. All the options considered are of hard structures, with details described below:

- Option 1: Hard structure i.e. the gravity wall system with the combination of pile system.
- Option 2: hard structure embankment with prestressed concrete.
- Option 3: hard embankment, i.e. slope stone embankment above and the reinforced piling system below.

The technical analysis of options on the embankment structure are shown in Table 3.3.

**Table 3.3: Analysis on the options for the structure of Long Xuyen canal embankment**

Criteria	Option 1	Option 2	Option 3 (selected)
<b>Description</b>	Gravity concrete embankment wall	Prestressed concrete BT wall	Slope stone embankment above and the reinforced piling system below
<b>Technical</b>	<ul style="list-style-type: none"> <li>- High stability.</li> <li>- Highest volume of construction work, construction period is long, construction method is more difficult than the other options.</li> <li>- Operation and maintenance (O&amp;M) is similar compared to other options.</li> <li>- Not ensure the harmonisation with the existing section of Long Xuyen embankment.</li> </ul>	<ul style="list-style-type: none"> <li>- High stability.</li> <li>- Lowest volume of construction work, construction period is shortest as precast concrete wall can be used; construction method is relatively easy.</li> <li>- O&amp;M is similar compared to other options.</li> <li>- Not ensure the harmonisation with the existing section of Long Xuyen embankment.</li> </ul>	<ul style="list-style-type: none"> <li>- Stability is ensured, but is lesser than options 1&amp;2.</li> <li>- Average volume of construction work compared to other options, construction time is moderate, construction method is easiest.</li> <li>- O&amp;M is similar compared to other options.</li> <li>- Ensure the harmonisation with the existing section of Long Xuyen embankment.</li> </ul>
<b>Environmental</b>	<ul style="list-style-type: none"> <li>- The hydraulic section of the flow is not affected as the embankment is vertical</li> <li>- Construction related impacts (dust, noise, waste) is highest due to highest volume of construction work</li> </ul>	<ul style="list-style-type: none"> <li>- The hydraulic section of the flow is not affected as the embankment is vertical</li> <li>- Construction related impacts (dust, noise, waste) are lowest due to lowest volume of construction work</li> </ul>	<ul style="list-style-type: none"> <li>- The hydraulic section of the flow is not affected as the natural condition of the river bank is already sloppy</li> <li>- Construction related impacts (dust, noise, waste) are average due to average volume of construction work</li> </ul>
<b>Social</b>	<ul style="list-style-type: none"> <li>- Land acquisition and resettlement is moderate, as the excavation and concrete work require the encroachment to the river bank.</li> </ul>	<ul style="list-style-type: none"> <li>- Land acquisition and resettlement is low, no concrete work that requires the river bank encroachment</li> </ul>	<ul style="list-style-type: none"> <li>- Land acquisition and resettlement is moderate, as the excavation and concrete work require the encroachment to the river bank.</li> </ul>
<b>Investment cost</b>	High construction cost	Highest construction cost	Medium construction cost
<p><b>Conclusion:</b> For all options, the sustainability of the embankment are all ensured. Option 1 has the high investment cost, require cause higher environmental impacts during the construction period. Option 2 is better than the other options on social, environmental aspects, however it has the highest investment cost. Option 3 is average in regards to the environmental, social and economical aspects. More importantly, the option 3 ensures landscape, i.e. the harmonisation with other existing section of Long Xuyen canal. In consideration of all aspects, option 3 is selected.</p>			

### 3.2.2.2. Alternatives of Cai Son, Ong Manh, Ba Bau embankment structures

The project proposes 2 options for structures of Cai Son, Ong Manh, Ba Bau canal as follows:

- Option 1: combined soft and hard structure, i.e slope concrete embankment below and the slope earth embankment covered with tree and grass
- Option 2: Combined hard and soft structure, i.e. vertical reinforced concrete embankment below, and the slope soft embankment above covered with tree and grass

Analysis and selection of technical solutions on embankment structures as presented in Table 3.4.

**Table 3.4: The analysis of technical options on the structure of Cai Son, Ong Manh, Ba Bau canals**

Criteria	Option 1	Option 2 (selected)
<b>Description</b>	- Combined hard and soft structure, i.e. slope concrete embankment below and the slope earth embankment	Combined hard and soft structure, i.e. vertical reinforced concrete embankment below, and the slope soft embankment
<b>Technical assessment</b>	<ul style="list-style-type: none"> <li>- Embankment stability is ensured as the flows of the canals are small and there is no traffic waterway activity</li> <li>- The volume of construction work is lesser, construction period is shorter and construction method is easier</li> <li>- Construction activities are affected by weather, and could not be carried out during rainy season</li> </ul>	<ul style="list-style-type: none"> <li>- Embankment stability is ensured and is higher than the option 1</li> <li>- The volume of construction work is greater, construction period is shorter, construction method is more complex</li> <li>- Construction activities are not affected by weather, construction during rainy season is possible</li> </ul>
<b>Environmental</b>	<ul style="list-style-type: none"> <li>- Construction related impacts (dust, noise, waste) are lesser due to higher volume of construction work</li> <li>- Landscape effect is aesthetical pleasing with the green area and similar as option 2</li> <li>- Hydraulic section of the flow is affected and become narrow as the hard embankment section below is sloppy</li> </ul>	<ul style="list-style-type: none"> <li>- Construction related impacts (dust, noise, waste) are lesser due to lower volume of construction work</li> <li>- Landscape effect is aesthetical pleasing with the green area and similar as option 1</li> <li>- Hydraulic section of the flow is not affected the hard embankment section below is vertical</li> </ul>
<b>Social</b>	The impact on land acquisition, resettlement, and livelihood restoration are higher as the below slope embankment structure will require more land acquisition	The impact on land acquisition, resettlement, and livelihood restoration are lower as the below vertical embankment structure will require lesser land acquisition.
<b>Cost</b>	Construction cost is lower	Construction cost is higher

Criteria	Option 1	Option 2 (selected)
<b>Conclusion:</b> Among the two options, option 2 is technically more difficult, caused more environmental impacts during construction period, and has high construction cost. However, option 2 is better than option 1 regarding the social impacts and hydraulic flow section of the canals during operation. In considerations of all aspects, option 2 is selected.		



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

This Chapter presents the findings of the assessment of potential environmental and social impacts arising from project implementation.

Upon completion of the project, the overall impacts will be positive in terms of economic and social issues and surface water quality. The direct beneficiaries are communities at both local and regional levels. The positive impacts brought by the project will solve most of the difficulties that Long Xuyen city is facing such as flooding, traffic congestion and environmental sanitation. However, the implementation of the project during the civil construction works phase will create negative impacts for the local communities due to the pollution of air, soils, watershed, noise and vibration. However, these negative impacts are localized, short-term, controllable and will cease upon completion of the construction phase. This chapter presents the type, level and scale of impacts caused by construction activities of each project component.

It must be recognized that the evaluation of potential impacts and their significance is largely commensurate with the level of project design and that of its constituent work components. In view of the project being between pre-feasibility and feasibility studies, a number of assumptions and estimates have been made, primarily based on the experience from the preceding urban investment project, such as the type and number of equipment used during construction.

In EIA it is important to identify as accurately as possible the potentially significant adverse effects and either remove them at the design stage, or develop effective mitigation to reduce their severity to acceptable levels. Other important aspects in the EIA process are the environmental and social setting and context in which the development is taking place. Thus projects in particularly sensitive areas or with valuable environmental and social receptors are likely to have more significant adverse effects. In the case of this project, the setting is predominantly urban environments, many of which are degraded by unregulated wastewater discharges, an inefficient transport network and poor quality housing. Consequently, the major effects in the low income areas are related to noise, disturbance and nuisance to local residents during the construction works, which are designed to improve the living and transport conditions and improve drainage and sanitation in the localised areas. The required resettlement of houses occupying the project footprint is of a higher category of adverse impact, The required resettlement of houses occupying the project footprint is of a higher category of adverse impact, which is also addressed in this ESIA.

### **4.1. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT**

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

The implementation of the subproject will bring a positive impact on living standards, environmental conditions and infrastructure services in the subproject area. The positive impacts of the subproject are summarized as follows:

- Additional economic, social, environment and aesthetic benefits from the construction of linear parks along Long Xuyen, Cai Son canals/embankment i.e. open space for recreation of local people.
- Minimize inundation through upgrading existing drainage systems: The project will improve the existing drainage capacity, while taking into account of future planning. The upgrading and renovation of roads accompanied by technical infrastructure, especially the drainage system, play an important role in minimizing urban flooding which is predicted to be severe

in the context of climate change (extreme weather events and sea level rise). The subproject would also enable the city authority to achieve objectives set in urban upgrading and planning along with the on-going projects in Long Xuyen city in particular, and An Giang province in general.

- Renovate urban landscape, enhance the quality of life: The subproject will contribute to urban rehabilitation, making opportunities for the development and for the poor, improving environmental conditions and public health across the City as well as creating temporary and long-term jobs for local people surrounding the project area (free labor, masonry, masons etc.) during the construction and operation phases.
- Reduce traffic congestion and increase the connectivity of transport links: Upon the completion of the subproject, urban transport effectiveness will be improved and strengthened. Besides, the traffic works also bring benefits to urban dwellers as well as suburban residents often traveling to Long Xuyen City.
- Improve environmental sanitation from moving households that encroach the canal, building drainage system, dredging the canals. Besides, upgrading and enlarging alleys and providing dustbins will minimize the littering in LIAs.
- Enlarge urban land: the construction of roads will form residential areas accompanied by social infrastructure along new roads, meanings urban area is enlarged to these sites.

#### **4.1.2. Potential Negative Impacts**

Based on the analysis of baseline data, field visits, and discussion with key officials and stakeholders, the potential negative impacts on natural environment and socio-economic environment have been identified. The details of environmental impact assessments are presented in the following sections.

In general, the implementation of the project will cause negative environmental and social impacts that are unavoidable. However, these negative impacts are generated by civil construction works of Components 1, 2 and 3 which propose investment of construction works on upgrading and renovating the technical infrastructure.

Many of environmental and social impacts are reversible, temporary, localized and controllable. These impacts can be minimized by mitigation measures through adopting appropriate construction technology, well environmental and social management, well performance of site specific mitigation measures, and adequate public consultation with local communities. However, the type and scale of impacts significantly depend on the nature and scope, location, and socio -environmental conditions as well as other human habits and time scale. The type and scale of the potential impacts of the project are identified in each component are summarized in Table 4.1 below, in which:

- No (N) – No impact;
- Low (L): Low impact: small works, localized, minor and temporary impacts, reversible and can be ignored;
- Medium (M) - Medium impact: medium scale of works, moderate and temporary impacts of which most are reversible, manageable and reducible;
- High (H): Large scale of works with significant impacts (environmentally or socially) of which can be minimized by performing appropriate mitigation measures.

Both M and H levels require implementation of mitigation measures, compliance with environmental safeguard policies as well as monitoring performance and institutional capacity building.

**Table 4.1: The level of possible negative impact of the project**

Component	Physical			Biological		Social				Others	
	Air pollution, noise, vibration	Land, water	Solid waste, sludge	Forest, Natural habitats	Fish, aqualife	Land acquisition and resettlement	Indigenous people	Physical Cultural Resources, the sensitive points	Livelihoods, community disturbance	Local flooding, traffic, safety	Off-site impacts
<b>Component 1: Upgrading Tertiary Infrastructure in Low Income Areas</b> (including LIA 1, LIA 3, LIA 5, LIA 6): total area of 74.78 hectares, 154 affected HHs, in which 120 HHs are partially affected and 34 HHs are completely affected. Key tasks include: upgrading and expanding alleys; constructing the drainage, light systems, layout for trees and trash cans on alleys.											
<ul style="list-style-type: none"><li>- Renovate LIA 1: total area of 9.82 ha, is located in My Binh ward; resettlement impacts 130 households, including 96 households partly affected, 34 households fully affected, 1,117 m<sup>2</sup> residential land and 56 m<sup>2</sup> agricultural land</li><li>- Renovate LIA 3: total area of 26.57 ha, is located in Dong Xuyen ward and My Xuyen ward; resettlement impacts 24 households partly affected, 174 m<sup>2</sup> residential land and 93 m<sup>2</sup> agricultural land</li><li>- Renovate LIA 5: total area of 5 ha, is located in My Xuyen ward; no household with houses and lands affected.</li><li>- Renovate the LIA 6: total area of 33.39 ha, is located in My Long ward and My Phuoc ward, no households with houses and lands affected.</li></ul>											
Pre - Construction	N	N	N	N	N	M	N	N	M	N	N
Construction	M	M	M	N	N	N	N	N	M	M	M
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	<p>Low or moderate impact can be best minimized by ECOPs (see Note 2 below).</p> <ul style="list-style-type: none"><li>- Pre – Construction: (i)Risk of UXO; (ii) land acquisition</li><li>- Construction: (i) Localized flooding; (ii) Social disturbance and increased traffic risks; (iii) Damage to water supply and communication systems; (iv) Impacts caused by transportation activities.</li><li>- Operation: (i) Local flooding due to blockage of the drainage system along alleys; (ii) Traffic safety; (iii) Waste Management</li></ul>										
<b>Component 2: Priority Primary and Secondary Infrastructures:</b> include upgrading, renovating and constructing 02 new roads (the Hung Vuong extensive street, Tran Quang Dieu street); upgrading and renovating 04 canals (Long Xuyen, Cai Son, Ong Manh, Ba Bau canals) in the rural areas of the city; impacting 491 HHs, in which 249 HHs are partially affected and 242 HHs completely affected.											
<b>Sub-component 2.1:</b> Building Hung Vuong extensive street to connect two existing Hung Vuong streets, 1 at My Long ward and 1 at My Quy ward. New Hung Vuong street will pass through three wards: My Long ward, My Long ward and Quy Phuoc ward.											
<ul style="list-style-type: none"><li>- Scale of investment: 24 m wide with road surface width of 12 m, the pavement width is 6m on each side with full base infrastructures.</li><li>- Land acquisition and resettlement: 130 households (partly), 45 households (fully), affected of 5,399 m<sup>2</sup> residential land and 18,089 m<sup>2</sup> agricultural land.</li><li>- Base infrastructures include sidewalks, water drainage system, trees, light system and technical trenches.</li><li>- Sensitive constructions include: My Phuoc market, Dong Thanh pagoda, Bui Huu Nghia secondary school and Trinh Hoai Duc primary school, Ngoc Anh kindergarten, their distant to the project location is about 4-40 m.</li></ul>											
Pre - Construction	N	N	N	N	N	M	N	N	M	N	N
Construction	M	M	M	N	N	N	N	M	M	M	M
Operation	L	L	L	N	N	N	N	N	N	L	N

Component	Physical			Biological		Social				Others	
	Air pollution, noise, vibration	Land, water	Solid waste, sludge	Forest, Natural habitats	Fish, aqualife	Land acquisition and resettlement	Indigenous people	Physical Cultural Resources, the sensitive points	Livelihoods, community disturbance	Local flooding, traffic, safety	Off-site impacts
Remark	Low or moderate impact can be best minimized by ECOPs (see Note 2 below). - Pre – Construction: (i) Risk of UXO; (ii) land acquisition Construction:(i) decreased water quality; (ii) localized flooding; (iii) Impacts on business activities; (iv) Impacts on PCRs and sensitive receptors. Operation: (i) Local flooding due to blockage of the drainage system; (ii) Traffic safe.										
<b>Sub-component 2.2:</b> Construction of Tran Quang Dieu street											
- Scale of investment: L = 0.9 km length, 20.5m wide (10.5m of surface width, 5 m of pavement width on each side) with full base infrastructures.											
- Land acquisition and resettlement: 85 households (partly); 89 households (fully); 9,201 m <sup>2</sup> of residential land and 3,348 m <sup>2</sup> agricultural land affected.											
- Technical infrastructures include sidewalks; drainage system; trees, electrical lighting systems along two road sides.											
- Sensitive receptors: Educational Center for orphans and lonely elderly Long Xuyen City, Chu Van An primary school, Vuong Tron maternity hospital.											
Pre - Construction	N	N	N	N	N	H	N	N	M	N	N
Construction	M	M	M	N	N	N	N	M	L	M	M
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	Low or moderate impact can be best minimized by ECOPs (see Note 2 below). - Pre – Construction: (i) Risk of UXO; (ii) land acquisition - Construction:(i) decreased water quality; (ii) localized flooding; (iii) Impacts on business activities; (iv) Impacts on PCRs and sensitive receptors. - Operation: (i) Local flooding due to blockage of the drainage system; (ii) Traffic safe.										
<b>Sub-component 2.3:</b> Building the embankment of Long Xuyen canal											
- Scale of investment: L = 2.34 km in length, divided into 3 sections: i) Section 1 from Nguyen Du to My Binh with 0.6 km long, ii) Section 2 from Le Thi Nhien to My Long with 0.44 km long, iii) Section 3 from Nguyen Thai Hoc bridge to Ton Duc Thang bridge with 1.3 km long.											
- Land acquisition and resettlement: 80 households (partly), 72 households (fully), 4,732 m <sup>2</sup> of residential land and 810 m <sup>2</sup> agricultural land affected.											
- The works include: embankments of canal, build roads behind the embankments following the scale 13 m (7 m of surface width and 3m of pavement width on each side), building the drainage system, light system and planting trees.											
- Sensitive projects: Ong Bac pagoda and Long Xuyen market											
Pre - Construction	N	N	N	N	N	H	N	N	M	N	N
Construction	M	M	M	M	M	N	N	L	M	M	M
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	Low or moderate impact can be best minimized by ECOPs (see Note 2 below). - Pre – Construction: (i)Risk of UXO; (ii) land acquisition. - Construction: (i) Risk of shore erosion during embankment process; (ii) Structure collapse due to pile driving; (iii) Impacts on waterways traffic; (iv) Impact on PCR and sensitives receptors. - Operation: (i) Risks of embankment subsidence and breakage; (ii) Local flooding due to blockage of the drainage system; (iii) The risk of canal										

Component	Physical			Biological		Social				Others	
	Air pollution, noise, vibration	Land, water	Solid waste, sludge	Forest, Natural habitats	Fish, aqualife	Land acquisition and resettlement	Indigenous people	Physical Cultural Resources, the sensitive points	Livelihoods, community disturbance	Local flooding, traffic, safety	Off-site impacts
	pollution and congestion caused by rubbish littering from households along canals.										
<b>Sub-component 2.4:</b> Renovate Cai Son canal											
<ul style="list-style-type: none"><li>- Scale of investment: L = 1.5 km in length, the works include: dredging the canal, the canal embankment, constructing , managing operating route with 3-4m long and wastewater collecting sewers connecting to the collecting system of the city.</li><li>- Land acquisition and resettlement: 41 households (partly), 15 households (fully), 1,995 m<sup>2</sup> of residential land and 1,032 m<sup>2</sup> agricultural land affected.</li><li>- Sensitive constructions: General hospital of Long Xuyen City, Binh Dan general hospital.</li></ul>											
Pre - Construction	N	N	N	N	N	M	N	N	L	N	N
Construction	M	M	M	M	M	N	N	M	M	M	M
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	<p>Low or moderate impact can be best minimized by ECOPs (see Note 2 below).</p> <ul style="list-style-type: none"><li>- Pre – Construction: (i) Risk of UXO; (ii) land acquisition.</li><li>- Construction: (i) odor from dredged sediment; (ii) local flooding during dredging process; (iii) Risk of subsidence during canal embankmentand (iv) Risks on collapse and cracking of infrastructure due to pile jacking during embankment process; (v) impacts on PCRs and sensitive receptors.</li><li>- Operation: Local flooding due to blockage of the drainage system; (iv) The risk of canal pollution and congestion caused by rubbish littering from households along canals.</li></ul>										
<b>Sub-component 2.5:</b> Renovate Ba Bau canal											
<ul style="list-style-type: none"><li>- Scale of investment: 1.0 km in length, the works include: dredging the canal, the canal embankment, constructing , managing operating route with 3-4m long and wastewater collecting sewers connecting to the collecting system of the city.</li><li>- Land acquisition and resettlement: 24 households (partly); 08 households (whole); 1,229 m<sup>2</sup> of residential land and 473 m<sup>2</sup> agricultural land affected.</li><li>- Sensitive points: Hung Vuong secondary school and Buu Vien monastic house.</li></ul>											
Pre - Construction	N	N	N	N	N	L	N	N	L	N	N
Construction	M	M	M	M	M	N	N	M	M	M	M
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	<p>Low or moderate impact can be best minimized by ECOPs (see Note 2 below).</p> <ul style="list-style-type: none"><li>- Pre – Construction: (i) Risk of UXO; (ii) land acquisition.</li><li>- Construction: (i) odor from dredged sediment; (ii) local flooding during dredging process; (iii) Risk of subsidence during canal embankmentand (iv) Risks on collapse and cracking of infrastructure due to pile jacking during embankment process; (v) impacts on PCRs and sensitive receptors.</li><li>- Operation: Local flooding due to blockage of the drainage system; (iv) The risk of canal pollution and congestion caused by rubbish littering from households along canals.</li></ul>										
<b>Sub-component 2.6:</b> Renovate Ong Manh canal											
<ul style="list-style-type: none"><li>- Scale of investment: L= 1.6 km in length, the works include: dredging the canal, the canal embankment, constructing , managing operating route with 3-4m long and</li></ul>											



Component	Physical			Biological		Social				Others	
	Air pollution, noise, vibration	Land, water	Solid waste, sludge	Forest, Natural habitats	Fish, aqualife	Land acquisition and resettlement	Indigenous people	Physical Cultural Resources, the sensitive points	Livelihoods, community disturbance	Local flooding, traffic, safety	Off-site impacts
wastewater collecting sewers connecting to the collecting system of the city.											
- Land acquisition and resettlement: 67 households (partly); 8 households (whole); 743 m <sup>2</sup> of residential land and 2,810 m <sup>2</sup> agricultural land affected.											
- Sensitive constructions: Phuoc Minh pagoda which is away from the canal about 5m.											
Pre - Construction	N	N	N	N	N	L	N	N	M	N	N
Construction	M	M	M	M	M	N	N	L	L	M	M
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	Low or moderate impact can be best minimized by ECOPs (see Note 2 below). - Pre – Construction: (i) Risk of UXO; (ii) land acquisition. - Construction: (i) odor from dredged sediment; (ii) local flooding during dredging process; (iii) Risk of subsidence during canal embankmentand (iv) Risks on collapse and cracking of infrastructure due to pile jacking during embankment process; (v) impacts on PCRs and sensitive receptors. - Operation: Local flooding due to blockage of the drainage system; (iv) The risk of canal pollution and congestion caused by rubbish littering from households along canals.										
<b>Component 3: Resettlement sites</b>											
- Scale of investment: constructing resettlement site with a total area of 04 hectares, located on My Phuoc ward and My Hoa ward with full technical infrastructure.											
- Land acquisition and resettlement: 22 households (partly); 2 households (fully); 200 m <sup>2</sup> of residential land and 33,556 m <sup>2</sup> agricultural land affected.											
- Technical infrastructure include: traffic roads, power supply, water supply, drainage systems...and the accompanying social infrastructures such as culture houses, health centers, kindergartens.											
- No sensitive constructions in the construction area and around the project area.											
Pre - Construction	N	N	N	N	N	L	N	N	L	N	N
Construction	M	M	M	N	N	N	N	N	L	M	M
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	Low or moderate impact can be best minimized by ECOPs (see Note 2 below). - Pre – Construction: (i)Risk of UXO; (ii) Land acquisition. - Construction: Impacts on rice farming. - Operation: (i) Wastewater; (iii) Solid waste impact;										
Notes: (1) The following criterias are used to assess the impact level: No (N) -no impact; Low (L) - low, local impact, can recover, temporary; Medium (M) – small constructions in the urban/sensitive areas, medium-scaled constructions with moderate impact and most of them can recover, minimize, and easy to manage, locally, temporary; High (H) – medium-scaled constructions in small urban/sensitive areas, large-scaled projects with significant impact (social and/or environmental aspects) are unable to recover and claim; Both the M and H should be supervised and mitigation measures are needed to implement as well as improve institutional capacity for adequate protection.											
(2) The small and medium-scaled constructions, most of impacts are local, temporary, and can be mitigated through the application of technology and good construction management with close surveillance, monitoring and close consultation with the local community.											

### **4.1.3. Impact Assessment for Component 1 – Upgrading Tertiary Infrastructure in LIAs**

Upgrading tertiary infrastructure in Low Income Areas (LIAs) include: Widening long main alleys with minimum width of 4 m; Upgrading, rehabilitating small alleys; Building drainage system; Dredging small canals in LIA 2; Install water supply pipes and providing waste bins. Construction, implementation of these items causes environmental impacts. These impacts are assessed into details by each phase and presented as follows.

#### ***4.1.3.1. Component1: Impacts during Preparation***

##### ***Impacts on land acquisition***

Land acquisition and resettlement in part or whole area will physically and mentally impacts on people's life, even causing social problems and prolonged litigation.

In the entire Component 1, 120 households are affected partly and 34 households are to be displaced, 1,291 m<sup>2</sup> resident land, 149 m<sup>2</sup> agricultural land.

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.

Most of households in LIAs are self-employed with insecure income sources due to their low education levels and unstable career. At the same time, housing conditions are of temporary nature and degraded; in the event of relocation, they are quite worried about the possibility of owning a new home. During the consultation meeting, most of the surveyed households were very concerned about the resettlement policies and procedures. For business and commercial households, they are concerned about a new place for the family to resume their business. The detailed impact assessment is presented in Section 4.2.

##### ***Remaining unexploded ordnances (UXO)***

The subproject construction sites have been much affected by human activities including extensive urban development, and UXOs have already been cleared. However, there can be remaining UXOs from the war time, which can be encountered during excavation. 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: Impacts during Construction***

##### **A. Component 1: Generic Environmental Impacts during Construction**

Construction phase including the following activities: constructing and installing drainage sewers; constructing lighting system, and pavement of the alleys. These activities will cause environmental impacts such as emission, solid waste, wastewater, noise, vibration, ect. Besides, this phase also causes typical impacts namely local flooding, disturbance to communities and impacts on traffic. However, these impacts are non-continuous, short-term and mostly temporary.

##### **➤ Impacts on air environment**

##### **Dust caused by demolition**

There are 154 households having affected structures with total land acquisition of 1,291 m<sup>3</sup>. Structures within acquisition scope in the LIA include mainly resident's houses such as: class-4 houses, yards, fence, gate piers. There are no sensitive receptors within acquisition scope.

Most of the structures to be demolished are built with masonry, brick. Demolition of structures and adhesion of materials generates dust.

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 m/s);

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

→  $E_d = 0.04656 \text{ kg/ton}$ .

**Table 4.2: Forecasts of dispersed dust from demolition**

Item	Volume of excavating and backfilling (m <sup>3</sup> )	Construction stage (Quarter)	Dust load (kg/day)
LIA 1	2,826	2	3.18
LIA 3	6,277.5	3	4.71
LIA 5	8,752.5	5	3.94
LIA 6	8,752.5	5	3.94

Note: Unit weight of debris: 1.8 tons/m<sup>3</sup>

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 3.5 m/s and a distance of 10-200 m from generating sources, height of 1.5-27 m, the concentration of pollutants created by transportation operations can be calculated as follows:

- For LIA 1: Dust concentrations vary between 0.13-2.57 mg/m<sup>3</sup> (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>).
- For LIA 3: Dust concentrations vary between 0.11-3.74 mg/m<sup>3</sup>.
- For LIA 5: Dust concentrations vary between 0.13-3.17 mg/m<sup>3</sup>.
- For LIA 6: Dust concentrations vary between 0.15-3.18 mg/m<sup>3</sup>.

The data indicate that at the distance of 10 m from construction site, dust concentration is 9 – 12 times higher than the standard; at the distance of 50 m from construction site, dust concentration is 2.5 to 3 times higher than the standard and meets the standard at the distance of 170 m from construction site. Within this distance, existing households along the alleys under construction, workers at construction sites, traffic participants along the alleys will be affected. See Table 4.5 for scope and affected objects.

However, dust caused by demolition activities is raw dust, with big weight, so it is rapidly deposited to the ground. At the same time, demolition activities are not implemented on a large scale; demolition is implemented with successive method, so impact radius should be significantly restricted. Therefore, impact is assessed at average level.

**Dust pollution from earthwork, grading and constructing pavement and drainage:**

During the construction phase, excavation activities include removal of organic matters on top soil layer and digging for drainage system installation. Due to narrow alleys, machineries and mechanical devices will be deployed; the task is carried out by man power and basic equipment (crowbars, hoes, shovels, small concrete mixer, concrete drilling and cutting machines, etc.). These activities will generate dust influencing directly to workers at construction sites and local people.

According to dust emission formula [1] by the guidelines of environmental assessment sourcebook (World Bank, 1991) and US EPA, 1995:  $\rightarrow E = 0.0272 \text{ kg/ton} [k = 0.35; U \text{ (wind velocity)} = 3 \text{ m/s}; M \text{ (average humidity)} = 14 \text{ \%}]$ . The loads of dispersed dust generated by excavation can be forecasted as follows (Table 4.3):

**Table 4.3: Forecasts of dispersed dust from excavation, backfilling and ground leveling**

Item	Volume of excavating and backfilling (m <sup>3</sup> )	Construction stage (Quarter)	Dust load (kg/day)
LIA 1	11.304	16	1.01
LIA 3	4,370,12	6	1.04
LIA 5	884,51	2	0.63
LIA 6	1.516,73	3	0.72

Note: Unit weight of soil: 1.4 tons/m<sup>3</sup>

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 3.0 m/s and a distance of 10-45 m from generating sources, height 1.5 - 6 m, the concentration of pollutants created by transportation operations can be calculated as follows:

- For LIA 1: Dust concentrations vary between 0.1-0.9 mg/m<sup>3</sup> (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>).
- For LIA 3: Dust concentrations vary between 0.13-0.88 mg/m<sup>3</sup>.
- For LIA 5: Dust concentrations vary between 0.15-0.61 mg/m<sup>3</sup>.
- For LIA 6: Dust concentrations vary between 0.17-0.7 mg/m<sup>3</sup>.

The data indicates that at the distance of 10 m from construction site, dust concentration is 2 – 3 times higher than the standard; at the distance of 30 m from construction site, dust concentration is 1.1 to 1.3 times higher than the standard and meets the standard at the distance of 35 m from construction site. Within this distance, existing households along the alleys, workers at construction sites, traffic participants along the alleys will be affected. See Table 4.5 for scope and affected objects.

However, dust caused by excavation, backfilling has high humidity, so dust will rapidly be deposited and exist for a short period of time. Duration of dust generation is approximately 2 - 4 weeks at each construction location. At the same time, construction will be implemented by each section and bidding package in different time periods, so impact scope is not spread. Therefore, impact is assessed at medium level and can be minimized.

#### **Dust and emission generated from transportation**

Dust and exhaust gases from transportation: According to the standards established by the World Health Organization (WHO) (Assessment of Sources of Air, Water and Land Pollution –Part 1: Rapid Inventory Techniques in Environmental Pollution, WHO, 1993), 15-ton diesel vehicles will generate loads of dust and exhausted CO, SO<sub>2</sub>, NO<sub>2</sub>, and HC as follows: dust: at 1.6 g/km/vehicle; CO gas: 3.7 g/km/vehicle; SO<sub>2</sub>: 7.43S g/km/vehicle; NO<sub>x</sub>: 24.1 g/km/vehicle and HC: 3 g/km/vehicle (diesel of 0.05% S). The subproject will use 15-ton trucks for transporting. The average transport distance is 20 km. The total passages of trucks and the generated dust loads in the process of soil transportation are calculated as follows (Table 4.4):

**Table 4.4: Number of truck passages in constructing items of Component 1**

Construction Items	Volume of material (m <sup>3</sup> )	Transport time (months)	Number of vehicles (trip/day)	Volume of waste (m <sup>3</sup> )	Transport time (months)	Number of vehicles (trip/day)	Total vehicle (trip/day)
LIA 1	9,144.87	3	16	3,032.7	2	8	24
LIA 3	7,058.40	2	18	3,249	2	8	26
LIA 5	10,817.89	3	20	858	1	4	24

LIA 6	10,817.89	3	20	3,682.5	2	10	30
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From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 3 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 LIA 1:* Dust concentrations vary 0.12 mg/m<sup>3</sup> (compared with permissible standard limits of 0.3mg/m<sup>3</sup>); CO contents 5.31 mg/m<sup>3</sup> (compared with 30 mg/m<sup>3</sup>); SO<sub>2</sub> contents 0.03 mg/m<sup>3</sup> (compared with 0.35 mg/m<sup>3</sup>); and NO<sub>x</sub> contents 0.03 mg/m<sup>3</sup> (compared with 0.2 mg/m<sup>3</sup>).
- *For LIA 3:* Dust concentrations vary 0.11 mg/m<sup>3</sup>; CO contents 5 mg/m<sup>3</sup>; SO<sub>2</sub> contents 0.02 mg/m<sup>3</sup>; and NO<sub>x</sub> contents 0.02 mg/m<sup>3</sup>.
- *For LIA 5:* Dust concentrations vary 0.13 mg/m<sup>3</sup>; CO contents 5.33 mg/m<sup>3</sup>; SO<sub>2</sub> contents 0.04 mg/m<sup>3</sup>; and NO<sub>x</sub> contents 0.04 mg/m<sup>3</sup>.
- *For LIA 6:* Dust concentrations vary 0.15 mg/m<sup>3</sup>; CO contents 5.25 mg/m<sup>3</sup>; SO<sub>2</sub> contents 0.04 mg/m<sup>3</sup>; and NO<sub>x</sub> contents 0.04 mg/m<sup>3</sup>.

#### Dust:

In general, the loads of dust generated in the process of transporting excavated earth are forecast as being not substantial and would be distributed evenly along transportation routes, between 0.11 and 0.15 mg/m<sup>3</sup>. According to calculations, the dust concentration would not exceed the national standards on ambient air quality (QCVN 05: 2013/BTNMT).

The main transport routes for materials transportation would be: Tran Hung Dao street, Bui Van Danh street, Ha Hoang Ho street and some other 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 thereby assessed as being medium.

#### Exhaust gases:

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 24 – 30 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.

**Table 4.5: Component 1 - Impact objects and scope of dust, noise and vibration**

Construction Name	Sensitive object affected	Distance from work (m)
LIA 1	- <u>In the project area:</u> residential area along alleys, workers at construction site and traffic participants along the alleys. - <u>On transportation route:</u> Dong Thinh Pagoda, Long Xuyen Cathedral, An Giang Continuing Education Center.	3-10
LIA 3	- <u>In the project area:</u> residential area along alleys, workers at construction site and traffic participants along the alleys. - <u>On transportation route:</u> Hoa Lan Kindergarten; Long Xuyen Bishop; Hung Vuong Secondary School; Chu Van An Primary School; Vuong Tron maternity hospital; Phap Hoa Pagoda; Phuoc Loc Tho Pagoda; Long Xuyen Night market; Binh Minh nursery school, Phu Hoa market.	3-10



Construction Name	Sensitive object affected	Distance from work (m)
LIA 5	- <u>In the project area</u> : residential area along alleys, workers at construction site and traffic participants along the alleys. - <u>On transportation route</u> : Dong Thinh Pagoda, Long Xuyen Cathedral, An Giang Continuing Education Center, Hoa Lan Kindergarten; Long Xuyen Bishop; Binh Minh nursery school; Phu Hoa market.	0.5 - 10
LIA 6	- <u>In the project area</u> : residential area along alleys, workers at construction site and traffic participants along the alleys - <u>On transportation route</u> : Quang Te Pagoda, Hospital of Ophthalmology – Ear, Nose, Throat - Odontostomatology	0.5 - 20

### ➤ Impacts on water environment

#### *Stormwater runoff*

The flow rate of stormwater runoff in the construction area will be dependent on climatic factors in the area. The total amount of stormwater generated in the Project area during construction operations can be estimated from the following formula:

$$Q = \varphi \times q \times S \quad [2]$$

In which:

S : total Project area (m<sup>2</sup>)

$\varphi$  : runoff coefficient of land cover (if the cover is mostly soil, then  $\varphi = 0.2$ ; in case of mostly macadam (with no agglutinant materials), then  $\varphi = 0.4$ ; in case of mostly asphalt or concrete, then  $\varphi = 0.6$ )

q : rainfall intensity (l/s.ha),  $q = 166.7 \times i$

- 166.7: module for converting rainfall intensity from rainfall depth to volume

q : rainfall intensity =  $166.7 \times i$ , with i being the greatest rainfall depth in the area in the month with the greatest precipitation (Hoang Hue, 1996). According to hydrologic data of the area, the greatest rainfall is in July with 295 mm and a number of rainy days of 23.1 and 3 hours/day, hence  $i = 0.07$  mm/minute  $\rightarrow q = 11,669$  (l/s.ha).

**Table 4.6: Total stormwater generated in the Project area in Component 1**

Name of works	Storm water drainage area (m <sup>2</sup> )	Flow coefficient	Rainwater flow rate (l/s)
LIA 1	5,743.5	0.4	2.03
LIA 3	16,245	0.4	5.741
LIA 5	4,290	0.4	1.52
LIA 6	18,412.5	0.4	6.51

In principle, the rainwater is lightly polluted waste water (consider as clean). The concentration of pollutants in runoff rainwater, according to the World Health Organization (WHO) as follows:

**Table 4.7: Concentration of pollutants in stormwater runoff**

No.	Parameter	Concentration (mg/l)
1	Nito	0.05 – 1.5
2	Photpho	0.004 – 0.03
3	COD	10 – 20
4	TSS	10 – 20

Sources: WHO, 1993

Comparing to other types of wastewater, concentrations of pollutants in rainwater are much lower and can be disposed directly into the water sources. However, during construction, the uncompleted construction surface with the construction waste will contaminate rainwater. Contractors shall consider measures for controlling material, machines and waste at site to minimize the contamination of rainwater.

The issue should be noted for rainwater is the drainage possibility. If the drainage measure is not appropriate, flooding and stagnant may occur at construction sites and even in areas along two sides of the route. These issues causes bad impact to region landscape and slow down the construction progress. Solutions for rainwater drainage and anti-local flooding in the area of construction will be presented in detail in chapter 5.

#### ***Oil-contaminated water from the construction vehicle***

The project will use diesel oil as fuel to operate construction machinery and equipment. The oil could be spilled due to the work of loading and unloading oil (transportation of oil from the container to the location of the machine used and manipulating the oil into machinery). Especially, in case of incidents, the oil from punctured and cracked fuel tank would lead to oil leakage into the street, spread further by rainwater into ditches, polluting the surface water in the area.

This source of contamination is hard to quantify because it depends on the working consciousness as well as the actions of workers, thus one cannot estimate the amount generated.

#### ***Wastewater from construction activitie***

Construction wastewater is mainly spilled water of mixing concrete and ground washing water after finishing pouring concrete. The amount of water spilled from concrete mixing is not much since it is absorbed directly into soil when falling. After pouring the concrete, water is applied to increase cohesiveness of concrete and will be absorbed directly into the surface so it does not arise. Such wastewater from construction activities are insignificant impact sources.

#### ***Domestic wastewater***

The amount of waste water generated from the activities of workers in the construction sector is not significant and cannot be adjusted. Water demand for each worker stated in TCVN 33:2006 is 45 lit / person / day including water for washing, cooking and personal hygiene. The amount of waste water generated is calculated as 100 % of the daily amount of water used. Calculation flow in each area for each investment category of component 1 is as follows:

**Table 4.8: Domestic wastewater flow in Component 1**

Construction Item	Amount of workers (person)	Irregulated coefficient (K)	Amount of wastewater discharged (m <sup>3</sup> /day)
LIA 1	20	2.5	2.25
LIA 3	20	2.5	2.25
LIA 5	10	2.5	1.13
LIA 6	15	2.5	1.69

Source: Hoang Hue, 2000

The composition and concentration of pollutants from domestic wastewater after treatment with septic tanks can be reffered in the following Table 4.9:

**Table 4.9: Domestic Wastewater Quality**

Pollutants	Concentration	QCVN 14:2008/BTNMT (Column B)
pH	5 – 9	5 - 9
BOD <sub>5</sub>	450 – 540	50

Pollutants	Concentration	QCVN 14:2008/BTNMT (Column B)
TSS	700 – 1450	100
Nitrat (NO <sub>3</sub> <sup>-</sup> )	50 – 100	50
Total coliform	10 <sup>6</sup> – 10 <sup>9</sup>	5.000

Source: Hoang Hue, 2000

The data mentioned above shows that most wastewater parameters do not meet QCVN 14:2008/BTNMT – National technical regulation on wastewater quality. Although the effluent flow is not high, this wastewater will locally pollute the construction sectors, especially in worker's camps if no appropriate treatment measures are applied.

However, the construction is successively performed so the number of worker is not many. In addition, the contractors prioritize local man powers so the generating at source will be minimized and level of impact is low.

#### ➤ Impact from solid waste

The solid waste generated in this period is mainly domestic solid waste and construction waste from earthworks:

- Construction Waste: mostly are excavated soil and dredged sludge.
- Domestic solid waste: there are not many workers at this stage so the solid waste is insignificant. Domestic solid waste generated in this period is about 0.5 kg/person/day and mainly are fruit skin, water bottles, food boxes, etc.

**Table 4.10: Solid Waste Generated from Construction Activities**

Construction Item	Construction solid waste (m <sup>3</sup> )	Domestic solid waste (kg/day)
LIA 1	5,858.7	15
LIA 3	9,526.5	15
LIA 5	9,610.5	10
LIA 6	12,435	12.5

This amount of waste without proper mitigation measures will impact on the air environment (offensive odor from the degradation), the area landscape and traffic in the area.

#### ➤ Impact from hazardous waste

Hazardous wastes generated from subproject implementation would include waste grease and oil, oily rags, and empty oil/grease containers. The existence of grease from maintenance and repair of transportation and construction means in the subproject areas is inevitable. The amount of waste grease and oil generated during construction depends on the following factors:

- The amount of transportation and construction means in the construction site;
- The amount of oil discharged from transportation and construction means;
- Scheduled changes of oil and maintenance of machinery and equipment.

The average amount of grease and oil discharged from machinery and equipment is 7 liters/each change. Oil change and maintenance of machines-equipment are scheduled every 3 months at most. The number of vehicles and construction means needing oil changes is 32 (including 14 trucks). The amount of waste grease and oil generated in the construction site therefore averages (14 x 7 liters/time)/3 months = 32.7 liters of oil/month. In addition, the subproject would also generate an estimated amount of 50 kg of oily rags and containers per month.

Without appropriate management, these types of construction waste would have negative impacts on the soil, water, and air environment; residual grease and oil in containers can penetrate into the ground, causing soil pollution. The impact level is assessed to be medium.

➤ **Impacts on traffic and infrastructure**

*Road traffic disturbances and increased traffic risks in LIAs*

Alley roads in the LIAs are narrow (less than 2.5 m) with many dead-ends. The daily inconvenient traffic in the area will be more serious during the construction because the construction site will take the space. At the same time, risks of accidents due to narrow roads, lack of light during night or congestion at construction locations also impact traveling activities of households along alleys. The impact level is assessed to be medium. The contractors shall apply appropriate measures to mitigate impacts on traffic in the area.

*Impacts on traffic and infrastructure from the transport*

The project construction will increase the number of vehicles, especially trucks carrying raw materials (74 trips), and waste (30 trips). This increase will affect the traffic situation of the region because Hoang Ha Ho, Tran Hung Dao route are among the main roads in Long Xuyen city.

Besides, the increase in the number of heavy truck on the roads also increases the risk of:

- Traffic accidents to passengers;
- Dust, noise from vehicle affects the health of inhabitants along the street and traffic participants.
- Roads are downgraded, creating pot-holes and are more likely to cause accidents on the road, especially at night.

The impact on traffic will be limited if project owners and contractors have a reasonable construction plan, coordinate with local governments in regulating traffic and having legal and economic sanction in transportation.

➤ **Health and Safety Risks to the Community**

As described above, residents in LIAs are quite populous; most of them are self-employed and poorly educated. This situation is especially pronounced in LIA 1. Associated risks include:

- (i) Risks of accidents caused to the residents by transportation vehicles during construction must also be taken into account of by the construction contractors. Transportation activities using trucks need to have support from traffic regulators upon passing through residential areas. Since there are many households leaving along the roads within immediate proximity to the construction areas, the likelihood of the safety risk to the community is high. This impact is assessed as moderate.
- (ii) Various construction operations would generate domestic wastewater and wastes giving rise to large populations of flies and mosquitoes, and possibly forming epidemic nests of diarrhea, dengue fever, and malaria. Workers coming during the construction process, etc. will result in dirty pools and pits, polluting water sources and the air, giving rise to large populations of flies and mosquitoes, and possibly forming epidemic sources of diarrhea, dengue fever, and malaria. Such impacts could only be mitigated or minimized with good prevention, treatment and sanitation measures. Concentration of workers in the area may result in increased contraction of HIV/AIDS and other sexually transmitted diseases, especially through prostitution, posing risks to the local community. However, as the work is at a small scale, and construction would not last long, this impact is low and controllable.

➤ **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.

### **B. Component 1: Site-specific Impacts during Construction**

#### *Local flooding*

The existing alleys in the LIAs are relatively small, narrow and do not have drainage system. Wastewater and stormwater are currently running off freely and discharged into adjacent canals. Therefore, during the rainy season, frequent inundation in LIAs is observed. The risk of flooding in LIA 1 and LIA 3 is higher as they are affected by the tidal regime of the canals which are located within or adjacent to the areas e.g. Long Xuyen canal adjacent to LIA 1, Ong Manh and Ba Bau canals in LIA 3.

According to the calculation, the rain flows from LIA 1 to LIA 6 areas are 2.03 l/s, 5.74 l/s, 1.52 l/s, 6.51 l/s respectively (equivalent to the rainfall of 10 – 22 cm). Without the construction, people in LIAs during are already experienced of local floods due to lack of drainage and the tidal effects combining with rain. The construction and upgrading of the alleys include gathering material and machinery at construction site and alley concrete surfacing. The construction of alleys would obstruct water flow thus can cause increased the local floods, which will consequently affect the local traffic and daily activities of local people. This impact will be over upon completion of the drainage system within LIAs areas.

However, the construction of LIAs is will be carried out in 03 months, in dry season. It will be divided into small packages, and carried out in successive manner, alley by alley in a rather short period (averagely 07-10 days for one alley). Therefore, this impact is assessed as medium due to its temporary and localized nature, and will cease upon completion of the construction.

#### *Social disturbance and increased traffic risks*

The alleys upgrading activities are of small scale, and only involve simple construction methods. However, these activities have to be carried out in a very restricted area, i.e. small and narrow



alleys which is less than 3.5 m wide, with relatively dense households along the two sides of the alleys. Therefore, subproject activities will cause social disturbance and traffic issue in a number of ways: (i) gathering of materials and construction work could cause some damages to the existing alleys and limit traffic access of people; (ii) increased dust impact to nearby local households and small shops; (iii) unwanted accidents risk; (iv) social conflict between the construction workers and local people. The impacts are likely happened but they would stop by end of construction. The impact is assessed as temporary and at moderate level.

#### ***Damage to water supply and communication systems***

The water supply pipelines mainly run along alleys (19.9 km long). Therefore, the rehabilitation of the alleys and installation of the combined sewers and water supply pipe system under this component may potentially affect the water supply infrastructure of the area, interrupting water supply operations due to temporary shut-off of water transmission pipelines or to break water transmission pipelines. Therefore, measures to prevent pipe breakage must be devised and carried out during the construction under this subproject. The impact level is assessed to be medium.

Communication infrastructure: In the construction sites of this component the communication infrastructures such as Internet cables or telephone lines go overhead. During construction of LIAs, all of these infrastructures will be downgrade under pavement. Therefore, there will be temporary impacts on the communication infrastructure in these areas in a short time. The impact level is assessed to be low.

#### ***Impacts caused by transportation activities***

In addition to the impacts as mentioned above, material and waste transportation activities also cause negative impacts. The residential area along the routes, traffic participants and sensitive receptors on the routes are affected objects (see Table 4.11). The impacts include: (i) Increased dust, exhaust gases, and noise affecting religious practices, especially during the religious events and practices (1<sup>st</sup> and 15<sup>th</sup> days every month), visitors to the pagodas, affecting education practices ii) Risks of traffic accidents and safety due to transportation.

However, because emission sources are mobile, impacts are dispersed on the entire routes. At the same time, duration that vehicles travel across these objects (3-5 minutes) is very short, impacts are insignificant. Impacts are assessed at medium level.

**Table 4.11: Transportation routes and affected objects**

Items	Length of transportation routes	Transportation routes	Affected objects
LIA 1	20.2	Tran Hung Dao street → Nguyen Du street → AnGiang solid waste treatment complex	Inhabitants, Passengers, PCR's and sensitive sites along the route: Dong Thinh Pagoda, Long Xuyen Cathedral, An Giang Continuing Education Center.
LIA 3	21.3	Tran Hung Dao street → Ha Hoang Ho street → An Giang solid waste treatment complex.	Inhabitants, Passengers, PCR's and sensitive sites along the route: Hoa Lan Kindergarten; Long Xuyen Bishop; Hung Vuong Secondary School; Chu Van An Primary School; Vuong Tron maternity hospital; Phap Hoa Pagoda; Phuoc Loc Tho Pagoda; Long Xuyen Night market; Binh Minh nursery school, Phu Hoa market.
LIA 5	20.4	Tran Hung Dao street → Ha Hoang Ho street → Bui Thi Xuan street → Bui Van Danh street → National	Inhabitants, Passengers, PCR's and sensitive sites along the route Dong Thinh Pagoda, Long Xuyen Cathedral, An Giang Continuing Education Center,

		Highway No 91 → An Giang solid waste treatment complex.	Hoa Lan Kindergarten; Long Xuyen Bishop; Binh Minh nursery school; Phu Hoa market.
LIA 6	20	Tran Hung Dao street → Ly Thai To street → An Giang solid waste treatment complex.	Inhabitants, Passengers, PCR and sensitive sites along the route Quang Te Pagoda, Hospital of Ophthalmology – Ear, Nose, Throat - Odontostomatology

#### ***Impact on the PCRs and sensitive receptors***

As described in Chapter 2, Section 2.5, within the scope of the construction sites of Component 1, there is no PCR or sensitive receptor. Therefore no such impact is incurred.

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

##### ***Local flooding due to blockage of the drainage system along alleys***

During the operation, solid waste from illegal littering on the road could block the drains on the sides of the alley, thereby affecting the storm water drainage. In addition, the operation of drainage system along the alleys will generate accumulated sludge in the manholes. This waste will emit bad odor and bring harms to local landscape if not handled promptly. If being not periodically dredged, this accumulated sludge and solid waste could potentially affect the drainage capacity, causing local floods to some parts of LIAs especially during rainy days. However, the impact can be mitigated if proper O&M practices are adopted.

##### ***Traffic safety***

After construction, the traffic in LIAs will be more convenient, increasing traffic flow in LIAs, and thereby increasing pollutants in the environment such as dust and emissions. Because of the small area of alleys, the increase in traffic flow will not be high and can be controlled by arranging traffic signs to limit loading capacity and means of transportation. Therefore, even these impacts are long-term, they could be mitigated and are assessed as low.

##### ***Waste Management***

In Component 1, there will be arrangements of trash bins along the alleys. This helps minimize contamination from littering. This impact is considered positive because it improves the environmental sanitation and urban aesthetic. It is only negative when the garbage is uncollected, causing overloaded containing capacity. Meanwhile, the possible risks of bad odor and sanitation will affect people living near these bins.

#### ***4.1.4. Impact Assessment for Component 2 - Priority Primary and Secondary Infrastructures***

The investments under component 2 includes: (i) Construction of extended Hung Vuong Street, of 1.2 km long, 24 m wide; (ii) Construction of Nguyen Quang Dieu Street, 0.9 km long; 20.5 m wide; (iii) Concrete embankment of Long Xuyen Canal, with the total length of 1.9 km, height of 2.5 – 3.0 m; (iv) Dredging and embankment of Cai Son, Ong Manh and Ba Bau canals with combined concrete and earth structure, with the width of 15 m; and the total respective lengths of 1.5; 1.6 and 1.0 km.

Detailed assessment on the potential adverse impacts during preparation, construction and operation of investments under component 2 are described below.

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

Impacts during the preparation phase of component 2 investments include: (i) UXO risk; (ii) land acquisition and resettlement.

### ***Impact by UXOs***

Because city was bombed during the war period, UXO removal is important so as to avoid any potential threat to works and safety for local people and workers. For the investments under this component, UXO needs to be carefully considered and removed before construction activities can commence. The impacts of UXO in the project area represent significant negative impacts if mitigation measures are not applied, with high risk to human health, life, and also infrastructure. UXO removal must be completed before starting civil works.

### ***Impacts by land acquisition***

Land acquisition will affect AHs both physically and mentally, even causing social problems and prolonged litigation. The land acquisition will affect 491 households, including 249 partly affected households, 242 relocated households, affected 965,556 m<sup>2</sup> resident land, 1,049.835 m<sup>2</sup> agricultural land. The detailed impact assessment for land acquisition and resettlement under this component is given in Section 4.2 – Social Assessment.

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

##### **A. Component 2: Generic Impacts during Construction**

### ***Impacts on air quality***

Air environment will be affected during construction due to dust, gases, noise, etc from the activities of 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.

#### ***a1. Dust and emission***

##### **Dust from demolition activities**

Before carrying out the construction work, clearance activities will be done. Accordingly, the structure within the scope of land acquisition will be demolished. Waste arising from this activity is debris with estimated volume 43,275 m<sup>3</sup>.

The structure breaking will generate dust. This dust will spread and affect communities around the project area if it not collected and screened

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):  $E=0.03752$  kg/ton. Based on pollution coefficient E and compliance with the subproject work progress, the loads of dispersed dust generated by demolition can be forecasted as follows (Table 4.12):

**Table 4.12: Forecasts of dispersed dust from demolition**

Construction Items	Demolition volume (m <sup>3</sup> )	Estimated Time (month)	Volume of dust generated (kg/day)
Construction of Hung Vuong Street Extension	7,200	6	2.7
Construction of Tran Quang Dieu Street	4,725	6	1.77
Construction of Long Xuyen canal embankment	14,950	8	4.21
Cai Son canal Restoration	6,000	3	4.5
Ong Manh canal Restoration	4,000	3	3.0
Ba Bau canal Restoration	6,400	4	3.6

Note: Unit weight of debris: 1.8 tons/m<sup>3</sup>

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 3 m/s, and a distance of 5 - 150 m from generating sources, height 1.5-27 m, the concentration of pollutants created by demolition can be calculated as follows.

- For Extended Hung Vuong street: Dust concentrations vary between 0.14 - 2.21 mg/m<sup>3</sup> (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>).
- For Tran Quang Dieu street : Dust concentrations vary between 0.13-1.48 mg/m<sup>3</sup>.
- For Long Xuyen canal: Dust concentrations vary between 0.14-3.38 mg/m<sup>3</sup>.
- For Cai Son canal: Dust concentrations vary between 0.11-3.57 mg/m<sup>3</sup>.
- For Ong Manh canal: Dust concentrations vary between 0.15-2.92 mg/m<sup>3</sup>.
- For Ba Bau canal: Dust concentrations vary between 0.13-2.43 mg/m<sup>3</sup>.

Dust concentration is 5 – 11 times higher than allowable level at height of 1.5 m and distance of 10 m. At distance of 150 m from generating sources, the concentration is within allowable level of QCVN 05:2013/BTNMT. The affected objects are the existing households, PCRs, sensitive sites (at the distance of 1-70 m) and passengers in the area (see Table 4.18 below). These activities happen only 6 - 8 weeks at each demolition point, so the impact level is medium.

This data is calculated for dry season, in rainy season, the high humidity will increase the settling and decrease the dispersion of particles, therefore, the dust concentration will be 1.5 – 2 times lower than that in dry season. Thereby, impacts will be lower.

#### ***Dust from earthworks***

According to the project schedule, project construction is expected from August, 2021 to September 2018 (5 years); Project construction will be divided into several packages and will be implemented at different timelines. Dust generated by excavation and backfilling activities under Component 2 is calculated in the same way as component 1. Based on [1] → pollution coefficient E = 0.0272 kg/ton. The loads of dispersed dust generated by earthworks can be forecasted as follows:

**Table 4.13: Earthwork volumes and duration of component 2**

Construction Item	Earthworks volume (m <sup>3</sup> )	Estimated Time (months)	Load of dust generated (kg/day)
Construction of Hung Vuong Street Extension	5,400	13	0.64
Construction of Tran Quang Dieu Street	4,275	15	0.51
Construction of Long Xuyen canal embankment	91,425	10	6.52
Cai Son canal Restoration	117,000	10	13.9
Ong Manh canal Restoration	96,000	18	11.41
Ba Bau canal Restoration	137,600	12	16.28

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 3 m/s, and a distance of 5-300 m from generating sources, độ cao 1.5-100 m, the concentration of pollutants created by transportation operations can be calculated as follows.

- For extended Hung Vuong street: Dust concentrations vary between 0.13-0.62 mg/m<sup>3</sup> (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>).
- For Tran Quang Dieu street : Dust concentrations vary between 0.11-0.5 mg/m<sup>3</sup>.

- For Long Xuyen canal: Dust concentrations vary between 0.14-5.16 mg/m<sup>3</sup>.
- For Cai Son canal: Dust concentrations vary between 0.1-10.82 mg/m<sup>3</sup>.
- For Ong Manh canal: Dust concentrations vary between 0.14-12.75 mg/m<sup>3</sup>.
- For Ba Bau canal: Dust concentrations vary between 0.12-8.92 mg/m<sup>3</sup>.

The data shows that at the distance of 10 m from construction site, dust concentration from street building is 1.7 - 2.1 times higher than the standard and dust concentration from canal improving is 42.5 times higher than the standard. Within these distances, the affected objects are the households along the street and canal, PCRs, sensitive sites in the area (see Table 4.18 below)

However, because sediment and soil caused by excavation and backfilling has humidity which is higher than that of surface soil layer (because of ground water and tide impacts), dust tends to deposit rapidly and exist for a short period of time. The tasks are performed successively with the duration of 12-20 months at each construction and therefore, impacts are interruptive, scattered and will be ended when finishing excavation. This impact is able to be mitigated by applying ECOPs so it is assessed as medium impact.

### ***Impact from the transportation of materials***

In the project, material is transported by 2 ways:

- ✓ *Waterway:* Material is transported by barges toward Hau river and gathered at construction material site nearby Vam Cong ferry, with the average distance of 68 km. The material is continuously transported by 15-ton-truck to construction site with the average distance of 10 km.

The transportation generates dust by the action of wind and careless screening. However, there are few people living along the river path, in addition the water is an effective dust holding environment so the dust cannot spread widely, and therefore, dust pollution from barges is unremarkable.

- ✓ *Road transport:* Sand, stone is transported by 15-ton-trucks (bucket volume 12.5 m<sup>3</sup>) to construction site with the distance of 10 km. The other raw materials are mostly from available sources in Long Xuyen city at the maximum distance of 10 km.

Construction activities will generate wastes need to be disposed. These wastes are mainly excavated and dredged soil and sludge. Dust emissions occur from the loaded materials and from tire wear whenever vehicles travel. Amount of material and dust concentration is presented in Table 4.14:



**Table 4.14: Component 2 - Volume of materials and wastes transported by roads**

Construction Item	Material Volume (m <sup>3</sup> )	Transport time (months)	Number of vehicles (trip/day)	Waste disposal volume (m <sup>3</sup> )	Transport time (month)	The number of vehicles (turn/date)	Total vehicles (trip/day)
Construction of Hung Vuong Street Extension	16,176.99	4	22	6,660	3	12	34
Construction of Tran Quang Dieu Street	9,342	3	16	4,477.5	3	8	24
Construction of Long Xuyen canal embankment	59,800	10	32	11,212.5	5	12	37
Cai Son canal Restoration	65,902.13	10	36	53,250	8	36	44
Ong Manh canal Restoration	78,400	10	42	56,800	12	26	54
Ba Bau canal Restoration	53,298.58	10	28	38,500	8	26	36

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 3 m/s, and a distance of 5-20 m from generating sources, độ cao từ 1.5-15 m, the concentration of pollutants created by transportation operations can be calculated as follows.

- For extended Hung Vuong street: Dust concentrations 0.13 mg/m<sup>3</sup> (compared with permissible standard limits of 0.3mg/m<sup>3</sup>); CO contents 5.46 mg/m<sup>3</sup> (compared with 30 mg/m<sup>3</sup>); NO<sub>x</sub> 0.04 mg/m<sup>3</sup> (compared with 0.2 mg/m<sup>3</sup>); SO<sub>2</sub> 0.04 mg/m<sup>3</sup> (compared with 0.35 mg/m<sup>3</sup>).
- For Tran Quang Dieu street: Dust concentrations 0.11 mg/m<sup>3</sup>; CO contents 5 mg/m<sup>3</sup>; NO<sub>x</sub> contents 0.02 mg/m<sup>3</sup>; SO<sub>2</sub> contents 0.02 mg/m<sup>3</sup>.
- For Long Xuyen canal: Dust concentrations 0.14 mg/m<sup>3</sup>; CO contents 5.35 mg/m<sup>3</sup>; NO<sub>x</sub> contents 0.04 mg/m<sup>3</sup>; SO<sub>2</sub> contents 0.04 mg/m<sup>3</sup>.
- For Cai Son canal: Dust concentrations 0.1 mg/m<sup>3</sup>; CO contents 5.05 mg/m<sup>3</sup>; NO<sub>x</sub> contents 0.03 mg/m<sup>3</sup>; SO<sub>2</sub> contents 0.03 mg/m<sup>3</sup>.
- For Ong Manh canal: Dust concentrations 0.15 mg/m<sup>3</sup>; CO contents 5.03 mg/m<sup>3</sup>; NO<sub>x</sub> contents 0.04 mg/m<sup>3</sup>; SO<sub>2</sub> contents 0.04 mg/m<sup>3</sup>.
- For Ba Bau canal: Dust concentrations 0.12 mg/m<sup>3</sup>; CO contents 5.01 mg/m<sup>3</sup>; NO<sub>x</sub> contents 0.02 mg/m<sup>3</sup>; SO<sub>2</sub> contents 0.03 mg/m<sup>3</sup>.

Dust:

In general, the loads of dust generated in the process of transporting are forecast as being not substantial and would be distributed evenly along transportation routes, between 0.1 and 0.15 mg/m<sup>3</sup>. According to calculations, the dust concentration would not exceed the national standards on ambient air quality (QCVN 05: 2013/BTNMT). However, it must be noted that the amount of dust generated is large owing to the mobilization of machinery and vehicles on the construction site. At some points of time, relatively large amounts of dust may abruptly increase when a large number of machines and vehicles are mobilized for necessary construction tasks.

The main transport routes for materials transportation would be Tran Hung Dao, Bui Van Danh, Ha Hoang Ho and some other internal transport routes. 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 ground leveling, excavation, backfilling and transportation is thereby assessed as being medium.

#### Exhaust gases:

All criteria namely CO, SO<sub>2</sub>, NO<sub>x</sub> caused by material and waste transportation activities of vehicles are within allowable limit of QCVN 05:2013/BTNMT.

#### a2. Noise

The results of separate noise level assessment of individual construction and transport vehicles as well as resonant noise level are estimated and presented in the Table 4.15 below:

**Table 4.15: Component 2 - Maximum noise levels from transportation and construction facilities**

Construction facilities	Distance to noise source (m)						
	15	50	100	200	300	400	450
Truck	96-99	85-88	79-82	73-76	70-72	67-70	66-69
Roller	74-77	64-67	58-61	52-55	48-51	45-48	44-47
Compactors	76-79	66-69	60-63	54-57	50-53	47-50	46-49
Graders	85-88	75-78	69-72	63-66	59-62	56-59	55-58
Concrete mixers	85	75	69	63	59	56	55
Bulldozers	80-85	70-74	64-68	58-62	54-59	51-56	50-55
25 ton crane	87	77	71	65	61	58	57
Generator	74	64	58	52	48	45	44
Excavators	85-88	75-78	69-72	63-66	59-62	56-59	55-58
Pile machine	89	79	73	67	63	60	59
Plastic spreader	101	91	85	79	75	72	71
<b>QCVN 26:2010/BTNMT (From 6h-21h) - common areas</b>	<b>70</b>						

#### Comments:

The noise levels of most facilities do not meet QCVN 26: 2010/BTNMT - National Technical Regulations on noise (70dBA for normal area from 6 - 21h) at the distance less than 50 meters. The impact scope of plastic spreader is even larger, 450 m. Within this distance, residential area along the route, PCRs, sensitive sites in the area are affected (see Table 4.18 below).

However, the calculation is performed with all equipment is operated at the same time; whereas, in fact, the construction is spliced into several packages and construction facilities operate at different times. In addition, equipment operates 8 hours/day at most so that these noise sources are discontinuous, short-term and can be assessed at medium level.

#### A3. Vibration

Refer to the vibration level of the vehicle, machinery and equipment in the report of *Transit Noise And Vibration Impact Assessment* (US, Federal Transit Administration, 2006), the level of vibration of vehicles, machinery and equipment are presented in Table 4.16:

**Table 4.16: Component 2 - Vibration of the vehicle, machinery and equipment**

No	Vehicle	Vibration at distance of 7.5 m	QCVN 27:2010/BTNMT, (From
1	Truck	86	<b>75dB</b>
2	Bulldozers / brushed machine	87	
3	Excavators	94	
4	Roller	94	
5	Pile machine	93	

Source: US FTA, 2006.

The transmission of vibration in space will decrease by distance and be calculated as following:

**Table 4.17: Component 2 - Vibration level according to the distance of facilities**

No	Vehicle	Vibration at distance of D (m) (dB)									
		7.5	12.5	15	17.5	20	22.5	25	27.5	30	32.5
1	Truck	82	79	77	75	73	72	70	69	68	67
2	Bulldozers / brushed machine	83	80	78	76	74	73	71	70	69	68
3	Excavators	90	87	85	83	81	80	78	77	76	75
4	Roller	90	87	85	83	81	80	78	77	76	75
5	Pile machine	89	86	84	82	80	79	77	76	75	74
QCVN 27:2010/BTNMT,											

**Comment:** At the distance beyond 30 meters from transmission sources, all vibration levels meet QCVN 27: 2010/BTNMT - normal area from 6:00 to 21:00. Within the distance, the following impacts should be considered:

#### *Impacts on surrounding environment*

Vibrations generated during the operation of the road roller does not only affect the working environment, the health of workers who operate and manipulate the machine, but also spread as waves on the ground surface causing certain impacts to the surrounding environment and particularly for the construction of buildings as well as the living conditions of people in the neighboring residential areas.

In terms of the project area, the effects of this impact on the community is inevitable because there are always people living on the routes and canals. However, the influence sphere is within 30m radius. Currently, there is no underground or multi-storey construction in a radius of 30 m of all routes so the impact is significantly limited.

The following table shows impact objects and scope of pollution sources caused by construction activities for items under Component 2:

**Table 4.18: Component 2 - Impact objects and scope of dust, noise and vibration**

Construction item	Affected object	Distance (m)
Construction of Hung Vuong Street Extension	<ul style="list-style-type: none"> <li>- <u>In the project area</u>: residential area along route, workers at construction site, My Phuoc market, Dong Thanh Pagoda, Bui Huu Nghia secondary school and Trinh Hoai Duc primary school</li> <li>- <u>On transportation route</u>: inhabitants, passengers, PCRs and sensitive sites along the route: Dong Thinh Pagoda, Long Xuyen Cathedral, An Giang Continuing Education Center, Quang Te Pagoda, Hospital of Ophthalmology-Ear, Nose, Throat- Odontostomatology</li> </ul>	3 - 10
Construction of Tran	- <u>In the project area</u> : residential area along route,	3 – 10

Construction item	Affected object	Distance (m)
Quang Dieu Street	workers at construction site, Vuong Tron maternity hospital. - <u>On transportation route</u> : inhabitants, passengers, PCRs and sensitive sites along the route: Chu Van An primary school, Long Xuyen night market, Phap Hoa Pagoda, Hung Vuong secondary school, Binh Minh nursery school	
Construction of Long Xuyen canal embankment	- <u>In the project area</u> : residential area along route, workers at construction site, Ong Bac Pagoda, Long Xuyen Market - <u>On transportation route</u> : inhabitants, passengers, PCRs and sensitive sites along the route: Dong Thinh Pagoda, Long Xuyen Cathedral, An Giang Continuing Education Center, Long Xuyen Bishop, Hoa Lan Kindergarten.	3 – 70
Cai Son canal Restoration	- <u>In the project area</u> : residential area along route, workers at construction site; General hospital of Long Xuyen city; Binh Dan general hospital. - <u>On transportation route</u> : inhabitants, passengers, PCRs and sensitive sites along the route: Dong Thinh Pagoda, Long Xuyen Cathedral, An Giang Continuing Education Center, Quang Te Pagoda, Hospital of Opthamology - Ear, Nose, Throat - Odontostomatology	0.5 - 20
Ba Bau canal Restoration	- <u>In the project area</u> : residential area along route, workers at construction site. - <u>On transportation route</u> : inhabitants, passengers, PCRs and sensitive sites along the route: Phu Hoa market, Long Xuyen Bishop, Hoa Lan Kindergarten Chu Van An primary school, Long Xuyen night market.	0.5 – 25
Ong Manh canal Restoration	- <u>In the project area</u> : residential area along route, workers at construction; Chinese Pagoda. - <u>On transportation route</u> : inhabitants, passengers, PCRs and sensitive sites along the route: Chu Van An primary school, Long Xuyen night market.	0.5 - 25

### ➤ Impact on Water Quality

#### *Impact by runoff Stormwater*

The flow of rainwater in the construction area depends on climate condition in the region. Total storm water generated from the project area during the construction is estimated as formual [2]. Flow of rainwater in the area as follow Table 4.19:

**Table 4.19: Flow of rainwater in the area – Component 2**

Item	Storm water drainage area	Flow coefficient	Rainwater flow rate (l/s)
Construction of Hung Vuong Street	28,800	0.2	5.1
Construction of Tran Quang Dieu Street	18,450	0.4	6.5
Construction of Long Xuyen canal	57,500	0.4	20.3
Cai Son canal Restoration	22,500	0.4	7.9
Ba Bau canal Restoration	15,000	0.4	5.3
Ong Manh canal Restoration	24,000	0.4	8.5

In principle, the rainwater is lightly polluted waste water (consider as clean). Moreover, the air quality of the area is relatively good so that rainwater has not contaminated by pollutants.

However, during construction, the uncompleted construction surface with the construction waste such as oil and grease, waste and raw material will contaminate rainwater. This impact can be mitigated by screening material, collecting spilled oil and material on construction site, therefore, the impact level is low.

#### ***Impact on surface water quality***

The dredging negatively changes the surface water quality, especially on the operation area. Accumulated sediment mainly consists of sand, organic matter, carcasses of aquatic organism, and especially heavy metals. The dredging process disturbs the flow, releases these components into the environment, and makes them diffuse widely. However, the analysis of heavy metal in sludge as mentioned in Chapter 2 shows that the concentration meets the standard. Therefore, the impact of heavy metals diffusing in water is considered as negligible.

An important impact caused by dredging operations is increasing suspended solid in water. This impact is particularly serious if the water is used for aquaculture purposes because they directly affect the habitat quality of aquatic species. The only function of Cai Son, Ong Manh and Ba Bau canals are drainage and there is no aquaculture activity within the radius of 5 km of the project area, thus the impact is insignificant.

#### ***The impact from leachate***

Total amount of dredged sediment from Cai Son (33,750 m<sup>3</sup>), Ong Manh (36,000 m<sup>3</sup>) and Ba Bau (22,500 m<sup>3</sup>) canals is 92,250 m<sup>3</sup>. After being dredged, the mud will be gathered along the canal to reduce the volume and moisture before being transported for disposal. At this time, the mud is a thick liquid, so that it will generate leachate with high SS concentration. This impact is not serious because the suspended solid is sediment dredged from the canal so it does not change the composition of canal water. However, it is necessary to apply measures to lead the leachates into settling holes before recirculating the flow to the canal in order to reduce pollution loads to surface water quality.

#### ***Impact on soil and groundwater quality***

Gathering sediment along the canal possibly pollute soil and groundwater environments because of sludge leachate. The mechanism causing this situation is heavy metal and organic pollutants in leachate penetrate into the surface soil layer and with time will penetrate into the groundwater stratum below. However, the sludge monitoring mentioned in Chapter 2 shows that the heavy metal concentration meets QCVN 03-MT: 2015/BTNMT - National technical regulation on the allowable limits of heavy metals in the soils. In addition, there is an HDPE layer at the bottom of sludge gathering area and the duration for storing at site does not exceed 48 hour so the impact is unremarkable.

#### ***Waste water from construction activities***

Construction wastewater is mainly spilled water of mixing concrete and ground washing water after finishing pouring concrete. In fact, the amount of water spilled from concrete mixing is not much since it is absorbed directly into soil when falling. After pouring the concrete, water is applied to increase cohesiveness of concrete and will be absorbed directly into the surface so it does not arise. Such wastewater from construction activities are insignificant impact sources.

#### ***Domestic wastewater of construction workers***

The amount of wastewater generated from the activities of workers in the construction sector is insignificant and controllable. Water demand for each worker stated in TCVN 33:2006 is



45lit/person.day, including water for washing, cooking and personal hygiene. The amount of wastewater generated is calculated as 100 % of the daily amount of used water.

**Table 4.20: Component 2 – Flow rate of generated domestic wastewater**

Construction Items	No. Of workers	Irregular coefficients (K)	Flow rate of wastewater (m <sup>3</sup> /day)
Construction of Hung Vuong Street	30	2.5	3.38
Construction of Tran Quang Dieu Street	25	2.5	2.81
Construction of Long Xuyen canal	45	2.5	5.06
Cai Son canal Restoration	25	2.5	2.81
Ba Bau canal Restoration	25	2.5	2.81
Ong Manh canal Restoration	25	2.5	2.81

Domestic wastewater contains mainly excreted substances with high concentration of organic waste. In particular, concentration of BOD<sub>5</sub> in urine is about 8.6 g/l and in feces is about 9.6 g/100g. Therefore, feces and urine would remarkably impact on soil and water environment of the project area if they are discharged directly into the ground. However, during the construction, contractors minimizing measures shall be applied, including:

- Using local man powers to reduce number of workers at camp area in order to minimize the generating source;
- Providing on-site mobile toilet.

➤ **Solid waste**

The solid waste generated in this period includes:

- Domestic solid waste: Domestic solid waste generated mainly from workers activities with the composition of fruit skin, water bottles, food boxes, etc. This amount of waste without proper mitigation measures will impact on the surface water, ground water and air environment. Impacts are also from offensive odor and leachate of the solid waste degradation. Besides, some inorganic matters such as bottles, plastic bags and other item presenting in water will affect the aesthetics and downgrade the water quality, thereby affect aquatic organism.
- Construction waste: mainly consist of debris, excavated soil, dredged sediment, waste construction material. These kinds of solid waste could spill to outside area/canal and prevent the pathway or reduce the surface water quality.

**Table 4.21: Component 2 – Solid waste from construction stage**

Construction Items	Construction waste	Domestic solid waste
Construction of Hung Vuong Street	13,860	15
Construction of Tran Quang Dieu Street	9,202.5	12.5
Construction of Long Xuyen canal	26,162.5	22.5
Cai Son canal Restoration	59,250	12.5
Ba Bau canal Restoration	42,500	12.5
Ong Manh canal Restoration	63,200	12.5

Data in Table 4.21 is total amount of solid waste of each item. In fact, the generating amount is much lower because the construction items are partly carried out. This is not hazardous waste and is collected within 48 hour by An Giang URENCO, therefore impacts are short-term and controllable and can be assessed at medium level.

➤ **Hazardous waste**

The average amount of grease and oil discharged from machinery and equipment is 7 liters/each change. Oil change and maintenance of machines-equipment are scheduled every 3 months at most. The number of vehicles and construction means needing oil changes is 257 (including 48 trucks and

209 construction means). The amount of waste grease and oil generated in the construction site therefore averages  $(257 \times 7 \text{ liters/time})/3 \text{ months} = 600 \text{ liters of oil/month}$ . In addition, the subproject would also generate an estimated amount of 80 kg of oily rags and containers per month.

### ➤ **Impacts on ecological**

#### For terrestrial ecosystems

Survey results show that terrestrial ecosystems located along 2 basins of canal Long Xuyen, Cai Son, Ong Manh, Ba Bau are mainly some fruit trees (mango, jackfruit, coconut water, etc), vegetables (spinach, cabbage, etc.). There's also a number of bushy plants such as sedge, etc. and the weeds. The plants will be cut down while conducting clearance to serve the construction.

The cutting down of the above plants also affect life of some animals, insects, bird, etc. However, number of species and quantity affected are small, mainly like frog, snake, and invertebrates living along the rivers and on the bank of the dredged canals.

#### For aquatic ecosystems

As Chapter 2 has shown, the aquatic ecosystem of Long Xuyen, Cai Son, Ong Manh and Ba Bau canal is poor and do not have the diversity of species as well as any endangered species according to the Red Book of Vietnam and IUCN. The present species mainly include benthic creatures such as eels, loaches; crustaceans such as snails, shrimp; and all kinds of perch, black carp, etc. and plankton species of animals and plants in nutrient-rich environments. Dredging activities affect the lives of aquatic species, including:

- The strip of the substrates including benthic organisms reduces species diversity and species composition of aquatic ecosystem.
- High concentration of suspended solids in the water due to dredging process would restrict light to the water layers, affecting photosynthesis of algal, algae, mosses and cause discomfort for fish life (because small particles entering gills make the fishes asphyxiated).
- Bottom disturbance will promote the decomposition of organic material by microorganisms. Accordingly, the depletion of oxygen in the water makes the invertebrates asphyxiated as well as losing their habitats.

There are also some other impacts related to the work of dredging due to the influence of suspended solids in the water on the lives of aquatic species. Some experimentation and researches on the impact of suspended solids in the water on the lives of aquatic species have been made. To fish, eggs and larvae of fish, one of the most sensitive species to levels of suspended sediment in the water. In locations with high turbidity, populations of underwater free-swimming organisms like fish will likely swim out of the disturbed areas; Shellfish is virtually unaffected because the sediment levels affecting shellfish are over 10,000 mg/l (DORE 2000).

\* *The ecosystem recovery of the dredging area:* The recovery of disturbed habitats following dredging ultimately depends upon the nature of the new sediment at the dredge site, sources and types of re-colonising animals, and the extent of the disturbance (ICES 1992).

Among the available data on the recovery of the benthic communities along rivers, the scientific reports of the USACE and EPA are notable. As reported by the USACE, if the substrate stabilizes for small and medium speeds, the recovery time of the dredging area will be below 5 years. Meanwhile, the measurement of the USEPA on the recovery of the dredging area in Alaska rivers has pointed out that the recovery of biological diversity of invertebrate is determined to be in 1 year (A. M. Prussian et al. 1999).

Table 4.22 below shows the relationship between the speed of ecosystem recovery after dredging according to the nature of sediment and extent of disturbance

**Table 4.22: The recovery time observed in the dredging area**

No.	Habitat type	Recovery time
1	The mud is often disturbed	4 weeks
2	Canals mud	6 months
3	Lagoon mud	> 11 months
4	Sand-gravel	1-2 years
5	Mud-Sand	18 months
6	Gravel	>2 years
7	Sand	3 years

Based on the above statistics the nature of the sediments in Cai Son, Ong Manh, Ba Bau canals belongs to the type of canals mud - sand with the ecosystems recovery after dredging is predicted at around 18 months.

➤ **Impacts on traffic infrastructure**

In the construction of items in component 3, the number of vehicles transporting waste and raw material is not much (08 trips/day). However, most of them are heavy vehicles and the project areas occupy several residential routes, impacts on traffic infrastructure are possible.

The increasing number of vehicle may affect the traffic safety and traffic jam on route. The transportation route includes Ha Hoang Ho, Tran Hung Dao. This task also impacts on PCRs and sensitive sites on route (see chapter 2, part 2.6), especially on holy days, rush hour.

These impacts will take places all the construction. However, the construction will be divided into several bidding packages and implemented successively so the quantity of vehicles is much fewer than calculation. The impact is temporary, interrupted but extended (2 years) so it should be assessed at a medium level.

➤ **Impacts on water traffic**

The material for construction activities is transported by both waterway and land, estimating there will be about 60 barge trips / month serving for transporting construction materials. Thus, there will be an increase in the number of barge transporting on Hau River. This increase may cause some impact as below:

- Increase risk of waterway accidents;
- Increase the risk of bridge collapse on Hau River caused by the collision of barge with bridge;
- Increase risk of oil spill due to waterways accidents;
- The risks will be positively limited if the project owners and contractors have a reasonable construction plan, regularly update shipping schedules and have legal and economic constraints with transporter, level of impact is medium.

➤ **Impact on water supply and communication infrastructure**

The water supply pipelines mainly run along the sidewalks of the roads. Therefore, the rehabilitation of roads which include excavation and installation of the combined sewers under this component may potentially affect the water supply infrastructure of the area, interrupting water supply operations due to temporary shut-off of water transmission pipelines or to break water transmission pipelines. Therefore, measures to prevent pipe breakage must be devised and carried out during the construction under this subproject. The impact level is assessed to be medium.

➤ **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 03 canal 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 medium.

➤ **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.

**B. Component 2: Site-specific Impacts during Construction**

***b1. Site-specific Impacts due to the construction of extended Hung Vuong Street (Subcomponent 2.1) and Tran Quang Dieu Street (Subcomponent 2.2)***

The construction of extended Hung Vuong Street and Tran Quang Dieu Street is similar, including construction of the roads and associated structures such as drainage, lighting system and trees. At intersection with the existing canals, bridges and box culvert will be constructed.

Concretely, on the alignment of Hung Vuong Street, there will be one culvert D2.000 will be installed at the intersection with one unnamed small canal at km0+910.72. In addition, one small concrete bridge of 60.2 m long, and 13 m wide will be constructed at km0+87.7 of Hung Vuong road, i.e. at the intersection with the Tam Bot canal.

Tran Quang Dieu respectively intersected with Ong Manh and Ba Bau canals at km0+366 and km0+91.73. At these intersection, two small concrete bridges one of 12 m long, 20.5 m wide; and one of 40.2 m long, 15 m wide will be constructed.

The site specific impacts include: (i) decreased water quality of canals intersected with the roads; (ii) interrupted business of households along route; (iii) impacts on PCRs and sensitive receptors.

***Reduced surface water quality of intersected canals due to construction of culvert and bridges on the road alignments***

The construction method for end supports and abutment are drilling pier. The drilling will increase the turbidity of surface water due to falling/incomplete recapturing of bentonite solution. Bentonite is a non-toxic substance, of fertile soil type, yet upon falling outside the small fine grains may cover the river bed and obstruct exchange of oxygen between water and sludge at the canals bed.

At the bored piles drilled stones and debris may be gathered locally. In addition, the material gathered near canal bank such as cement, sand, stone, could spill into the water and degrade surface water quality and aquatic life.

Another factor bound to cause water source pollution is a small amount of domestic waste and wastewater from workers' camps. This source of pollutants (estimated at 87.5 m<sup>3</sup>/day), if discharged directly into canals, would cause organic pollution (BOD, COD) and nutrient pollution (N, P) to the receiving waters. However, the surface water quality in these canals are already contaminated (see section 2.2.1, chapter 2). The impacts only happen during construction period which last about 03 months and would stop by operation. Therefore, the impacts on surface water quality of the canals due to bridge construction is assessed as low, temporary and could be mitigated by good construction practices.

***Increased local flooding***

As described in Section 2.4.5, the local inundation in inner Long Xuyen City varies from slight flooding (flood level below 20 cm) to medium (flood levels from 20 – 50 cm) and concentrates in wards of My Phuoc, My Xuyen and Dong Xuyen. The most frequently flooded areas are My Phuoc and My Xuyen in streets of Vo Thi Sau, Yet Kieu and Phan Dang Luu. The road construction items under Component 2 located in wards of My Phuoc and My Xuyen will be influenced by the current inundation. At the same time, during the construction process, machinery and materials gathering and concrete road surfacing will increase the risk of flooding especially during the rainy seasons, and affecting daily activities of local resident. As the density of local people along the streets are relatively high, the magnitude of impacts is assessed as moderate. These impacts will happen during the construction and would stop by operation when the drainage system along the streets are constructed. The impacts are assessed as temporary and could be mitigated by applying appropriate construction method.

***Impacts on business activities of residents along Hung Vuong Street***

Hung Vuong Street is currently the main city road in a densely populated area with many small business householders along roadsides. Construction activities may cause the following impacts mostly related to traffic as construction operations will occupy part of the road surface, while the other part will be used for gathering machinery and storage of construction materials during construction. These impacts include: (i) disturbances to local business activities as access to business establishments may be obstructed; (ii) affected drainage capability in the area; (iii) increased dust, noise, waste, and decreased landscape; (iv) risks of erosion and subsidence to existing works along roadsides from deep excavation for the construction of pipe trenches; (v) safety risks to vehicles and community, especially at night when excavation is performed. The magnitude of impacts are assessed as moderate and short term.



***Impacts on PCRs and sensitive receptors***

For Hung Vuong Street Extension: My Phuoc Market (20m away), Dong Thanh Pagoda (5m away), Bui Huu Nghia Secondary School and Trinh Hoai Duc Primary School (10 m away).

For Tran Quang Dieu Street: Vuong Tron Maternity Hospital (10 m away), relocated 5 graves.

*Impacts on My Phuoc Market (20m distant):* The construction of Hung Vuong street would have impacts on My Phuoc market due to: (i) limited access to the market; (ii) risks of construction accidents to traders and customers; and (iii) disturbance of business activities; (iv) increased dust and exhaust gases, affecting market activities and goods; (v) conflicts between workers and traders and customers; (vi) traffic congestion at the market peak hour (6.00 – 8.00 am, 4.00 – 6.00 pm).

*Impacts on Dong Thanh Pagoda (5 m distant):* The construction of Hung Vuong street would potentially impact Dong Thanh Pagoda (5 m distant) due to: (i) limited access to the pagoda; (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 (1<sup>st</sup> and 15<sup>th</sup> days every month) due to construction activities.

*Impacts on Bui Huu Nghia Secondary School and Trinh Hoai Duc Primary School (10 m away):* The construction of Hung Vuong street would potentially impact Bui Huu Nghia Secondary School and Trinh Hoai Duc Primary School due to: (i) increased dust, exhaust gases, noise, vibration, solid waste, and wastewater due to construction activities; (ii) Lessons affected by noise; (iii) Safety risks during construction to the pupils and teachers; (iv) increased traffic congestion at school opening and dismissal hour.

*Impacts on Vuong Tron Maternity Hospital (10 m away):* The construction of Tran Quang Dieu Street potentially impacts the activities of Vuong Tron Maternity Hospital due to: (i) hindrance access to the hospital; (ii) increased dust, exhaust gases, noise, vibration, solid waste, and wastewater due to construction activities; (iii) safety risks during construction to the doctors and patience.

*Impacts from relocated graves:* Construction of Tran Quang Dieu roads will displace 5 graves. To the Vietnamese people, household and individual graves are considered PCRs with spiritual implication and should be respected carefully. The owner and relatives of the graves will be psychologically affected because this is directly related to spiritual matters and religious beliefs. The Bank's OP/BP 4.11 applies for this subproject. The level of this impact caused by this activity is considered moderate.

In addition to the aforesaid impacts, PCRs and sensitive receptors can be affected by vibration caused by excavation process for the installation of box culvert along the road and operation of construction machineries such as rollers within radius of 30 m. Vibration impact level is identified by distance from the works to sources of pollution. Specifically, within a radius of 5 m, vibration could cause risk (i) structural subsidence, crack; (ii) infrastructure collapse. Out of the above scope, Potential impacts are just restricted to vibration with irregular frequency. And there is no risk of subsidence, crack, collapse out of the mentioned scope.

Thus, Bui Huu Nghia Secondary School and Trinh Hoai Duc Primary School (10 m away), Vuong Tron Maternity Hospital (10 m away), My Phuoc Market (20 m away) are not subject to risk on infrastructure collapse as they are located beyond the area of influence.

Dong Thanh Pagoda (5 m away) is located within the radius of 5 m, so it can be impacted. However, only its fence, gate are affected. Concretely, the excavation process may encounter the foundation of the gate and fence pagoda and cause a risk on infrastructure collapse. The main building of pagoda is 15 m distant from the construction site, so the risk on infrastructure collapse is not likely occurred.



Dong Thanh Pagoda

## ***b2. Impacts from rehabilitating canal***

### ***b2.1 Rehabilitating Long Xuyen Canal (Subcomponent 2.3)***

The rehabilitation of Long Xuyen canal includes embanking, canal road construction with associated infrastructure of drainage, lighting and trees. The source of pollution depends on the nature of construction activities as follows: the risk of landslides; buildings in danger of collapsing due to pile driving operation; affect waterway transport; PCR and affect sensitives receptors.

#### ***Risk of shore erosion during embankment process***

Existing bank of Long Xuyen is natural earth banks, so there's high risk of shore erosion and embankment subsidence during embankment process. The main reasons include: (i) construction on weak soil structure; ii) placing of heavy machineries and equipment on canal banks; (iii) dredging process unexpectedly encounters the ground water; (iv) vibration during the piling process. In case of shore erosion and embankment subsidence, the workers and residents along two sides of Long Xuyen canal 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.

These impacts are localized, short term during construction period, and avoidable if geotechnical survey is carefully considered during the detailed design, and via the application of good construction method.

#### ***Structure collapse due to pile driving during embankment of Long Xuyen Canal***

Embankment construction involves driving of concrete pile to the depth of about 15 m. When performing this work, the pile driving equipment will press a sizeable force on the pile down to the required depth. The impact force will cause waveform vibration on the ground. The vibration will cause fracture in geological links and links between the structure with geological background, causing trembling and cracking even collapsing for the building. According to the initial technical calculation, the risk on infrastructure collapse is within the radius of 5-10 m.

In the subproject area, about 90% of the structures along the canal route are temporary, low-level and corrugated iron roofed house, which are about 1-3 m distant from the canal. However, these houses will be relocated to the distance of 15 m along the two sides of the canals for the construction of the embankment, operational roads and sidewalks. Thus, the risk on house cracking or collapse during the construction process would not happen if the land acquisition is completed prior to construction.

In addition there are several PCRs and sensitive receptors along canals such as Ong Bac Pagoda (1 storey building, 70 m from Long Xuyen Canal), Long Xuyen market (1 storey structure, 30 m from Long Xuyen Canal). They are more than 10 m distant from Long Xuyen canal, thus do not encounter the risks on collapsing or cracking during construction.

### ***Impacts on waterways traffic on Long Xuyen Canal***

As for Long Xuyen Canal, the waterway traffic is quite busy with the navigation of large and medium vessels, especially at the intersection of Long Xuyen Canal with Hau River and intersection between the Long Xuyen Canal and the Rach Gia Long Xuyen Canal. This is a direct route in connection to Hau River as the main regional waterways.

Long Xuyen canal has the average width of about 100 m. During construction, the flow is partially occupied (to the width of 5-7 m, and length of 20 m) for the construction the embankment foundation and anchoring of barge with construction machineries placed above. As the occupied surface water area is rather small compared to the hydrological flow of Long Xuyen canal, the impact on waterway traffic is assessed as low.

During construction, raw materials will be transported by waterway in addition to road, which is only about 2 barges per day. Thus the impact on increased waterway traffic due to raw material transportation is assessed as minor.

### ***Impacts on PCRs and sensitive receptors along Long Xuyen canal***

There are specific structures around the canals: Ong Bac Pagoda (70 m away), Long Xuyen Market (30 m away), relocated 3 graves. The associated impacts include:

*Impacts on Long Xuyen Market (30 m distant):* The Rehabilitating Long Xuyen Canal would have impacts on Long Xuyen market due to: (i) limited access to the market; (ii) risks of construction accidents to traders and customers; and (iii) disturbance of business activities; (iv) increased dust and exhaust gases, affecting market activities and goods; (v) conflicts between workers and traders and customers; (vi) traffic congestion at the market peak hour (6.00 – 8.00 am, 4.00 – 6.00 pm).

*Impacts on Ong Bac Pagoda (70 m distant):* The Rehabilitating Long Xuyen Canal would potentially impact Ong Bac Pagoda due to: (i) limited access to the pagoda; (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 (1<sup>st</sup> and 15<sup>th</sup> days every month) due to construction activities.

*Impacts from relocated graves:* Rehabilitating Long Xuyen Canal will displace 3 graves. To the Vietnamese people, household and individual graves are considered PCRs with spiritual implication and should be respected carefully. The owner and relatives of the graves will be psychologically affected because this is directly related to spiritual matters and religious beliefs. The Bank's OP/BP 4.11 applies for this subproject. The level of this impact caused by this activity is considered moderate.

## ***b2.2 Rehabilitating Cai Son Canal (Subcomponent 2.4), Ong Manh Canal (Subcomponent 2.5) and Ba Bau Canal (Subcomponent 2.6)***

The rehabilitation of Cai Son, Ong Manh and Ba Bau canals includes canal dredging, embankment, construction of operational with associated infrastructure of drainage, lighting and trees.

The source of pollution depends on the nature of construction activities as follows: (i) odor from dredged sediment; (ii) local flooding during dredging process; (iii) risks on bank erosion, infrastructure cracking and collapse due to pile jacking process; and (iv) impacts on PCRs and sensitive receptors.

The detailed assessment of this impact is presented below:

#### ***Odor from dredged sediment***

The total volume of dredged sludge arising from Cai Son Canal, Ong Manh Canal and Ba Bau is 33,750 m<sup>3</sup>; 36,000 m<sup>3</sup> and 22,500 m<sup>3</sup> respectively. Sludge in these canals is organic sediment deposited at the bottom for long time and receiving various sources of organic pollution. Submerged condition will create anaerobic environment leading to the decomposition of organic matter and toxic gases such as CH<sub>4</sub>, H<sub>2</sub>S, and NH<sub>3</sub> etc. When the material is dredged it will release these gases into the atmosphere, especially bad odors directly to workers on the construction site and the surrounding people.

This impact is considered inevitable. The following objects and scope will be affected:

- For canals of Ong Manh and Ba Bau: crowded residential neighborhood along the canals will be affected by this pollution. However, as the dredging operations will be carried out by segment of 50 -100 m long at a time, the odor pollution will impact directly to households by segment also. At the same time, the odor will affect the monks, Buddhists, visitors of Phuoc Minh Ni Pagoda (5 m from Ong Manh Canal) when dredging operations carried out at the end segment of Ong Manh Canal.
- For Cai Son canal: densely populated only from Km0+200 to Km0+450 on the left bank. Thus, the odor from the sludge dredging will impact locally in that area.

#### ***Local flooding during the dredging process***

Canals of Long Xuyen, Cai Son, Ong Manh and Ba Bau play an important role as the drainage in the area. Meanwhile, the canals have been severely deposited and encroached and their drainage capacity is very limited. The risk of flooding is likely occurred due to the occupancy of the construction facilities and machinery and the flow blocking by segment (approximately 50-100 m each). When it is blocked, the water will flow over onto two sides, causing local flooding along the canal area. This risk will be higher at the time of the high tide. Contractors need to have a flow diversion plan or pumping plan to address this temporary inundation for residential areas along Long Xuyen Canal (specially the segment in LIA 1), Ong Manh (segment in LIA 3), Ba Bau (segment in LIA 3) and residential area from km0 + 200 to Km0+ 450 along Cai Son Canal

#### ***Risk of subsidence during canal embankment***

The current status Cai Son, Ong Manh, Ba Bau canal banks is natural earth banks. Therefore, similar to Long Xuyen canal, the embankment of these canals will encounter the risks on shore erosion and subsidence as discussed above.

In case of subsidence, residential areas along Ong Manh Canal, Ba Bau Canal and specifically those from km0+200 to km0+450 along Cai Son Canal as well as the safety for workers will be affected. There may be damages to property if subsidence happens on large scale.

The above mentioned causes are associated with geological survey, design plans and operation progress of the contractor. All these tasks are implemented at preparation phase and are approved by relevant authorities; in addition, construction activities are carried out section by section and therefore the scope of impact is not significant and the impact is evaluated as low.

#### ***Risks on collapse and cracking of infrastructure due to pile jacking during embankment process***

Embankment construction of the Ong Manh, Ba Bau and Cai Son canals involve the jacking of concrete piles to the depth of 12 m. Based on the weak soil structure in Mekong region, it is



calculated that the risks on infrastructure cracking and collapse are within the radius of 5 m from the embankment.

In the subproject area, about 90 % of infrastructures along the canals are temporary houses. However, these local houses will be relocated out of the boundary of 5-6 m from the canal for the construction of embankment and operational roads along the canals.

Along the Cai Son Canal, Binh Dan and Long Xuyen Hospitals are about 10-20 m distant from the canal, and thus is not expected to be impacts by the pile jacking process.

Along the Ong Manh Canal, the gate and the main building of Phuoc Minh Ni Pagoda (2 storey building) is respectively about 5 m, and 10 m distant from the construction site of the canal. As it is presented above, the area of influence is within 5 m from the embankment, thus there is potentially a collapse risk to the gate and the fence of the pagoda if there is not adequate protection and mitigation measures. Also the gate and the fence around the playground was built quite simply, iron gates and cement fences with low value and easily recovered. Therefore, contractors needs to take measures to reduce and avoid compensation and remedy if problem occurs.



**Phuoc Minh Ni Pagoda**

Overall, the area of influence by pile jacking process is similar to the site clearance boundary. Thus, the risks on infrastructure collapse and cracking are assessed as low if land acquisition is completed prior to construction.

### ***Impacts on PCRs and sensitive receptors***

There are specific structures around the canals, such as:

- Cai Son Canal: Binh Dan Hospital (10 m away), Long Xuyen City General Hospital (20 m away), relocated 4 graves.
- Ong Manh Canal: Phuoc Minh Ni Pagoda (5 m away), relocated 1 graves.
- Ba Bau Canal: Buu Vien Monastery, 40 m away; relocated 2 graves.

The associated impacts include:

- For religious structures: (i) hindrance to access to the pagoda; (ii) increase in dust, exhaust gases, and noise affecting religious practices and visitors to the pagoda, especially during the religious events (1st and 15th days every month); iii) increased construction wastes, waste water; (iv) risks of traffic accidents and safety due to construction; and (v) localized flooding because of construction during rainy days; (vi) conflicts between workers and visitors to the



pagoda; (vi) risk on infrastructure collapse due to vibration during piling process as indicated above.

- For Binh Dan Hospital (from 10 m) and Long Xuyen Hospital (from 20 m): The renovation of Cai Son canal potentially impacts the activities of Vuong Tron Maternity Hospital due to (i) hindrance access to the hospital; (ii) increased dust, exhaust gases, noise, vibration, solid waste, and wastewater due to construction activities; and (iii) safety risks during construction to the doctors and patients.
- *Impacts from relocated graves:* Rehabilitating Cai Son, Ong Manh, Ba Bau Canals will displace 4, 1 and 2 graves, respectively. To the Vietnamese people, household and individual graves are considered PCRs with spiritual implication and should be respected carefully. The owner and relatives of the graves will be psychologically affected because this is directly related to spiritual matters and religious beliefs. The Bank's OP/BP 4.11 applies for this subproject. The level of this impact caused by this activity is considered moderate.

### ***b3. Impacts caused by material and waste transportation activities***

The following table shows impact objects and scope of pollution sources and traffic safety risks caused by construction activities for items under Component 2:

**Table 4.1: Component 2 - Impact objects and scope of dust, noise and vibration**

<b>Construction item</b>	<b>Distance (m)</b>	<b>Transportation routes</b>	<b>Affected object</b>	<b>Distance (m)</b>
Subcomponent 2.1: Constructing the extension of Hung Vuong Street	19.4	Tran Hung Dao street → Ly Thai To street → An Giang solid waste treatment complex.	Inhabitants, passengers, PCRs and sensitive sites along the route: Dong Thinh Pagoda, Long Xuyen Cathedral, An Giang Continuing Education Center, Quang Te Pagoda, Hospital of Ophthalmology-Ear, Nose, Throat-Odontostomatology	3 - 10
Subcomponent 2.2: Constructing Tran Quang Dieu Street	21.3	Tran Hung Dao street → Ha Hoang Ho street → An Giang solid waste treatment complex.	Inhabitants, passengers, PCRs and sensitive sites along the route: Chu Van An primary school, Long Xuyen night market, Phap Hoa Pagoda, Hung Vuong secondary school, Binh Minh nursery school	3 - 10
Subcomponent 2.3: Rehabilitating Long Xuyen Canal	20.4	Tran Hung Dao street → Bui Van Danh street → An Giang solid waste treatment complex.	Inhabitants, passengers, PCRs and sensitive sites along the route: Dong Thinh Pagoda, Long Xuyen Cathedral, An Giang Continuing Education Center, Long Xuyen Bishop, Hoa Lan Kindergarten.	3 - 70
Subcomponent 2.4: Rehabilitating Cai Son Canal	20	Tran Hung Dao street → An Giang solid waste treatment complex.	Inhabitants, passengers, PCRs and sensitive sites along the route: Dong Thinh Pagoda, Long Xuyen Cathedral, An Giang Continuing Education Center, Quang Te Pagoda, Hospital of Ophthalmology - Ear, Nose, Throat - Odontostomatology	0.5 - 20

Construction item	Distance (m)	Transportation routes	Affected object	Distance (m)
Subcomponent 2.5: Rehabilitating OngManh Canal	20.4	Tran Hung Dao street → Ha Hoang Ho street → An Giang solid waste treatment complex	Inhabitants, passengers, PCRs and sensitive sites along the route: Phu Hoa market, Long Xuyen Bishop, Hoa Lan Kindergarten Chu Van An primary school, Long Xuyen night market.	0.5 – 25
Subcomponent 2.6: Rehabilitating Ba Bau Canal	20.4	Tran Hung Dao street → Ha Hoang Ho street → An Giang solid waste treatment complex.	Inhabitants, passengers, PCRs and sensitive sites along the route: Chu Van An primary school, Long Xuyen night market.	0.5 - 25

It is estimated that, during construction under Component 2 there will be an increase of the amount of vehicles transporting raw materials and wastes for disposal. The trucks transporting materials will travel along routes indicated in Table 4.23 with some heavy traffic. Therefore, in addition to dust, noise, and vibration, this increased traffic will be likely to result in potential risks of traffic accidents and jams on these routes, especially during rush hours. The impact level is assessed to be medium.

#### **4.1.4.3. Component 2: Impacts during Operation**

During the operational stage, impacts are evaluated as positive primarily, meeting the project objectives such as enhanced water drainage; improved environmental sanitation, urban aesthetic; completed network of transport links and adaptation to climate change. These impacts are already mentioned in the analysis of with and without the project alternatives.

In addition to the positive impacts, the operational project will have several negative impacts if not controlled by specific mitigation measures. These impacts include the risk of subsidence, embankment damages for canals with waterway traffic; impacts maintenance of drainage system; traffic risks and inundation, specifically as follows:

#### ***Construction of extended Hung Vuong Street (Subcomponent 2.1) and Tran Quang Dieu Street (Subcomponent 2.2)***

##### ***Traffic safety issues***

Traffic safety is probably the key impacts during the operation of Hung Vuong and Tran Quang Dieu Streets 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.

##### ***Local flooding on the Hung Vuong and Tran Quang Dieu Streets due to inadequate maintenance***

The new constructed streets 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.

***Rehabilitating Long Xuyen Canal (Subcomponents 2.3)******Risk on embankment subsidence***

The Long Xuyen embankment have the hard structure, i.e. stone, thus it is quite stable compared to those of soft structure or combined hard and soft structure. However, during the operation process, there is a risk on embankment subsidence due to: (i) inadequate and/or poor hydrology and geotechnical surveys during detailed design; (ii) construction of adjacent infrastructures could cause damage to the embankment.

Any incidents of damage to embankments will directly affect the life of local people, environment landscape and quality of infrastructure located in the area protected by the embankment system

***The risk of canals pollution and congestion caused by rubbish littering from households along canals***

During the operation stage, the risk of canal pollution and congestion caused by littering from households along canals may occur with the following reasons:

- Households do not change their living habits;
- Persistent canal encroachment;
- Lack of strict management of the local government in the maintenance of civilized urban lifestyles.

***Rehabilitating Cai Son, Ong Manh, Ba Bau Canal (Subcomponent 2.3).******Embankment subsidence risk during operation of Cai Son, Ong Manh and Ba Bau Canals***

The canals have the combined hard and soft structure, with the concrete embankment below and the soil revetment covered with grass and trees at the upper part. During the embankment operation, there is a risk on embankment subsidence due to: (i) heavy rain, great flood, weak foundation causing embankment erosion; (ii) construction of adjacent infrastructures could cause damage to the embankment; (iii) failure to maintain trees and/or vegetation on the soft embankments could result in soil erosion and subsidence of the embankment.

Any incidents of damage to embankments will directly affect the life of local people, environment landscape and quality of infrastructure located in the area protected by the embankment system

***The risk of canal pollution and congestion caused by rubbish littering from households along canals***

Similar to Long Xuyen canal, the operation of Cai Son, Ong Manh, Ba Bau canals also have the risk on canal pollution and congestion due to waste littering as described above.

**4.1.5. Impact Assessments for Component 3: Resettlement Site Construction**

Resettlement areas is located on My Phuoc and My Hoa ward with a total area of 4 ha. This component supports the construction of resettlement areas for those who are affected and displaced by the project, which includes construction of technical infrastructure such as roads, electric, water supply, etc. and the accompanying social infrastructure such as culture houses, health centers, kindergartens. This will help for households affected because the project does not disturb residential activities and the access to the best living conditions will be immediately available when the project is implemented.

Some impacts on environment also arise from the construction such as dust, noise, vibration, wastewater, solid waste... However, these impacts are able to be controlled through ECOPs so that the impact levels are assessed at low to medium. The assessment of each stage is presented as below.

#### 4.1.5.1. Component 3: Impacts during Preparation

Similar to Component 1 and 2, activities in the pre-construction phase include:

- Risk of UXO.
- Land acquisition.

##### *Impacts by UXO clearance*

As already indicated in section 4.1.4.1 and 4.1.4.2, there is a high safety risk due to the UXO from the war time. Therefore, UXO detection and clearance must be carried out before commencement of any construction work.

##### *Impacts on people's life from land acquisition*

Fully or partially land acquisition will impact AHs both physically and mentally, even causing social problems and prolonged litigation. The construction of resettlement area will affect 02 fully affected households, 200 m<sup>2</sup> resident land, 33,556 m<sup>2</sup> agricultural and 12 graves to be relocated. Impacts due to land acquisition are assessed in part 4.2.

#### 4.1.5.2. Component 3: Impact during Construction

##### ➤ *Impacts on air quality*

Air environment will be affected during construction due to dust, gases, noise, etc. from the activities of 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.

##### a1. Dust and emission

##### *Dust from earthworks activities*

According to the project schedule, project construction period is expected to begin from September, 2018 to August, 2011 (5 years); the construction will be divided into several bidding packages that will be implemented at different timelines. According to the feasibility report of the project, the total volume of earthwork soil in component 3 is 65,000 m<sup>3</sup>. Dust generated by excavation and backfilling activities under Component 3 is calculated in the same way as Components 1 and 2.

The concentration of dust generated by the process of earthwork is calculated in Table 4.24 (baseline data included):

**Table 4.2: Concentration of dust generated from Excavation of road and sewerage construction**

L (m)	W (m)	Concentration (mg/m <sup>3</sup> )						QCVN 05:2013/BTNMT (Average in hour) (mg/m <sup>3</sup> )
		H=1.5	H=3	H=6	H=9	H=12	H=15	
10	10	1.30	0.70	0.41	0.31	0.26	0.23	0.3
20	20	0.70	0.41	0.26	0.21	0.18	0.17	
40	40	0.41	0.26	0.18	0.16	0.14	0.14	
60	60	0.31	0.21	0.16	0.14	0.13	0.13	
80	80	0.26	0.18	0.14	0.13	0.13	0.12	
100	100	0.23	0.17	0.14	0.13	0.12	0.12	

**Comment:** The above results shows that dust concentration from street building is 1.03 – 4.3 times higher than QCVN 05:2013/BTNMT but particles settle quickly and occur in short time. Besides, the construction scale of component 3 is large, construction items will be divided into different timelines and a few households living at the distance of 100 m from the project area. Therefore, this impact is assessed as low impact.

### ***Dust and emission generated from transportation***

The activities of transporting materials and waste disposal will generate exhausted gas from fuel combustion process of the internal combustion engine, such as dust, NO<sub>2</sub>, SO<sub>2</sub>, CO. These emissions will reduce ambient air quality.

Total amount of materials for construction of the resettlement area is approximately 182,692.35 tons. The material will be transported from material mines to the construction area by 15 T trucks within 24 months. Hence, there are about 17 trips per day. Dust concentration and emission is calculated in the same way as components 1 and 2. The results show that:

Dust concentration 0.11 mg/m<sup>3</sup> (compared with permissible standard limits of 0.3mg/m<sup>3</sup>); CO content 5 mg/m<sup>3</sup> (compared with 30 mg/m<sup>3</sup>); NO<sub>x</sub> content 0.02 mg/m<sup>3</sup> (compared with 0.2 mg/m<sup>3</sup>); SO<sub>2</sub> trung bình 0.02 mg/m<sup>3</sup> (compared with 0.35 mg/m<sup>3</sup>).

The dust and emission concentration would not exceed the national standards on ambient air quality (QCVN 05: 2013/BTNMT).

### **a2. Noise**

*Noise generates from:*

- Vehicle transporting sand, soil, construction material ...
- Operation of construction facilities: excavator, bulldozer, concrete mixer...

**Table 4.3: Maximum noise levels from transportation and construction activities**

No.	Equipment/Vehicles	Distance to noise source (m)					
		15	50	100	200	300	400
1	Truck	97	87	81	75	71	69
2	Roller	74	64	58	52	48	45
3	Compactors	76	66	60	54	50	47
4	Graders	88	78	72	66	62	59
5	Concrete mixers	85	75	69	63	59	56
6	Bulldozers	80	70	64	58	54	51
7	25 ton crane	87	77	71	65	61	58
8	Generator	74	64	58	52	48	45
9	Excavators	88	78	72	66	62	59

### **Comments:**

The noise levels of most facilities do not meet QCVN 26: 2010/BTNMT - National Technical Regulations on noise (70 dBA for normal area from 6:00 – 21:00) at the distance less than 100 meters. The impact scope of excavator is even larger, 300 m. However, truck is a mobile source and transport material only so the impact is not continuous and short-term.

Within the distance of 100 m from generating source, workers at site and residential area nearby are affected. No sensitive point is affected.

### **a3. Vibration**

Vibrations generated during the operation of the machinery may cause crack and even collapse for construction within the scope of impact, especially high buildings, underground works on weak land.

Formula [8] is applied to calculate the transmission of vibration in space and the result is presented in Table 4.26:



**Table 4.4: Vibration level according to the distance of vehicles**

No.	Vehicle	Vibration at distance of D(m) (dB)									
		7.5	12.5	15	17.5	20	22.5	25	27.5	30	32.5
1	Truck	82	79	77	75	73	72	70	69	68	67
2	Bulldozers /	83	80	78	76	74	73	71	70	69	68
3	Excavators	90	87	85	83	81	80	78	77	76	75
4	Roller	90	87	85	83	81	80	78	77	76	75
QCVN 27:2010/BTNMT, (From 6:00 - 21:00) - normal areas		75 dB									

**Comment:** at the distance more than 30 m from the emission source, vibration level of all machine meet QCVN 27:2010/BTNMT – normal area from 6:00 to 21:00.

Field survey shows that there is no underground or high building in the radius of 50-100m from the project so that the possibility of crack and collapse is insignificant.

#### ➤ **Impact on water environment**

##### ***Impact by stormwater***

The flow of stormwater runoff in the construction area depends on regional climatic factors. In principle, the stormwater is slightly polluted wastewater (graded as clean). However, this water may be contaminated with impurities such as grease, waste, building materials, ... Therefore, the management measures to minimize contamination of stormwater into water sources will be taken by contractors to prevent the pollution. The rainwater runoff flow is estimated around 141,36m<sup>3</sup>.

##### ***Wastewater from construction activities***

Construction wastewater mainly consists of spilled water of mixing concrete and washing water after finishing pouring concrete. The amount of water spilled from concrete mixing is not large as concrete mixing tank is closed and infused directly into the soil after falling. Washing water after concrete pouring is in fact used as a cohesive for concrete materials and absorbed directly into the surface. Such wastewater from construction activities is negligible.

##### ***Domestic wastewater from construction workers***

The maximum number of workers in construction stage is estimated as 50. Water demand for each worker stated in TCVN 33:2006 is 45 liters/person/day including water for washing, cooking and personal hygiene. Since they will work one shift per day, the water consumption per worker is 45 liters/day, with uncontrolled factor K = 2.5. The amount of wastewater is relatively corresponding with 100 % water supply, so the flow of domestic wastewater generated is about 5.6 m<sup>3</sup>/day.

#### ➤ **Solid waste**

Construction activities on site will generate the following solid wastes:

- Domestic solid waste
- Construction waste including plant biomass, debris, waste rock, soil ...

##### ***Domestic solid waste***

The composition of domestic solid waste includes mainly packaging material such as nylon bag, lunch box and leftover food, vegetables, cans ... There are about 50 workers a day in construction site.

The amount of solid waste generated is estimated as follows:

$$m = k = 50 \times N \times 0.5 = 25 \text{ kg/day.}$$

Where:

k: velocity of solid waste generation (kg/person/day),  $k = 0.5$  to  $0.7$ , select  $k = 0.5$ .

N: Number of construction workers at the site.

The volume of domestic solid waste generated by workers is not large. However, if no measures to collect and treat the waste it may be discharged directly into canals and areas surrounding the project and affect the river water quality and bring harms to the regional landscape. Therefore, the project in cooperation with the contractor will have a plan for waste collection and disposal in accordance with regulations.

#### Solid waste from construction activities

Construction waste includes:

- Vegetation biomass arising from ground clearing activities:
- Debris from demolition within the land acquisition area: about  $13,000 \text{ m}^3$ .
- Organic dredged sludge during construction of the project: about  $26,000 \text{ m}^3$ .
- Packaging material for building materials, steel scrap: about 1 ton, according to some actual projects of a similar nature.
- Rocks, cement waste,...estimated from 2-5 tons, but the volume is often reused for ground backfilling for a number of local households.

Construction waste should be collected and dumped at the prescribed places to avoid harms to regional landscape and local flooding by occupying water drainage surface.

In overall, the impacts caused by solid waste can be well controlled with the implementation of the measures proposed in ECOPs. Therefore, the impact is assessed as medium.

#### ➤ **Impacts from hazardous solid waste**

The amount of waste grease and oil generated in the construction site therefore averages  $(34 \times 7 \text{ liters/time})/3 \text{ months} = 79.3 \text{ liters of oil/month}$ . In addition, the subproject would also generate an estimated amount of 15 kg of oily rags per month.

Without appropriate management, these types of construction waste would have negative impacts on the soil, water, and air environment; residual grease and oil in containers can penetrate into the ground, causing soil pollution. The impact level is assessed to be medium.

#### ➤ **Local flooding**

During the construction, the occupation of machinery, gathering material at construction site and concreting the surface will narrow the flow or reduce the penetrability of land, and therefore cause risk of local flooding. Contractors shall find drainage solutions to the flooding in rainy season.

#### ➤ **Impacts on traffic infrastructure**

In the construction of items in component 3, the number of vehicles transporting waste and raw material is not much (12 trips/day). However, most of them are heavy vehicles and the project areas occupy several residential routes, impacts on traffic infrastructure are possible.

The increasing number of vehicle may affect the traffic safety and traffic jam on route. The transportation route includes Tran Hung Dao, Hoang Ha Ho. This task also impacts on PCRs and sensitive sites on route (see chapter 2, part 2.6), especially on holy days, rush hour...

These impacts will take places all the construction. However, the construction will be divided into several bidding packages and implemented successively so the quantity of vehicles is much fewer than calculation. The impact is temporary, interrupted but extended (2 years) so it should be assessed at a medium level.

➤ **Impacts on rice farming**

The land expected to build resettlement site is currently land for rice cultivation by farmers. The construction activity will convert 4 hectares of agricultural land into urban land. Accordingly, the livelihoods of rice farming household activities will be affected. Detailed impact assessment is presented in Section 4.2.

Other notable impacts for construction activities are related to the unacquired land area. These impacts include: (i) direct discharge of wastewater, waste oil, hazardous waste, ... into farming areas affecting the growth and development of rice; (ii) reckless harvest by workers affecting crop yields; (iii) the gathering of materials, machinery and equipment near farming area blocking/restricting water supply for rice irrigation.

All these impacts related to on-site management measures are controllable within the extent of ECOPs. The impacts are assessed as medium.

**4.1.5.3. Component 3: Impact during Operation**

The environmental impacts in the Operation stage include domestic wastewater and solid waste, and local flooding.

***Impacts from wastewater***

Domestic wastewater generated by operation activities include water from toilets, washbasin, shower, kitchen faucet and floor washing. The amount of wastewater is calculated as 100% of water supply volume and the estimated amount of wastewater in the resettlement area is about 180 m<sup>3</sup>.

The amount of wastewater from households, schools, health centers, ... is connected to the general drainage system of the city

***Impacts from solid waste***

Solid wastes arising from different sources in the project area include:

- Solid waste generated from households with the estimated volume of about 1,200 kg/day (calculated for 1,500 people, an average of 4 persons per household, garbage generation speed from 0.5 to 0.8 kg/person/day);
- Solid waste arising from the street (calculated area of 21,637 m<sup>2</sup>, garbage generation speed 0.05 kg/m<sup>2</sup>/day): 1,082 kg/day.

Municipal solid waste consists of:

- Non-hazardous solid waste:
  - Unrecyclable non-hazardous solid waste: leftover food (rice, vegetables, fruit peels, bones, ...), contaminated plastic bag, broken glass etc ...
  - Recyclable non-hazardous solid waste: clean plastic bag, PET bottles, clean glass bottles, metal, paper, cardboard, ..
- Hazardous solid waste: batteries, fluorescent light bulbs, ant and mosquito sprays, spent oil.

These wastes will cause bad odor, soil pollution, affecting the aesthetic and environmental sanitation if not properly collected and treated.

***Local inundation***

The drainage in resettlement area will be maintained periodically. This process arise sediment from dredging, odor and leachate. These sources cause insignificant effect because dredged sludge is collected and transferred by specific truck during day. Thus, the level of impact is low.

## 4.2. CUMULATIVE IMPACT ASSESSEMENT

Cumulative impact under consideration is defined as two or more individual effects that, when considered together, are considerable or which compound or increase other environmental impacts. The cumulative impact from several projects result from the incremental impacts of the proposed subproject when added to other closely related, and reasonably foreseeable, future projects. The impacts that do not result in part from the subproject will not be discussed.

The discussion of impact severity and likelihood of occurrence need not be as detailed as for effects attributable to the subproject alone. The analysis of cumulative effects in this ESIA focuses on the effects of concurrent construction and operation of the proposed subproject with other spatially and temporally proximate projects. 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.

### *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. Geographically, the proposed subproject is located in Long Xuyen City. 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 resulted from implementation of the subproject.

## 4.3. SOCIAL IMPACTS

The project is expected to have significant positive social impacts in Long Xuyen City for people living in the project area by upgrading urban infrastructure (roads, drainage, water supply and sanitation, public facilities, and power supply) based on community priorities. The project covers 8 wards of Long Xuyen city and will bring benefits to 98,472 people.

Upgrading tertiary infrastructures will bring many benefits to residents in LIAs like: improving environmental condition, living condition, bringing access to social service and raising land value. 24,396 people (4,726 households) living in the LIAs will in particular directly benefit from the upgrading of infrastructures are, especially poor and social policy households.

Besides positive impacts, the project also brings negative impacts like: land acquisition, resettlement, loss of livelihood, social problems.

### 4.3.1. Positive impacts

#### **Positive impacts of Component1: Upgrading tertiary infrastructure in LIA 1, LIA 3, LIA 5, LIA 6.**

- Increasing land reserve for the city by re-planning infrastructure system.
- 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
- By improving infrastructure and access in the LIAs, value of land and house will increase accordingly.

- Number of beneficiaries: 24,396 people, 4,726 HHs including 110 poor households.

**Positive impacts of Component 2 – Constructing road: constructing extended Hung Vuong street, upgrading Tran Quang Dieu street, constructing revetment for Long Xuyen canal.**

- The connection of internal traffic systems and inter-district road will facilitate the traveling and transportation of goods in the area, promoting the trade and promoting sustainable economic development. In addition, improvement of existing traffic system also help to improve connectivity of traffic network, decrease traffic capacity for main roads, reduce consumption of fossil fuel and save traveling time.
- Construction of sewage system helps to improve drainage capacity for the city, improve environmental sanitation.
- Beneficiaries: Residents all over the city.

**Positive impacts of Component 2 – Improving Canal: Cai Son canal, Ong Manh canal, Ba Bau canal.**

- Dredging Cai Son, Ba Bau, Ong Manh canal systems helps to improve sanitation in the area, increase water drainage in flood and rainy season, improve living condition for people living on the both banks of the canal.

**Positive impacts of Component 3: Constructing Resettlement site.**

- Constructing technical infrastructure like: traffic road, electricity, lighting system, water drainage... and social infrastructure like cultural house, medical station, kindergarten...will help ensure relocated households security of tenure, safety and good living conditions.
- Beneficiaries: people living along the canals.

#### **4.3.2. Negative Impacts**

***Land acquisition***

- Number of affected households: 863 HHs in which 276 HHs are relocated.
- The project acquires 165,380 m<sup>2</sup> land, in which:
  - Residential land: 24,789 m<sup>2</sup>
  - Agricultural land: 60,266 m<sup>2</sup>
  - Land managed by organizations: 5,447 m<sup>2</sup>
  - Public land: 75,865 m<sup>2</sup>.

The area of land to be acquired to serve the project, including two types: (i) temporary land acquisition for constructing auxiliary works for construction like the material gathering area, workmen's huts, waste dumps ...; (ii) Permanent land acquisition for constructing work items of the project. For farming households, land is the most important asset, losing land means losing tools for making living, leading to shocks for people. In addition, their circumstances will be changed if they receive compensation or assistance to change job. Therefore, even though households with land acquisition get compensation and full support from the project, they may still get great disturbance for jobs and economic activities of their family.

***Impact on livelihood***

The project will bring negative impacts on livelihood. Impact on business households along the transport route, construction and relocated business households: relocation may affect the income and livelihood of the household doing business. For those who do small business, hairdressing, nailing ... when being relocated in another place, maybe they will get difficulties to maintain their previous jobs (due to market, location... ). 25 HHs whose trading/business will be permanently affected by the project, requiring relocation.



### ***Gender Issues***

The project brings many risks, specially for women:

- 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.
- Female-headed households (number) face additional challenges associated with resettlement, especially when they are reliant on extended family and social networks for the care and socialization of children.
- Women are also more susceptible to the risks of HIV/AIDS infection compared to men.
- Women are often managing home based business to be relocated.

### ***Other social risks***

#### ***Flood***

Due to the features of Long Xuyen city, local inundation and flooding frequently happen in inner city and mostly from May to October. The flooding causes a lot of problems for local people. Therefore, people in the project area worry that some of the proposed items for the project can make the situation worse when constructing in the rainy season, preventing drainage capacity of the inherently poor sewer system. People in the project area require to apply appropriate measures to reduce the deficit flood in the construction phase and operation of the service road. People wish that the flooding and inundation in the city will be improved after the project is completed.

#### ***Lacking of employment opportunity***

The shortage of job opportunities is one of the issues requiring special attention in the project area. For households in the project area who depend on small businesses and seasonal jobs, lack of skills, low educational level, there will be increasingly risks of loss of livelihoods if they have to relocate far from their current location with possible social and economic disruption. Assistance for relocation close to former location is requested.

For farmers depending on agricultural activity, the acquisition of agricultural land will make them lose their main source of income. Most of people in the survey wish to have the option of "land for land" for their lost agricultural land. However, if this option is not possible, they would like to have new employment opportunities. Most of respondents in the survey said that they are ready to participate in the project and want to be involved in vocational training to get other jobs when the project will be implemented.

#### ***Moving of tomb/grave***

Survey results show that, in the project area, people still kept custom to bury the dead in the area of land for agricultural production. In addition, in this area there are some Chinese tombs. Therefore, it is recommended a thorough review of technical options to minimize the impact of moving the graves. However, if unavoidable, households having affected graves will get compensation at replacement cost. Graves als needs to be exhumed and relocated in culturally and spiritually sensitive manner.

#### ***Limitation in accessibility***

During the construction period, the proposed investment in residential areas, agricultural lands will cause access disruption to productive land or workplaces and public buildings. Many respondents in the survey expressed concerns of limited access to market and cultivation land. In addition, the project can easily disrupt daily life and social activities of people.

***Temporary impacts******For economy in the project area***

In general, construction activities related to the implementation of the project can also cause disruption and disturbance of economic activities in the project area. Especially, construction of road can disrupt production activities in the project area due to:

- People have to use other road, or people have less road lanes to use;
- Affecting traffic capacity on the roads, causing traffic jam in peak hours and potential risks of traffic accidents.
- People get limitation in doing business activities along the road due to land acquisition;
- Causing obstacles for access to external resources into the project area;
- Causing obstacles for exchange of products from project area to other areas;
- The construction phase can indirectly cause many negative impacts on the economic activity in the project area.
- Dust and noise pollution

The process of construction and transportation of soil and construction materials increases levels of dust and gas emissions from motor vehicles (SO<sub>2</sub>, NO<sub>2</sub>, CO<sub>2</sub>, S ...) into the air, this is the risk causing respiratory diseases, skin diseases, affecting the health of those working in the construction site and the people around them. However these effects occur only during construction, the impact is assessed to be medium and can be mitigated by using mist spraying method.

Noise can adversely affect workers at the construction site and bother people living in the neighborhood. Exposure to intense noise for a long time will cause hearing declination, tiredness, stress, insomnia, reduce labor productivity; if people are affected by loud noise for 8 constant hours in many months, they can have increased blood pressure, affected nervous system and get occupational deafness... However this impact is assessed to happen in a short time and can be minimized.

***External labor force and social issues***

High concentration of workers in the construction site with high percentage of male workers and temporary residents, presence of business and entertainment activities can generate social problems like prostitution, violence, drug dealing. Some other social diseases like HIV/AIDS, and other Sexually Transmitted Disease/Infection (STD/STI) can occur; HIV/AIDS/STD/STI awareness and prevention measures need to be included in the contractors' contracts.

Issues related to social ills have been discussed during in-depth consultation with local authorities and during community consultation in the project area with affected people.

**4.4. INDUCED IMPACTS**

The existing land use along the 02 roads (Extended Hung Vuong street, Tran Quang Dieu street), 04 canals (Long Xuyen, Cai Son, Ong Manh, Ba Bau canals) alignments under Component 2 residential, agricultural, and garden land. When these new roads are built and operated, land use along the total road alignments of 2.1 km will be changed in the tendency that residential houses will be built along the road alignments. As the result, agricultural land will be changed to urban residential area. In the future, the area along the road alignments will be change to urban residential area in accordance with the city's Masterplan. The existing houses that are closest to the alignments will remained to be several rows back from the new road after new houses are built on existing agricultural land along the alignments thus land price of these existing residential houses are not expected to increase abruptly. Therefore, the potential induced impacts would be under control.

Therefore, there are no foreseeable induced adverse potential environmental impacts that could happen in the areas along the roads after it is built.

## CHAPTER 5. PROPOSED MITIGATION MEASURES

### 5.1. ENVIRONMENT

#### 5.1.1. General Principal

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 be Integrated Into 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**

- Enlargements will be carried out only for major alleys and with the consent of local communities.
- Alleys with no possibility of enlargement will be upgraded within their existing boundaries to limit site clearance and disturbances within local communities.
- Consistent investments are to be made in all alleys (drainage and lighting systems) to synchronize them with the secondary technical infrastructure of connecting lines.
- Detailed design will consider adequate temporary drainage to avoid potential flooding during construction.

##### **Component 2: Upgrading primary and secondary infrastructure priorities**

##### **(i) *Constructing 02 routes (Extended Hung Vuong - Subcomponent 2.1, Tran Quang Dieu - 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 sewer 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, manholes, 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.
- Detailed design will consider adequate temporary drainage to avoid potential flooding during construction.

**(ii) *Rehabilitating Long Xuyen canal – Subcomponent 2.3; Cai Son canal - Subcomponent 2.4; Ba Bau canal - Subcomponent 2.5; Ong Manh canal – Subcomponent 2.6***

- The detailed design for canal dredging shall include the update of Dredged Material Management Plan (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.
- Detailed design will consider adequate temporary drainage to avoid potential flooding during construction.
- 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 Long Xuyen, Cai Son, Ong Manh, Ba Bau canals to improve the landscape.

**Component 3: Resettlement Area**

The subproject will build green area within the resettlement site. The species to be planted shall be consulted with URENCO, prioritizing native species and avoid invasive plants.

Internal roads with drainage and sewers will also be built within the resettlement area. Trees are planted at every 10 m on sidewalks along the roads. 90W LED lamps will be used for lighting.

**5.1.3. Mitigation Measures During Preparation Phase**

**Mitigation Measures for Land Acquisition**

During detailed design, the PMU will study carefully the scale and scope of the subproject implementation to minimize land acquisition impacts. At the same time, the PMU will closely



coordinate with the local authorities to carry out dissemination activities so that the local communities understand the roles and significance of the subproject, and thus cooperate and supervise the contractors' performance during the subproject implementation process.

The subproject is expected to affect on **85,088 m<sup>2</sup>** land owned by **886** households and 25 units as the People's Committees/ management organizations, including **23,802 m<sup>2</sup>** of residential land; **60,266 m<sup>2</sup>** of agricultural land; **5,447 m<sup>2</sup>** of land managed by the organization; **75,865 m<sup>2</sup>** of public land owned by the Commune/ward PCs as specialized land, rivers and streams, and transport land. There are 863 households impacted with land and fixed assets by the subproject, of which 587 households are partly affected and 276 households are totally affected and have to relocate. Among the affected households, there are 226 vulnerable households (policy beneficiary HHs, poor HHs, etc.,) as well as 25 affected business households. 01 resettlement sites have been built for site clearance for Long Xuyen city subprojects in My Phuoc ward and My Hoa ward.

The estimated cost for the Resettlement Action Plan of the subproject is approximately 300,120,000,000VND (equivalent to 13,565,359 USD at the exchange rate of 22,124 VND = 1 USD).

The estimated cost for land clearance and resettlement is calculated based on provisions set by People Committee of An 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.

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 27 graves

- There are 27 graves of Catholics will need to be relocated for construction under Component 2 (Tran Quang Dieu road: 6 graves; Long Xuyen canal: 4 graves; Cai Son canal: 5 graves) and Component 3 (12 graves).
- 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, reburial 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 (8,640,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways.
- During implementation PMU will make early announce to the households whose graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to 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 An 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. 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 general 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 6.2 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 contract documents (BD/CD) annexes. 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
- 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***

The measures to mitigate the site-specific impacts during construction are presented in the Table 5.1 below.

**Table 5.1: Site-specific mitigation measures**

Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
<b>Component 1: Upgrading infrastructure. Site-specific Impacts includes:</b> local flooding, traffic disturbances and disturbances social to local communities	
<p>Local flooding</p> <ul style="list-style-type: none"> <li>- Residents within LIAs, especially in LIA 1 and LIA 3 (by the tidal regime of the canals which are located within)</li> </ul>	<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>- 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>- 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, such as: <ul style="list-style-type: none"> <li>• Building drainage works along/across the site during backfilling and ground leveling.</li> <li>• Digging drainage ditches/drains suiting practical conditions of the streets.</li> </ul> </li> <li>- Deploying standby pumps and other equipment items in case of needed drainage;</li> <li>- Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations.</li> <li>- Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area.</li> </ul>
<p>Social disturbance and increased traffic risks</p> <ul style="list-style-type: none"> <li>- Impacts on traffic within LIAs by narrow alleys</li> <li>- Impacts on traffic along connecting streets</li> <li>- Social disturbance in My Binh Ward (LIA 1), Dong Xuyen and My Xuyen Wards (LIA 3), My Xuyen Ward (LIA 5), My Long and My Phuoc Wards (LIA 6)</li> </ul>	<p><u>For impacts on traffic within LIAs</u></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>- Construction operations are to be successively performed by alley segment. Extensive construction operations on the entire route should be avoided.</li> <li>- For major alleys with a width of over 4m, construction should be carried out on one half of the road surface, leaving the other half for traffic traveling.</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> </ul>

Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
	<ul style="list-style-type: none"> <li>- Avoiding the waste/material transportation during rush hours;</li> <li>- Construction during night time is not allowed</li> </ul> <p><i><u>For impacts on traffic along connecting streets</u></i></p> <ul style="list-style-type: none"> <li>- Do not park vehicles in the roads longer than necessary. Maintain the required speed limit and do not overuse horn.</li> <li>- Comply with the traffic safety regulations while participating traffic.</li> <li>- Clean up wastes dropped off on road.</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading of construction materials, equipment, and wastes.</li> <li>- So as to minimize adverse impacts on the traffic along the streets linked to LIAs, a traffic management plan will be carried out, in which construction operations will be performed in some streets, some others will serve as temporary by pass roads and others will be used as transportation routes. This plan will be publicly announced to residents in the affected areas and to related agencies. The planned routes for material and waste transportation see Table 5.2 below.</li> </ul> <p><i><u>For impacts on social disturbance</u></i></p> <ul style="list-style-type: none"> <li>- Prioritized recruitment and employment of the workforce available in the locality;</li> <li>- Carrying out procedures on declaring the personnel present at construction sites;</li> <li>- Setting up workshops on construction site rules &amp; regulations for officers and workers;</li> <li>- Contractors' sanction measures against violations of construction site rules &amp; regulations.</li> </ul>
Damage to water supply and communication systems along alleys in LIAs (19.9 km)	<ul style="list-style-type: none"> <li>- Inform the water supply management and communication companies of the construction activities and their potential impacts such the risks of breakage other damages to the water supply pipeline at least 01 month before start of the construction.</li> <li>- Set up barriers around the construction area of water supply pipeline.</li> <li>- Use smaller excavation machine and Larsen pile driving method of construction to avoid breaking or disposition the water pipeline.</li> <li>- Deploy a qualified technical staff to supervise construction activities near the pipeline and communication cables.</li> <li>- In the case of breaking the pipeline or the communication information system cables, it is necessary to suspend the construction activities and immediately inform the water supply and communication companies and the local authority of the incident.</li> </ul>

Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
<b>Component 2: Upgrading roads connecting to LIAs; Reconstruction of Inner City Canals</b>	
<b>Subcomponent 2.1, 2.2: Constructing the extension of Hung Vuong Street and Tran Quang Dieu Streets.</b> Site specific impacts includes: (i) decreased water quality causing by constructing bridge on route; (ii) Local flooding; (iii) Affect business of the HHs; (iv) Impacts on PCRs and sensitives points.	
<p>Reduced surface water quality of intersected canals due to construction of culvert and bridges on the road alignments</p> <ul style="list-style-type: none"> <li>- At km0+910.72 and km0+87.7 of Hung Vuong road.</li> <li>- At km0+366 and km0+91.73 of Tran Quang Dieu street</li> </ul>	<ul style="list-style-type: none"> <li>- A construction plan of detailed measures and schedule is to be worked out for the building/laying of sewers and bridges at the intersections with the canal. This plan must be informed 30 days in advance to local government authorities and residents in the affected areas of extended Hung Vuong and Tran Quang Dieu Streets.</li> <li>- In the final segment of the drainage ditch temporarily connected to the canal, there will be a settlement pit for suspended matter to retain sludge, pollutants and waste in the water before it is discharged into the canal. This settlement pit will be emptied and tidied up every day by workers.</li> <li>- Before operation, all construction means and machines will be carefully checked in terms of technical parameters as well as operational performance to limit possible spills of oil, grease or fuel.</li> <li>- Construction operations during high tides should be limited.</li> <li>- Construction supervision staff at site must carry out strict management of workers during construction processes in order to limit materials and waste from spilling into the canal.</li> <li>- No machine &amp; equipment maintenance is to be carried out in areas close to the canal.</li> <li>- Construction operations for bridge foundations and piers will be bound to increase the turbidity of surface water. The construction unit should speed up the progress to cut down the radius of pollution transmission.</li> </ul>
<p>Local flooding</p> <ul style="list-style-type: none"> <li>- The residential areas along Hung Vuong road and Tran Quang Dieu street</li> </ul>	<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 proper drainage in that area</li> <li>- The contractors must set up temporary drainage system at the construction site and ensure that it is cleared of mud and other obstructions</li> <li>- Have a standby pumps for rapid drainage in case of heavy rain or extreme weather events.</li> <li>- Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations.</li> <li>- Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area.</li> </ul>
<p>Impacts on business activities of residents along Hung Vuong Street</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 01 month before start of the construction.</li> </ul>



Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
<ul style="list-style-type: none"> <li>- The street household businesses along Hung Vuong road</li> </ul>	<ul style="list-style-type: none"> <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 near the businesses.</li> <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, 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>- 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>
<p>Impacts on PCRs and sensitives receptors:</p> <ul style="list-style-type: none"> <li>- My Phuoc Market, Dong Thanh Pagoda on Hung Vuong road.</li> <li>- Vuong Tron Maternity Hospital and relocated graves on Tran Quang Dieu street</li> </ul>	<p><u>Relocation of graves:</u></p> <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, reburial 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 (8,640,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways.</li> <li>- During implementation the Subproject Owner will make early announce to the households whose graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to the affected household as required in the subproject RP and ESMP.</li> </ul> <p><u>For Dong Thanh Pagoda:</u></p> <ul style="list-style-type: none"> <li>- Inform the pagoda 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 100 m in front of the pagoda/church and monastic.</li> <li>- Environmental training for the workers includes codes of conducts when working in public areas and</li> </ul>

Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
	<p>sensitive receptors such as pagoda.</p> <ul style="list-style-type: none"> <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 goes to pagoda.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas.</li> <li>- Truck drivers shall restrict honking in areas close to the pagoda area.</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the pagoda.</li> <li>- The construction method shall include the measures to protect the foundation of the fence/gate, main building of the pagoda, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage</li> <li>- In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the pagoda.</li> </ul> <p><u>For Vuong Tron Maternity Hospital:</u></p> <ul style="list-style-type: none"> <li>- Inform the hospital 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>- Construction area to be fenced and marked with warning signs to prevent unauthorized people from entering.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at site.</li> <li>- Set up construction and traffic warning signs at the construction 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>- 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 hospital.</li> <li>- Arrange traffic guide for the vehicles go in/go out the hospital.</li> </ul> <p><u>For My Phuoc market</u></p> <ul style="list-style-type: none"> <li>- Limiting to transport materials/wastes (for constructing the items of Lias) when passing by Nguyen Du street 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>

Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
<b>Subcomponent 2.3: Rehabilitating Long Xuyen Canal. Site specific impacts includes:</b> (i) Risk of bank erosion and subsidence during embankment process; (ii) structure collapse due to pile driving during embankment process; (iii) local flooding during the dredging process; (iv) impacts on water traffic; (v) Impacts on PCRs and sensitives receptors.	
Risk of bank erosion and subsidence during embankment process - Residential areas along Long Xuyen Canal, Ong Manh Canal, Ba Bau Canal - From km0+200 to km0+450 along Cai Son Canal	<ul style="list-style-type: none"> <li>- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure sustainability and stability of the embankment;</li> <li>- Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to CSC and the authorities concerned for approval by the construction contractors.</li> <li>- Do not carry out works in rainy season.</li> <li>- Do not place heavy machineries and transportation vehicles near the canals banks. Inspection and supervision on land subsidence risks must be taken regularly in order to prepare the appropriate reinforcement plans.</li> <li>- Construction of side slope is made in accordance with the design.</li> <li>- Regularly check and monitor the risk of landslides to plan for possible reinforcement.</li> <li>- Construction of pitched roof must ensure correct design of dredging.</li> </ul>
Structure collapse due to pile driving during embankment of Long Xuyen Canal	<ul style="list-style-type: none"> <li>- Ensure that the detailed design and contractor's construction method take into account the risk cracking and collapse of nearby local houses and infrastructures.</li> <li>- Ensure that land acquisition and house relocation at the site boundary is completed prior to commencing construction work.</li> <li>- Cooperating with the local government to inform the time for pile driving, possible risks and public consultation.</li> <li>- Use construction method to reduce vibration for construction activities of embankment; closely monitoring the vibration level; incidents and logging of these parameters.</li> <li>- In the case dredging causes landslides and affects households and homes along the canal, the contractor is liable for damages or compensation of construction as the original status.</li> </ul>
Localized flooding during the dredging process - Residential areas along Long Xuyen Canal, Ong Manh Canal, Ba Bau Canal - From km0+200 to km0+450 along Cai Son Canal	<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, such as: (i) building drainage works along/across the site prior to dredging operations; (ii) Digging drainage ditches/drains suiting practical conditions.</li> <li>- Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area.</li> </ul>

Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
	<ul style="list-style-type: none"> <li>- Deploying standby pumps and other equipment items in case of extreme weather events</li> <li>- Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations.</li> </ul>
Impacts on waterways traffic on Long Xuyen Canal	<ul style="list-style-type: none"> <li>- The works design should evaluate the effects of restricting river flow</li> <li>- Coordinate with the local authority to inform local people of the construction plan prior to construction;</li> <li>- Coordinate with the Department of Inland Waterway to flag the signal system on the inland waterway the transport will travel through;</li> <li>- Provide the workers with all appropriate PPE and ensure that life jackets are used in proximity to water. Safety staff must be available at all times 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> </ul>
Impacts on PCRs and sensitive receptors along Long Xuyen canal <ul style="list-style-type: none"> <li>- Long Xuyen canal: Ong Bac Pagoda (from 70 m), Long Xuyen market (from 30 m)</li> </ul>	<p><u>For Ong Bac Pagoda</u></p> <ul style="list-style-type: none"> <li>- Inform pagodas 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 100 m in front of the pagoda/church and monastic.</li> <li>- Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagoda.</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 goes to pagoda.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas.</li> <li>- Truck drivers shall restrict honking in areas close to the pagoda area</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the pagoda</li> </ul> <p><u>For Long Xuyen market</u></p> <ul style="list-style-type: none"> <li>- Limiting to transport materials/wastes (for constructing the items of Lias) when passing by Nguyen Du street at the peak hours (morning: 5-9h; noon: 11-12h; afternoon and evening: 16 - 19h), which does not create any</li> </ul>

Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
	<p>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 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><b>Subcomponent 2.4, 2.5, 2.6: Rehabilitating Cai Son, Ong Manh, Ba Bau canals. Site specific impacts includes:</b> (i) odors and management of dredged sediments; (ii) local flooding during the dredging process; (iii) risk of subsidence during canal embankment; (iv) risks on collapse and cracking of infrastructure due to pile jacking during embankment process; (v) impacts on PCRs and sensitives receptors.</p>	
<p>Odors and management of dredged sediments</p> <ul style="list-style-type: none"> <li>- Households along canals;</li> <li>- On-site location for temporary gathering of sludge;</li> </ul>	<p><u>To control impacts by dredged sediment:</u></p> <ul style="list-style-type: none"> <li>- The Dredged Materials Management Plan (DMMPs) for have for the dredged works has been prepared. The DMMP is described in details in Annex 2.</li> <li>- According to the analyses, the sediments from the canal dredging work are not hazardous, with heavy metals lower than the acceptable limits. However, the dredging soils and sediments have high amount of organic compounds and pathogenic microorganisms (e.g. Ecoli) thus should not be used directly for agricultural purpose. It is recommended that the sediments could be dewatered and kept at least 03 months to allow partial biodegradation of organic substances and removal of microbial organisms. 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 An Giang SWTC.</li> <li>- Ensure that detailed design scope for the chanel 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 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> </ul> <p><u>To control impacts by odors from dredging process:</u></p> <p><u>On - site</u></p> <ul style="list-style-type: none"> <li>- On-site location for temporary gathering of sludge must be to the tail end of the wind, far from residential areas and sensitive works.</li> </ul>

Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
	<ul style="list-style-type: none"> <li>- Sludge dredged from channels would give off stinking odors of such gases as CH<sub>4</sub>, H<sub>2</sub>S, and mercaptans. To mitigate the impact from malodor of dredged sludge, it is therefore imperative to provide face masks, boots and gloves for workers who will work directly with this source of waste.</li> <li>- Dredged sludge will be collected and gathered along the construction site which is lined with geotextiles to prevent sludge leachate from infiltrating into the soil. This gathered sludge is to be transported and disposed of within 48 hours. A management plan for dredged material will be prepared to instruct contractors on managing this waste.</li> <li>- In no case should dredged sludge be indiscriminately disposed of. This waste must be appropriately managed under the PMU's supervision.</li> <li>- EM (Effective Microorganisms) deodorants are to be sprayed every day. These deodorants are able to remove malodors from H<sub>2</sub>S and mercaptans.</li> </ul> <p><i>For the transportation</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 10 cm 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 registry 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> <li>- Assign staff to guide the traffic during transportation, unloading, and loading.</li> </ul>
Local flooding during the dredging process	- Apply similar mitigation measures as those for Long Xuyen Canal (subcomponent 2.3)
Risk of subsidence during canal embankment	- Apply similar mitigation measures as those for Long Xuyen Canal (subcomponent 2.3)
Risks on collapse and cracking of infrastructure due to pile jacking during embankment process	- Apply similar mitigation measures as those for Long Xuyen Canal (subcomponent 2.3)
Impacts on PCRs and sensitive receptors	<p><b><i>For Phuoc Minh Ni, Buu Vien Pagodas</i></b></p> <ul style="list-style-type: none"> <li>- Inform pagodas of the construction activities and their potential impacts such, waste, dust, and noise, traffic,</li> </ul>



Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
<p>along Canals</p> <ul style="list-style-type: none"> <li>- Cai Son canal: Binh Dan Hospital (from 10 m and General Hospital of Long Xuyen city (from 20 m)</li> <li>- Ong Manh canal: Phuoc Minh Pagoda (from 5 m)</li> <li>- Ba Bau Canal: Buu Vien Pagoda (from 40 m)</li> </ul>	<p>and construction schedule at least 01 month before start of the construction.</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>- Prohibit gathering of construction materials within 100m in front of the pagoda/church and monastic.</li> <li>- Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagoda.</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 goes to pagoda.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas.</li> <li>- Truck drivers shall restrict honking in areas close to the pagoda area</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the pagoda</li> <li>- The construction method shall include the measures to protect the foundation of the fence/gate, main building of the pagoda, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage</li> <li>- In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the pagoda.</li> </ul> <p><b><i>For Binh Dan and General Hospitals</i></b></p> <ul style="list-style-type: none"> <li>- Inform the hospital 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>- Construction area to be fenced and marked with warning signs to prevent unauthorized people from entering.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at site.</li> <li>- Set up construction and traffic warning signs at the construction 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>- Cover the incomplete trenches under construction at the end of the working day.</li> <li>- Provide night lighting system with luminously painted fence and night lamp.</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the hospital.</li> <li>- Arrange traffic guide for the vehicles go in/go out the hospital.</li> </ul>

Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
<b>Component 3: Resettlement</b>	
Agriculture activities at resettlement area	<ul style="list-style-type: none"> <li>- Informing the community of the construction schedule at least 30 days before the construction.</li> <li>- Arrange drainage around the construction sites to ensure no soil erosion and sedimentation to the rice fields and irrigation canals.</li> <li>- Provide alternative water diversion from canals to the locations the local people requested, if they are affected.</li> <li>- Regularly check the affected on-field irrigation canals to ensure they are not blocked by construction spoils and wastes.</li> <li>- Immediately rehabilitate irrigation canals if they are damaged by construction activities to ensure that water supply for the rice fields inside ring dike is maintained.</li> <li>- Closely consult with the local community to ensure that suitable solutions to problems are taken and communities concerns related to construction activities are addressed.</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 area	Expected length (km)	Planned transportation route
<b>Component 1</b>		
LIA 1	20.2	Tran Hung Dao street → Nguyen Du street → An Giang solid waste treatment complex.
LIA 3	21.3	Tran Hung Dao street → Ha Hoang Ho street → An Giang solid waste treatment complex.
LIA 5	20.4	Tran Hung Dao street → Ha Hoang Ho street → Bui Thi Xuan street → Bui Van Danh street → National Highway No 91 → An Giang solid waste treatment complex.
LIA 6	20	Tran Hung Dao street → Ly Thai To street → An Giang solid waste treatment complex.
<b>Component 2</b>		

Construction area	Expected length (km)	Planned transportation route
Subcomponent 2.1: Constructing the extension of Hung Vuong Street	19.4	Tran Hung Dao street → Ly Thai To street → An Giang solid waste treatment complex.
Subcomponent 2.2: Constructing Tran Quang Dieu Street	21.3	Tran Hung Dao street → Ha Hoang Ho street → An Giang solid waste treatment complex.
Subcomponent 2.3: Rehabilitating Long Xuyen Canal	20.4	Tran Hung Dao street → Bui Van Danh street → An Giang solid waste treatment complex.
Subcomponent 2.4: Rehabilitating Cai Son Canal	20	Tran Hung Dao street → An Giang solid waste treatment complex.
Subcomponent 2.5: Rehabilitating Ong Manh Canal	20.4	Tran Hung Dao street → Ha Hoang Ho street → An Giang solid waste treatment complex
Subcomponent 2.6: Rehabilitating Ba Bau Canal	20.4	Tran Hung Dao street → Ha Hoang Ho street → An Giang solid waste treatment complex.
<b>Component 3: Resettlement</b>	25	Tran Hung Dao street → Ha Hoang Ho street → An Giang solid waste treatment complex.

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

#### Measures to Mitigate Site-Specific Impact under Component 1

The specific impacts occurred in the stage 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:

##### Site-specific measures to mitigate local flooding due to blockage of the drainage system along alleys

- 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.

##### Traffic safety

- Placing traffic signs, signals regulating speeds and types of vehicles allowed to circulate in main alleys.
- Cooperating with the local government to appoint the staff for traffic regulation at peak hours;
- Timely carrying out O & M when the structures become downgraded, damaged. maintain works with signs of deterioration or damages.

##### Waste management

- Limit the trash can arranged in positions of high population density, they should be located in the vacant area and downwind direction;
- Specification of trash can must meet the provisions of the construction according to the QCVN 07: 2010/BXD particular: i) the capacity of the trash can will be 100 liters and not exceeding 1 m<sup>3</sup>; ii) the trash can must be covered; iii) 1 trash can every 100 m; iv) rubbish in bins will not be left for than 24 hours; v) require daily emptying.
- The waste collecting unit must tidy up the areas around waste gathering spots, ensuring these spots are free from littering waste and stinking leachate.

#### Measures to Mitigate Site-Specific Impact under Component 2

The specific impacts occurred in the stage are mainly from the operation and maintenance (O & M) of the drainage system (dredged sludge from the manholes), traffic safety issues and the risk of re-contamination of Long Xuyen, Cai Son, Ong Manh, Ba Bau Canals owing to indiscriminate disposal of waste by local residents along the Canal.

##### ***Subcomponent 2.1 and 2.2.: Measures to mitigate impacts during operation of Hung Vuong and Tran Quang Dieu Streets***

##### Traffic safety issue

- 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;

*Local flooding on the Hung Vuong and Tran Quang Dieu Streets*

- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting disposal of 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;

***Subcomponent 2.3: Measures to mitigate impacts during the Operation of Long Xuyen Canal***

*Risk on embankment subsidence*

- To avoid risk on embankment cracking and subsidence, in detailed design should be implemented hydrology and geological surveys to ensure sustainable and stable designs
- City shall provide O & M Plan as well as budget source should be approved and arranged by the City.
- Closely monitor the construction of other infrastructures within the area that potentially affect the embankment structures

*The risk of canals pollution and congestion caused by rubbish littering from households along canals*

- Campaigns are to be launched by local government authorities among local communities to raise their awareness of environmental sanitation and civilized urban lifestyle.
- The operation management unit is to erect warning signs and regulations on banning waste disposal into canals and channels.
- Public waste bins will be placed on operational roads along the Canal and waste will be periodically collected.
- Punitive measures are to be applied to individuals who littering waste indiscriminately

***Subcomponent 2.4, 2.5 and 2.6: Measures to mitigate impacts during the Operation of Cai Son, Ong Manh, Ba Bau Canals***

*The risk of canal pollution and congestion caused by rubbish littering from households along canals*

Apply similar mitigation measures as those for Long Xuyen Canal (subcomponent 2.3)

**Measures to mitigate site-specific impacts for Component 3**

***Component 3 - Operation Stage***

*Management of generated wastewater*

- 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. In this case, the pollutant load has to be reduced by additional 30-40% BOD5/COD after treatment in the septic tank. The wastewater will be then connected to the wastewater collection and treatment system of Long Xuyen City (funded by Korea ODA).
- Sewer systems should be designed as closed sewer system.

- Daily cleaning and scrapping are required at the drainage manhole to avoid clog.
- Regularly carry out the dredging to limit the accumulation and deposition of organic compounds.

#### Management of generated solid waste

- Management Board of the resettlement areas must sign a contract for collection and transportation of municipal waste with URENCO or private waste collectors to transfer garbage emissions from resettlement areas;
- Disposition of garbage cans along the internal transport line in resettlement areas. - Specification of trash can must meet the provisions of the construction according to the QCVN 07: 2010/BXD particular: i) the capacity of the trash can will be 100 liters and not exceeding 1 m<sup>3</sup>; ii) the trash can must be covered; iii) 1 trash can every 100 m; iv) rubbish in bins will not be left for than 24 hours; v) require daily emptying
- Management Board of the resettlement areas must coordinate with local government to encourage residents to do garbage categorization program.

#### Local flooding

Apply similar mitigation measures for investment under component 1.

### **5.2. MEASURES TO MITIGATE CUMULATIVE IMPACTS**

The assessment indicates that the cumulative impacts of the subproject and the associated projects are mostly positive. The negatives cumulative impacts are minor to moderate and can be addressed individually at the project level.

### **5.3. MITIGATION MEASURES FOR SOCIAL IMPACTS**

#### **5.3.1. Consultation with stakeholders**

To minimize the risk related to the negative impacts that may arise and to establish communication channels, during project preparation, several public consultations have been organized. In addition, one community upgrade plan (CUP) has been prepared specifically for households living in the LIAs to represent their ideas on technical solutions in the design phase of the project. This will help to promote people's participation into the project and minimize complaints and conflict in the implementation phase. To avoid the overlapping in compensation work when there are many projects with different policies, the province authority has issued specific guidelines for the inventory, payment, replacement price for the project basing on resettlement policy of the project which has been approved by competent authorities. Public consultation will continue during the implementation phase.

#### **5.3.2. Preparation of Resettlement plan (RP)**

A RP was prepared for Long Xuyen City based on the RPF prepared for the Project. The RP addresses the adverse impacts related to land acquisition and resettlement a Resettlement Policy Framework and a Resettlement Plan for Long Xuyen City have been prepared The main principles of RPF and RP are:

- Compensate HH on the basis of replacement cost.
- Implement assistance programs to reduce to the minimum, difficulties for households during and after relocation to ensure the life of PAPs after relocation to be "better than or at least equal "as before resettlement.

The project implementation agencies will endeavor to create favorable conditions for PAPs in order to improve living conditions, income and production levels, and at the minimum to maintain the standard of living at the pre-project level.



**5.3.3. Good preparation and implementation of public health management plan**

A public health management plan will be prepared to control negative impacts and threats on public health during the construction of the sub-project. Proactively preventing diseases arising in the course of construction of the project, while effectively responding to the epidemic cases. Strengthening communication and education for people and the local authorities on the health and the risk of potential diseases arising during the construction of the sub-project.

**5.3.4. Good preparation and implementation of communication and community consultation on health with participation of community**

Increasing accessibility to information for people in the project area will ensure good implementation of the Project. People will be informed about the project and construction time via announcement and bulletins of ward/commune, PMU will coordinate information to the local population. The disclosure of information is an important contribution in promoting the progress of the project during implementation, preparation, and operation under the agreement of the community, government and project management unit. This will minimize the possibility of arising conflicts and other risks, increase investment efficiency and social significance of the project.

**5.3.5. Good preparation and implementation of gender action plan**

A gender action plan is needed to enhance the participation of women during the construction phase of the project, to provide 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. Specific attention should be paid to women conducting small businesses to be relocated.

**5.3.6. Hiring social experts**

To ensure an efficient implementation, PMU should hire social experienced experts to implement the resettlement plan, the income restoration program, the Gender Action Plan and the Public Health Management Plan.

## **CHAPTER 6. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)**

On the basis of the assessment of negative impacts presented in Chapter 4 and the measures of impact mitigation recommended in Chapter 5, this Chapter will present the Environmental and Social Management Plan (ESMP) for Long Xuyen Sub-project. The Environmental Management Program will identify the activities/actions to be implemented in the city of Long Xuyen Sub-project, including the environmental monitoring program and its implementation schedule, taking into account the compliance with the provisions of the Government's ESIA and safety policies of the World Bank (WB).

### **6.1. BASIS PRINCIPLES**

To ensure that all sources of pollution 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 be 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.

(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 describing specific requirements to be carried out by contractor to mitigate the subproject potential impacts considered to be general impacts (Section 6.1). The contractor will also be required to mitigate site-specific impacts which will be identified to address issues specific to 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 works under the subproject such as canals, bridges, roads. These measures will be included in the contracts for corresponding packages.

Measures to mitigate impacts from land acquisition and resettlement are mentioned separately in the Resettlement Plan (RP) and those measures will be carried out and supervised separately.

### **6.2. KEY IMPACT MITIGATION MEASURES**

#### **6.2.1. Mitigation Measures For General Preparation Impacts (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) Hazardous 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: Mitigation measures in accordance with ECOPs**

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
<b>1. Generated dust, noise, vibration, exhaust gas</b>	<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 about 20m<sup>3</sup> within barriers or covered so as to avoid dust dispersion.</li> <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</li> </ul>	<ul style="list-style-type: none"> <li>• QCVN 05: 2013/BTNMT: 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>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>near local people's houses or other sensitive works like pagodas, school gates, or offices.</p> <ul style="list-style-type: none"> <li>• Locate vehicle washing stations at the exit/entrance of construction of component 1.</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>• Installing picket fence with height of 2.5m at construction locations.</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>			
<b>2. Wastewater management</b>	<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 traffic roads and canal. 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> </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>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>• Clear ditches around the workers' camps every week.</li> <li>• Creating ditches for rain water collection and diversion.</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>			
<b>3. Solid waste management</b>	<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 construction activities.</li> <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.</li> <li>• Perform concrete mixing on impermeable ground. Collect waste and wastewater containing cement through drainage ditches with</li> </ul>	<ul style="list-style-type: none"> <li>• Decision No, 59/2007/NĐ-CP on garbage 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
	<p>sedimentation pits in construction sites before being discharged into receiving waters.</p> <ul style="list-style-type: none"> <li>Separate the components and parts which can be reused or recycled in the construction wastes before transporting the waste to treatment in accordance with design documents acceptable to the supervision engineer.</li> <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 An Giang URENCO to collect solid waste, conforming to 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 hazardous 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 hazardous waste.</li> <li>At each site or worker camp and maintenance area, the Contractor must arrange storage area or containers for hazardous waste (drum/plastic/composite containers can be used). These containers are only used to store hazardous waste and must be covered and labelled outside as “HAZARDOUS WASTE CONTAINER”.</li> <li>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</li> </ul>	<ul style="list-style-type: none"> <li>Circular No. 36/2015/TT-BTNMT on hazardous 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
	<p>shall be performed and disposed of by specially trained and certified workers.</p> <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 hazardous 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>			
<b>5. Water pollution</b>	<ul style="list-style-type: none"> <li>• The Contractor is responsible for controlling the surface water quality when discharging it out of the construction site, in accordance with QCVN 08-MT:2015/BTNMT – <i>National Technical Regulation on surface water quality</i> and QCVN 14:2008/BTNMT – <i>National Technical Regulation on domestic wastewater quality</i>.</li> <li>• Provide preliminary sedimentation ponds and ditches of storm water runoff at the construction sites.</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 approved disposal sites within the soonest possible time.</li> </ul>	<ul style="list-style-type: none"> <li>• QCVN 08-MT:2015/BTNMT – National Technical Regulation on surface water quality</li> <li>• QCVN 09-MT:2015/BTNMT: National Technical Regulation on Underground Water Quality</li> <li>• QCVN</li> </ul>	Contractor	PMU, IEMC, CSC,

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>Do not allow temporary gathering of bulk materials and mixing of concrete within 50 m from ponds, lakes, rivers, streams, or other water sources.</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 25 m from rivers/canals.</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 hazardous waste management regulation</li> </ul>	<p>14:2008/BTNMT: National technical regulation on domestic 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>		
<b>6. Impacts on plants and aquatic species</b>	<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 with green trees, but on vacant land instead.</li> <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</li> </ul>	<ul style="list-style-type: none"> <li>Law on environmental protection No. 55/2014/QH13</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>areas agreed to by the Construction Supervision Consultant for later use in re-vegetation and shall be adequately protected.</p> <ul style="list-style-type: none"> <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>			
<b>7. Impacts on urban landscape and beauty</b>	<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 from the gate of schools, offices temples, pagodas, etc.</li> <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>	<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. 22/2010/TT-BXD on requirements on safety</li> </ul>	Contractor	PMU, CSC, IEMC
<b>8. Sedimentation, erosion, flooding, subsidence and slides</b>	<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</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> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	disposal sites.	<ul style="list-style-type: none"> <li>• QCVN 08-MT:2015/BTNMT – National technical regulation on surface water quality</li> </ul>		
<b>9. Traffic management</b>	<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>• Arrange and provide separate passageway with safe and easy access for pedestrian and for people with disability and mobility issues especially the areas in proximity of schools, including easy wheel chair access and hand rail. Make staff available any time for helping people with disability if needed.</li> <li>• Put speed limit signs at a distance of 200 m 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 construction vehicles and materials to encroach upon the pavements.</li> <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> </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 construction investment</li> <li>• Circular No. 22/2010/TT-BXD on regulation on construction safety</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>• 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>			
<b>10. Influence to existing infrastructure and services</b>	<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> <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>	<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
<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> </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.</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>• 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 workers.</li> <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>	<ul style="list-style-type: none"> <li>• 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 construction safety</li> <li>• Decision No. 96/2008/QĐ-TTg on clearance of UXOs</li> </ul>		
<b>12. Control of impacts on cultural works</b>	<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> </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>	Contractor	PMU, CSC, IEMC



Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>+ Suspend construction operations at the place of discovery;</li> <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
<b>13. Community's safety and health</b>	<ul style="list-style-type: none"> <li>The Contractor will have to conform to regulations in Circular No. 22/2010/TT-BXD by the Ministry of Construction on safety in construction.</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.</li> <li>Fence of excavation pits and open channels and make off with luminous cordon and warning signs. Provide sufficient lighting when carry out construction at night.</li> <li>Limit the speed of transport means to 20km/h within 200m from the construction site so as to minimize dust and noise.</li> <li>Keep noise-generating machines and vehicles at such suitable distances that noise transmitted to residential areas will not be higher than 70dBA.</li> <li>Use static compacting when the road base is constructed near areas with many households and weak temporary works to restrict vibration.</li> <li>The subproject will cooperate with the local health agency in developing and implementing plans for control of diseases among workers.</li> </ul>	<ul style="list-style-type: none"> <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 construction safety</li> <li>Decision No. 96/2008/QD-TTg on clearance of UXOs</li> </ul>	Contractor	PMU, CSC, IEMC
<b>14. Workers' health safety</b>	<ul style="list-style-type: none"> <li>Train workers on issues related to environment, safety and health, thus enhancing their awareness of HIV/AIDS and infectious diseases within 2 weeks prior to the commencement of packages with construction items lasting at least 6 months.</li> <li>Provide workers with and request them to use adequate safety gear such as masks, helmets, shoes/boots, goggles, etc. depending on job characteristics.</li> <li>Safely install power lines at offices and in construction sites and do not lay connectors on the ground or water surface. Electric wires must be with plugs. Place outdoor electric panels in protection cabinets.</li> <li>Limit the speeds of vehicles traveling inside construction sites to be 5km/hour.</li> <li>Provide fire-extinguishers, first-aid bags, and medical cabinets with sufficient medicines for treating general diseases in the locality must be provided at construction sites.</li> </ul>	<ul style="list-style-type: none"> <li>Decree No. 22/2010/TT-BXD on regulation of 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 safety in construction;</li> <li>Decision No. 96/2008/QD-TTg on</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>• Safely store fuels and chemicals in areas with impermeable ground with roofs and surrounding banks, equipped with safety warning signs located at least 20m from the camps and at the end of prevailing winds.</li> <li>• In case of chemical and fuel leakage, the following steps will have to be taken:               <ul style="list-style-type: none"> <li>+ Immediate check must be carried out to detect any possible case of injury. In case of injury, first-aid must be given and the injured person must be rushed to the nearest medical station for healthcare, and at the same time the case must be informed to the Supervision Engineer and the PMU;</li> <li>+ Carry assessment to determine the kind of leaking/overflowing fuel/chemical;</li> <li>+ Do not flush overflowing chemicals into drainage systems. Send staff with suitable safety gear to the site to handle the leakage by scattering sawdust (in case of small volumes of leaks/overflow) or sand (for high volumes of leaks/overflow). Use shovels to remove the surface soil layer if the leakage/overflow takes place on vacant land; and</li> <li>+ Subsequent to the occurrence of such incident or accident, the Contractor will have to prepare a detailed report describing the incident and performed activities and submit the same to the Supervision Engineer and the PMU for consideration and filing. Such report will also be presented to the Department of Natural Resources and Environment or functional agencies at their request..</li> </ul> </li> <li>• Set up the camps with sufficient supplies of clean water, power, and sanitation facilities. There must be at least one toilet compartment for every 25 workers, with separate toilets for males and females. Workers' beds must be provided with mosquito nets so as to prevent dengue fever. Temporary tents will be unacceptable.</li> <li>• Clean camps, kitchens, baths, and toilets and sanitize regularly, and keep in good sanitation conditions. Provide dustbins and collect wastes daily from the camps. Clear drainage ditches around the camps periodically.</li> <li>• Stop all construction activities during rains and storms, or upon accidents or serious incidents</li> </ul>	clearance of UXOs.		

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
<b>15. Management of warehouses and borrow pits</b>	<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
<b>16. Communication to local community</b>	<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 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.</li> <li>• Community concerns and requested information are to be monitored as the project progresses.</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
	<ul style="list-style-type: none"> <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>			

### 6.2.2. Site-Specific ESMP

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**

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
<b>1.</b>	<b>COMPONENT 1: TERTIARY INFRASTRUCTURE UPGRADING IN LIAs (LIA 1, LIA 3, LIA 5, LIA 6)</b>				
	<b>Preparation phase</b>				
	UXO clearance	The subproject owner (the subproject PMU) will sign a contract with the military civil engineering agency or An Giang Provincial Military Base for UXO detection and clearance at the construction sites. No construction activity will be allowed until the UXO clearance is completed.	Competent Military Unit	PMU	- Counterpart fund - IM: Contract
	Land acquisition and resettlement, grave relocation	Implementation of approved RP in accordance with its provision.	PMU, City People's Committee	ISMC	- Counterpart fund - IM: approved RP
	<b>Construction phase</b>				
	Localized flooding - Residents within LIAs, especially in LIA 1 and LIA 3 (by the tidal regime of the canals which are located within)	- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction.	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- 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. - 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. - The contractors must set up temporary drainage at the construction site and ensure that they are cleared of mud and other obstructions,	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions



No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<p>such as:</p> <ul style="list-style-type: none"> <li>• Building drainage works along/across the site during backfilling and ground leveling.</li> <li>• Digging drainage ditches/drains suiting practical conditions of the streets.</li> </ul> <p>- Deploying standby pumps and other equipment items in case of needed drainage;</p> <p>- Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations.</p> <p>- Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area.</p>			
	<p>Social disturbance and increased traffic risks</p> <p>- Impacts on traffic within LIAs by narrow alleys</p> <p>- Impacts on traffic along connecting streets</p> <p>- Social disturbance in My Binh Ward (LIA 1), Dong Xuyen and My Xuyen Wards (LIA 3), My Xuyen Ward (LIA 5), My Long and My Phuoc Wards (LIA 6)</p>	<p><u>For impacts on traffic within LIAs</u></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</li> <li>- Inform local residents in advanced (at least 07 days) about construction and work schedules, interruption of services, traffic routes.</li> <li>- Construction operations are to be successively performed by alley segment. Extensive construction operations on the entire route should be avoided.</li> <li>- For major alleys with a width of over 4m, construction should be carried out on one half of the road surface, leaving the other half for traffic traveling.</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> </ul>	Contractor	PMU, CSC, IEMC	<p>- Fund: IDA/IBRD</p> <p>- IM: Construction contract conditions</p>

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<ul style="list-style-type: none"> <li>- Construction during night time is not allowed</li> </ul> <p><i>For impacts on traffic along connecting streets</i></p> <ul style="list-style-type: none"> <li>- Do not park vehicles in the roads longer than necessary. Maintain the required speed limit and do not overuse horn.</li> <li>- Comply with the traffic safety regulations while participating traffic.</li> <li>- Clean up wastes dropped off on road.</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading of construction materials, equipment, and wastes.</li> <li>- So as to minimize adverse impacts on the traffic along the streets linked to LIAs, a traffic management plan will be carried out, in which construction operations will be performed in some streets, some others will serve as temporary by pass roads and others will be used as transportation routes. This plan will be publicly announced to residents in the affected areas and to related agencies. The planned routes for material and waste transportation see Table 5.2 below.</li> </ul> <p><i>For impacts on social disturbance</i></p> <ul style="list-style-type: none"> <li>- Prioritized recruitment and employment of the workforce available in the locality;</li> <li>- Carrying out procedures on declaring the personnel present at construction sites;</li> <li>- Setting up workshops on construction site rules &amp; regulations for officers and workers;</li> <li>- Contractors' sanction measures against violations of construction site rules &amp; regulations.</li> </ul>			
	Damage to water supply and communication systems	<ul style="list-style-type: none"> <li>- PMU will ensure that detailed design will consider set up barriers around the construction area of water supply pipeline and limit breaking the pipeline or the communication information system cables</li> </ul>	Detailed design	PMU	<ul style="list-style-type: none"> <li>- Detailed design contract</li> <li>- City fund</li> </ul>

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	along alleys in LIAs (19.9 km)	<ul style="list-style-type: none"> <li>- Inform the water supply management and communication companies of the construction activities and their potential impacts such the risks of breakage other damages to the water supply pipeline at least 01 month before start of the construction.</li> <li>- Set up barriers around the construction area of water supply pipeline.</li> <li>- Use smaller excavation machine and Larsen pile driving method of construction to avoid breaking or disposition the water pipeline.</li> <li>- Deploy a qualified technical staff to supervise construction activities near the pipeline and communication cables.</li> <li>- In the case of breaking the pipeline or the communication information system cables, it is necessary to suspend the construction activities and immediately inform the water supply and communication companies and the local authority of the incident.</li> </ul>	Contractor	PMU, CSC, IEMC	<ul style="list-style-type: none"> <li>- Include in construction contract conditions</li> <li>- IDA/IBRD budget</li> </ul>
<b>Operation phase</b>					
	Maintenance of the drainage system	<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>	Ward People's Committee	City	<ul style="list-style-type: none"> <li>- City Budget</li> <li>- IM: City Operation and Maintenance Plan</li> </ul>
	Traffic safety	<ul style="list-style-type: none"> <li>- Placing traffic signs, signals regulating speeds and types of vehicles allowed to circulate in main alleys.</li> <li>- Cooperating with the local government to appoint the staff for traffic regulation at peak hours;</li> <li>- Timely carrying out O &amp; M when the structures become downgraded, damaged. maintain works with signs of deterioration or damages.</li> </ul>	Ward People's Committee	City	<ul style="list-style-type: none"> <li>- City Budget</li> <li>- IM: City Operation and Maintenance Plan</li> </ul>
	Waste Management	<ul style="list-style-type: none"> <li>- Limit the trash can arranged in positions of high population density, they should be located in the vacant area and downwind direction;</li> </ul>	Ward People's Committee	City	<ul style="list-style-type: none"> <li>- City Budget</li> <li>- IM: City Operation</li> </ul>

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<ul style="list-style-type: none"> <li>- Specification of trash can must meet the provisions of the construction according to the QCVN 07: 2010/BXD particular: i) the capacity of the trash can will be 100 liters and not exceeding 1 m<sup>3</sup>; ii) the trash can must be covered; iii) 1 trash can every 100 m; iv) rubbish in bins will not be left for than 24 hours; v) require daily emptying.</li> <li>- The waste collecting unit must tidy up the areas around waste gathering spots, ensuring these spots are free from littering waste and stinking leachate.</li> </ul>			and Maintenance Plan
<b>2</b>	<b>COMPONENT 2: PRIORITY PRIMARY AND SECONDARY INFRASTRUCTURE</b> <b>(i) Constructing the extension of Hung Vuong Street; (ii) Constructing Tran Quang Dieu street; (iii) Rehabilitating Long Xuyen Canal; (iv) Rehabilitating Cai Son Canal; (v) Rehabilitating Ong Manh Canal; (vi) Rehabilitating Ba Bau Canal.</b>				
	<b>Preparation phase</b>				
	UXO clearance	The same Component 1	Competent Military Unit	PMU	<ul style="list-style-type: none"> <li>- Counterpart fund.</li> <li>- IM: Contractor's conditions</li> </ul>
	Land acquisition and resettlement, grave relocation	The same Component 1	PMU, City People's Committee	ISMC	<ul style="list-style-type: none"> <li>- Counterpart fund</li> <li>- IM: approved RP</li> </ul>
	<b>Construction phase</b>				
<b>2.1</b>	<b>Subcomponent 2.1, 2.2: Constructing the extension of Hung Vuong and Tran Quang Dieu street</b>				
	Reduced water quality of intersected canals due to construction of culvert and bridges on the road alignments:	PMU will ensure that detailed design will consider construction operations in line with the planned progress schedule	Detailed design consultant	PMU	<ul style="list-style-type: none"> <li>- Fund: City</li> <li>- IM: detailed design contract</li> </ul>
	<ul style="list-style-type: none"> <li>- At km 0+910.72 and km0+87.7 of Hung Vuong road.</li> <li>- At km0+366 and</li> </ul>	<ul style="list-style-type: none"> <li>- A construction plan of detailed measures and schedule is to be worked out for the building/laying of sewers and bridges at the intersections with the canal. This plan must be informed 30 days in advance to local government authorities and residents in the affected areas of extended Hung Vuong and Tran Quang Dieu Streets.</li> </ul>	Contractor	PMU, CSC, IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA/IBRD</li> <li>- IM: Construction contract conditions</li> </ul>

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	km0+91.73 of Tran Quang Dieu street	<ul style="list-style-type: none"> <li>- In the final segment of the drainage ditch temporarily connected to the canal, there will be a settlement pit for suspended matter to retain sludge, pollutants and waste in the water before it is discharged into the canal. This settlement pit will be emptied and tidied up every day by workers.</li> <li>- Before operation, all construction means and machines will be carefully checked in terms of technical parameters as well as operational performance to limit possible spills of oil, grease or fuel.</li> <li>- Construction operations during high tides should be limited.</li> <li>- Construction supervision staff at site must carry out strict management of workers during construction processes in order to limit materials and waste from spilling into the canal.</li> <li>- No machine &amp; equipment maintenance is to be carried out in areas close to the canal.</li> <li>- Construction operations for bridge foundations and piers will be bound to increase the turbidity of surface water. The construction unit should speed up the progress to cut down the radius of pollution transmission.</li> </ul>			
	Localized flooding	- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
	- The residential areas along Hung Vuong road and Tran Quang Dieu street	<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 proper drainage in that area</li> <li>- The contractors must set up temporary drainage system at the construction site and ensure that it is cleared of mud and other obstructions</li> <li>- Have a standby pumps for rapid drainage in case of heavy rain or extreme weather events.</li> <li>- Upon receiving information or feedback from local communities on</li> </ul>	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<p>localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations.</p> <ul style="list-style-type: none"> <li>- Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area</li> </ul>			
	Impacts on business of residents along Hung Vuong Street	<ul style="list-style-type: none"> <li>- PMU will ensure that detailed design will provide safe and easy access to the household businesses putting clean and strong thick wood panels or steel plates over the open ditches</li> </ul>	Detailed design consultant	PMU	<ul style="list-style-type: none"> <li>- Fund: City</li> <li>- IM: detailed design contract</li> </ul>
	<ul style="list-style-type: none"> <li>- The street household businesses along Hung Vuong road</li> </ul>	<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>- 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 near the businesses.</li> <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>- 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</li> </ul>	Contractor	PMU, CSC, IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA/IBRD</li> <li>- IM: Construction contract conditions</li> </ul>



No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		the subproject. - Immediately address any issue/problem caused by the construction activities and raised by the local household traders.			
	Impacts on PCRs and sensitives receptors: - My Phuoc Market, Dong Thanh Pagoda on Hung Vuong road. - Vuong Tron Maternity Hospital and relocated graves on Tran Quang Dieu street	- PMU will ensure that detailed design will consider arrange temporary walkways to ensure safety for those working or living on construction sites	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		<u>Relocation of graves:</u> - 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, reburial 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 (8,640,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways. - During implementation the Subproject Owner will make early announce to the households whose graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to the affected household as required in the subproject RP and ESMP. <u>For Dong Thanh Pagoda:</u> - Inform the pagoda 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. - The contractor shall coordinate with local authorities (leaders of local wards or communes) for agreed schedules of construction	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<p>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 100 m in front of the pagoda/church and monastic.</li> <li>- Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagoda.</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 pagoda.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas.</li> <li>- Truck drivers shall restrict honking in areas close to the pagoda area.</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the pagoda.</li> <li>- The construction method shall include the measures to protect the foundation of the fence/gate, main building of the pagoda, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage.</li> <li>- In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the pagoda.</li> </ul> <p><u>For Vuong Tron Maternity Hospital:</u></p> <ul style="list-style-type: none"> <li>- Inform the hospital 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>- Construction area to be fenced and marked with warning signs</li> </ul>			

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<p>to prevent unauthorized people from entering.</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>- Set up construction and traffic warning signs at the construction 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>- 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 hospital.</li> <li>- Arrange traffic guide for the vehicles go in/go out the hospital.</li> </ul> <p><u>For My Phuoc market</u></p> <ul style="list-style-type: none"> <li>- Limiting to transport materials/wastes (for constructing the items of Lias) when passing by Nguyen Du street 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>			
2.2	<b>Subcomponent 2.3: Rehabilitating Long Xuyen Canal</b>				
	Risk of bank erosion and subsidence during embankment process	- PMU will ensure that detailed design will consider must include the complete survey in geology and hydrology of the area and protection the areas with soft soils	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
	- Residential areas along Long Xuyen	- Ensure that the detailed design for the embankment includes	Contractor	PMU,	- Fund: IDA/IBRD

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	Canal, Ong Manh Canal, Ba Bau Canal - From km0+200 to km0+450 along Cai Son Canal	hydrological and geological surveys to ensure sustainability and stability of the embankment; - Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to CSC and the authorities concerned for approval by the construction contractors. - Do not carry out works in rainy season. - Do not place heavy machineries and transportation vehicles near the canals banks. Inspection and supervision on land subsidence risks must be taken regularly in order to prepare the appropriate reinforcement plans. - Construction of side slope is made in accordance with the design. - Regularly check and monitor the risk of landslides to plan for possible reinforcement. - Construction of pitched roof must ensure correct design of dredging.		CSC, IEMC	- IM: Construction contract conditions
	Structure collapse due to pile driving during embankment of Long Xuyen Canal	- Ensure that the detailed design and contractor's construction method take into account the risk cracking and collapse of nearby local house and infrastructure. - Ensure that land acquisition and house relocation at the site boundary is completed prior to commencing construction work. - Cooperating with the local government to inform the time for pile driving, possible risks and public consultation. - Use construction method to reduce vibration for construction activities of embankment; closely monitoring the vibration level; incidents and logging of these parameters. - In the case dredging causes landslides and affects households and homes along the canal, the contractor is liable for damages or compensation of construction as the original status.	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions
	Local flooding during the dredging process - Residential areas	- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	along Long Xuyen Canal, Ong Manh Canal, Ba Bau Canal - From km0+200 to km0+450 along Cai Son Canal	<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, such as: (i) building drainage works along/across the site prior to dredging operations; (ii) Digging drainage ditches/drains suiting practical conditions.</li> <li>- Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area.</li> <li>- Deploying standby pumps and other equipment items in case of extreme weather events</li> <li>- Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations.</li> </ul>	Contractor	PMU, CSC, IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA/IBRD</li> <li>- IM: Construction contract conditions</li> </ul>
	Impacts on waterways traffic on Long Xuyen Canal	<ul style="list-style-type: none"> <li>- The works design should evaluate the effects of restricting river flow.</li> <li>- Coordinate with the local authority to inform local people of the construction plan prior to construction;</li> <li>- Coordinate with the Department of Inland Waterway to flag the signal system on the inland waterway the transport will travel through;</li> <li>- Provide the workers with all appropriate PPE and ensure that life jackets are used in proximity to water. Safety staff must be available at all times 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> </ul>	Contractor	PMU, CSC, IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA/IBRD</li> <li>- IM: Construction contract conditions</li> </ul>

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	Impacts on PCRs and sensitive receptors along Long Xuyen canal - Long Xuyen canal: Ong Bac Pagoda (from 70 m), Long Xuyen market (from 30 m)	<ul style="list-style-type: none"> <li>- PMU will ensure that detailed design will consider arrange temporary walkways to ensure safety for those working or living on construction sites</li> </ul>	Detailed design consultant	PMU	<ul style="list-style-type: none"> <li>- Fund: City</li> <li>- IM: detailed design contract</li> </ul>
		<p><u>For Ong Bac Pagoda</u></p> <ul style="list-style-type: none"> <li>- Inform pagodas 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 100 m in front of the pagoda/church and monastic.</li> <li>- Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagoda.</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 pagoda.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas.</li> <li>- Truck drivers shall restrict honking in areas close to the pagoda area</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the pagoda.</li> </ul> <p><u>For Long Xuyen market</u></p> <ul style="list-style-type: none"> <li>- Limiting to transport materials/wastes (for constructing the items of Lias) when passing by Nguyen Du 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</li> </ul>	Contractor	PMU, CSC, IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA/IBRD</li> <li>- IM: Construction contract conditions</li> </ul>



No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<p>least two times a day at road along the market area.</p> <ul style="list-style-type: none"> <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>			
2.3	<b>Subcomponent 2.4, 2.5, 2.6: Rehabilitating Cai Son Canal, Ong Manh Canal and Ba Bau Canal</b>				
	<p>Odors and management of dredged sediments</p> <ul style="list-style-type: none"> <li>- Households along canals;</li> <li>- On-site location for temporary gathering of sludge;</li> </ul>	<ul style="list-style-type: none"> <li>- PMU will ensure that detailed design dredged sediment will consider collected and gathered along the construction site which is lined with geotextiles</li> </ul>	Detailed design consultant	PMU	<ul style="list-style-type: none"> <li>- Fund: City</li> <li>- IM: detailed design contract</li> </ul>
		<p><u>To control impacts by dredged sludge:</u></p> <ul style="list-style-type: none"> <li>- The Dredged Materials Management Plan (DMMPs) for have for the dredged works has been prepared. The DMMP is described in details in Annex 2.</li> <li>- According to the analyses, the sediments from the canal dredging work are not hazardous, with heavy metals lower than the acceptable limits. However, the dredging soils and sediments have high amount of organic compounds and pathogenic microorganisms (e.g. Ecoli) thus should not be used directly for agricultural purpose. It is recommended that the sediments could be dewatered and kept at least 03 months to allow partial biodegradation of organic substances and removal of microbial organisms. 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 An Giang SWTC.</li> <li>- Ensure that detailed design scope for the chanel 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</li> </ul>	Contractor	PMU, CSC, IEMC	<ul style="list-style-type: none"> <li>- Fund: IDA/IBRD</li> <li>- IM: Construction contract conditions</li> </ul>

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<p>will be incorporated into the related bidding documents and contracts</p> <ul style="list-style-type: none"> <li>- Prior to construction, the contractors shall 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> </ul> <p><u>To control impacts by odors from dredging process:</u></p> <p>On - site</p> <ul style="list-style-type: none"> <li>- On-site location for temporary gathering of sludge must be to the tail end of the wind, far from residential areas and sensitive works.</li> <li>- Sludge dredged from channels would give off stinking odors of such gases as CH<sub>4</sub>, H<sub>2</sub>S, and mercaptans. To mitigate the impact from malodor of dredged sludge, it is therefore imperative to provide face masks, boots and gloves for workers who will work directly with this source of waste.</li> <li>- Dredged sludge will be collected and gathered along the construction site which is lined with geotextiles to prevent sludge leachate from infiltrating into the soil. This gathered sludge is to be transported and disposed of within 48 hours. A management plan for dredged material will be prepared to instruct contractors on managing this waste.</li> <li>- In no case should dredged sludge be indiscriminately disposed of. This waste must be appropriately managed under the PMU's supervision.</li> <li>- EM (Effective Microorganisms) deodorants are to be sprayed every day. These deodorants are able to remove malodors from H<sub>2</sub>S and mercaptans.</li> </ul> <p><u>For the transportation:</u></p> <ul style="list-style-type: none"> <li>- Clean up the transport vehicles before leaving construction site. Do</li> </ul>			

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		not load to a height of 10 cm 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			
	Local flooding during the dredging process	Apply similar mitigation measures as those for Long Xuyen Canal (subcomponent 2.3)	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions
	Risk of subsidence during canal embankment	Apply similar mitigation measures as those for Long Xuyen Canal (subcomponent 2.3)	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions
	Risks on collapse and cracking of infrastructure due to pile jacking during embankment process	Apply similar mitigation measures as those for Long Xuyen Canal (subcomponent 2.3)	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions
	Impacts on PCRs and sensitive receptors along Canals	- PMU will ensure that detailed design will consider arrange temporary walkways to ensure safety for those working or living on construction sites.	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
	- Cai Son canal: Binh Dan Hospital (from 10 m) and General Hospital of Long Xuyen city (from 20	<u>For Phuoc Minh Ni, Buu Vien Pagodas</u> - Inform pagodas 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. - The contractor shall coordinate with local authorities (leaders of local	Contractor	PMU, CSC, IEMC	- Include in construction contract conditions - IDA/IBRD buget

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	m) - Ong Manh canal: Phuoc Minh Pagoda (from 5m) - Ba Bau Canal: Buu Vien Pagoda (from 40 m)	<p>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.</p> <ul style="list-style-type: none"> <li>- Prohibit gathering of construction materials within 100m in front of the pagoda/church and monastic.</li> <li>- Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagoda.</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 pagoda.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas.</li> <li>- Truck drivers shall restrict honking in areas close to the pagoda area</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the pagoda</li> <li>- The construction method shall include the measures to protect the foundation of the fence/gate, main building of the pagoda, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage</li> <li>- In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the pagoda.</li> </ul> <p><u>For Binh Dan and General Hospitals</u></p> <ul style="list-style-type: none"> <li>- Inform the hospital 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>- Construction area to be fenced and marked with warning signs to prevent unauthorized people from entering.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at site.</li> </ul>			

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<ul style="list-style-type: none"> <li>- Set up construction and traffic warning signs at the construction 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>- Cover the incomplete trenches under construction at the end of the working day.</li> <li>- Provide night lighting system with luminously painted fence and night lamp.</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the hospital.</li> <li>- Arrange traffic guide for the vehicles go in/go out the hospital</li> </ul>			
<b>Operation phase</b>					
2.1.	<b>Subcomponent 2.1, 2.2: Constructing the extension of Hung Vuong and Tran Quang Dieu street</b>				
	The impact on the environment while maintaining drainage systems	The same component 1	Urban Management Committee Division	City	- City Budget - IM: City Operation and Maintenance Plan
	Traffic safety	<ul style="list-style-type: none"> <li>- Local government authorities must be coordinated in deploying traffic guiding staff during rush hours;</li> <li>- Timely maintenance must be carried out upon signs of degradation or damage in the works.</li> </ul>	Urban Management Committee Division	City	- City Budget - IM: City Operation and Maintenance Plan
2.2.	<b>Subcomponent 2.3, 2.4, 2.5, 2.6: Rehabilitating Long Xuyen Canal, Cai Son Canal, Ong Manh Canal and Ba Bau Canal</b>				
	The impact on the environment while maintaining drainage systems	The same component 1	Urban Management Committee Division	City	- City Budget - IM: City Operation and Maintenance Plan
	Traffic safety	The same subcomponent 2.1, 2.2	Urban Management Committee	City	- City Budget - IM: City Operation and Maintenance

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
			Division		Plan
	Embankment subsidence risk during operation of Long Xuyen Canal, Cai Son Canal, Ong Manh Canal and Ba Bau Canal	<ul style="list-style-type: none"> <li>- City shall provide O &amp;M Plan as well as budget source should be approved and arranged by Long Xuyen City.</li> <li>- Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the embankment periodically</li> <li>- Closely monitor the construction of other infrastructures within the area that potentially affect the embankment structures</li> </ul>	Urban Management Committee Division	City	<ul style="list-style-type: none"> <li>- City Budget</li> <li>- IM: City Operation and Maintenance Plan</li> </ul>
<b>Component 3: Resettlement</b>					
<b>Preparation phase</b>					
	UXO clearance	The same component 1	Competent Military Unit	PMU	<ul style="list-style-type: none"> <li>- Counterpart fund.</li> <li>- IM: Contractor's conditions</li> </ul>
	Lan acquisition and resettlement	The same component 1	PMU, City People's Committee	ISMC	<ul style="list-style-type: none"> <li>- Counterpart fund</li> <li>- IM: approved RP</li> </ul>
<b>Construction</b>					
	Generic environmental impacts	- Applied the ECOPs (see 6.1.1)	Contractor	PMU, CSC, IEMC	<ul style="list-style-type: none"> <li>- Include in construction contract conditions</li> <li>- IDA/IBRD buget</li> </ul>
	Agriculture activities at resettlement area	<ul style="list-style-type: none"> <li>- Informing the community of the construction schedule at least 30 days before the construction.</li> <li>- Arrange drainage around the construction sites to ensure no soil erosion and sedimentation to the rice fields and irrigation canals.</li> <li>- Provide alternative water diversion from canals to the locations the local people requested, if they are affected.</li> </ul>	Contractor	PMU, CSC, IEMC	<ul style="list-style-type: none"> <li>- Include in construction contract conditions</li> <li>- IDA/IBRD buget</li> </ul>



No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<ul style="list-style-type: none"> <li>- Regularly check the affected on-field irrigation canals to ensure they are not blocked by construction spoils and wastes.</li> <li>- Immediately rehabilitate irrigation canals if they are damaged by construction activities to ensure that water supply for the rice fields inside ring dike is maintained.</li> <li>- Closely consult with the local community to ensure that suitable solutions to problems are taken and communities concerns related to construction activities are addressed</li> </ul>			
<b>Operation phase</b>					
	Impact from air emission	<ul style="list-style-type: none"> <li>- Regular clearing soil and sand on the road and bridge surface to reduce the dust;</li> <li>- Watering and washing the roads at least once a day during the dry season to mitigate the dust from surface of bridges/roads.</li> <li>- Inspecting/requiring the vehicles carrying the materials to be covered in order to avoid spilling materials on roads.</li> <li>- Checking the registry of the running vehicles which meet the emission standards as per the State regulations.</li> <li>- Planting trees along both road sides to prevent the dust dispersion into people's houses along the both sides.</li> </ul>	Ward People's Committee	City	<ul style="list-style-type: none"> <li>- City Budget</li> <li>- IM: City Operation and Maintenance Plan</li> </ul>
	Impact from waste water The generated wastewater from resettlement site is about 180 m <sup>3</sup> /day.	<ul style="list-style-type: none"> <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. In this case, the pollutant load has to be reduced by additional 30-40% BOD<sub>5</sub>/COD after treatment in the septic tank. The wastewater will be then connected to the wastewater collection and treatment system of Long Xuyen City (funded by ADB ODA).</li> <li>- Sewer systems should be designed as closed sewer system.</li> <li>- Daily cleaning and scrapping are required at the drainage manhole to avoid clog.</li> <li>- Regularly carry out the dredging to limit the accumulation and</li> </ul>	Ward People's Committee	City	<ul style="list-style-type: none"> <li>- City Budget</li> <li>- IM: City Operation and Maintenance Plan</li> </ul>

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		deposition of organic compounds.			
	Impact from solid waste The volume of the solid waste (2,282 kg/day)	<ul style="list-style-type: none"> <li>- Management Board of the resettlement areas must sign a contract for collection and transportation of municipal waste with URENCO or private waste collectors to transfer garbage emissions from resettlement areas;</li> <li>- Disposition of garbage cans along the internal transport line in resettlement areas. - Specification of trash can must meet the provisions of the construction according to the QCVN 07: 2010/BXD particular: i) the capacity of the trash can will be 100 liters and not exceeding 1 m<sup>3</sup>; ii) the trash can must be covered; iii) 1 trash can every 100 m; iv) rubbish in bins will not be left for than 24 hours; v) require daily emptying.</li> <li>- Management Board of the resettlement areas must coordinate with local government to encourage residents to do garbage categorization program..</li> </ul>	Ward People's Committee	City	<ul style="list-style-type: none"> <li>- City Budget</li> <li>- IM: City Operation and Maintenance Plan</li> </ul>

Mitigation measures for impacts on traffic and traffic safety due to transportation of construction materials and wastes:

- Clean up the transport vehicles before leaving construction site. Do not load to a height of 10 cm 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.

***The details on the DMMP (for Cai Son canal, Ong Manh canal and Ba Bau canal):***

Prior to construction, the contractors shall prepare a specific DMMP based on the updated DMMP. The contractor's DMMPs shall be submitted to the 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.

**6.2.3. Emergency Procedures**

During construction period, if there are environmental emergency or labor accidents, the Contractors have to make a report to describe in details the incidents and taken actions. The reports on the incidents have to be submitted to the Construction Supervision Consultants (CSC) and PMU for review and archive. The reports also have to be submitted to the concerned agencies if required. Please find below some risk response action plans:

**6.2.3.1. 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).

**6.2.3.2. 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 accidents 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.

#### **6.2.3.3. 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 advice them to evacuate.

#### **6.2.3.4. 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.

#### **6.2.3.5. 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;
- Electrocution; 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.

#### **6.2.3.6. 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).

#### **6.2.3.7. 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.

#### **6.2.3.8. 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. Curriculums on skills need to be designed relevant to the households 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 schools 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 loose 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. Gender action plan**

Gender action plan should be developed to ensure the participation of women in all activities of the project and ensure equality for women in getting benefits and access to the project. The Gender Action Plan should ensure the following objectives:

- To ensure the presence of female representative in the community monitoring and management activities:
  - At least 30 % women are trained in the field of project management.
  - At least 50 % of women are trained about sensitive issues.
  - For community leaders, government officials and consultants involved in the implementation and handing over of the project, the Project Management Unit will take the objective of recruiting 50% female staffs, of which 30 % holding decisive position.
- To create jobs for female workers in the project area: 15 % of unskilled workers to be hired in construction time will be women. 10 % of staffs for operation and maintenance of the project will be women.
- To raise public awareness about the activities of the project and to improve the sustainability of the environment: At least 5 campaigns will be conducted during the implementation of the project, including fields of environmental sanitation and social risks to support equality of women and men in accessibility to services.
- 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 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.

#### **6.3.5. 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.

#### **6.3.6. 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 have to recover the affected infrastructures, reinstate the original site as before carrying out the project.

**Table 6.3: 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.

## 6.4. ENVIRONMENTAL 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 local 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 6.8.2). Many of these measurements are required by Vietnamese regulations and would need to be done even if not directly related to expected project impacts.

Sampling locations are described in Annex 3 and the number of samples are made in accordance with progress of each work.

**Table 6.4: 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> , L <sub>eq</sub> , vibration
	2. Monitoring frequency	Preparation phase: 01 time before construction Construction phase: measurements taken every six-months
	3. Applied Regulation	QCVN 05:2013/BTNMT, QCVN 06:2009/BTNMT; QCVN 26:2010/BTNMT; QCVN 27:2010/BTNMT
	4. Monitoring positions	56 samples (Sampling locations are presented in Appendix)
<b>II</b>	<b>Surface Water Quality Monitoring</b>	
	1. Monitoring parameters	pH, DO, COD, BOD, N-NH <sub>4</sub> <sup>+</sup> , N-NO <sub>2</sub> <sup>-</sup> , N-NO <sub>3</sub> <sup>-</sup> , P-PO <sub>4</sub> <sup>3-</sup> , oil & grease, Coliform, Cl <sup>-</sup> , Fe, TSS
	2. Monitoring frequency	Preparation phase: 01 time before construction Construction phase: measurements taken every six-months
	3. Applied Regulation	QCVN 08-MT:2015/BTNMT
	4. Monitoring positions	17 samples (Sampling locations are presented in Appendix)
<b>III</b>	<b>Wastewater quality monitoring</b>	
	1. Monitoring parameters	pH, BOD <sub>5</sub> , COD, H <sub>2</sub> S, N-NH <sub>4</sub> , N-NO <sub>3</sub> , P-PO <sub>4</sub> , oil & grease, Coliforms, TSS
	2. Monitoring frequency	Preparation phase: 01 time before construction Construction phase: Do not monitor
	3. Applied Regulation	QCVN 14:2008/BTNMT
	4. Position monitoring	03 samples (Sampling locations are presented in Appendix)
<b>IV</b>	<b>Soil</b>	
	1. Monitoring parameters	As, Cd, Cu, Pb, Zn, Cr

No	Monitored items	Preparation and construction phase
	2. Monitoring frequency	Preparation phase: 01 time before construction Construction phase: measurements taken every six-months
	3. Applied Regulation	QCVN 03-MT:2015/BTNMT
	4. Monitoring positions	24 (Sampling locations are presented in Appendix)
V	Monitoring of erosion	During embankment construction
VI	Monitoring of solid waste	Monitoring volume of waste generated and sludge dredged
VI	Monitoring of hazardous waste	Monitoring volume at storage location

#### 6.4.4. 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.

#### 6.4.5. Estimated Costs for Environmental Monitoring Program

**Table 6.5: Estimated cost for samples and analysis in construction phase**

(Exchange rate: 1 USD = 23,330 VND)

No.	Monitoring	Frequency	The number of samples	Total samples	Unit (VND)	Amount (VND)	Amount (USD)
1	Quality of air, noise and vibration	Every 6 months	56	185	854,000	157,990,000	6,771.967
2	Wastewater quality monitoring	Every 6 months	17	71	1,962,000	139,302,000	5,970.939
3	Surface water	Every 6 months	17	71	1,962,000	139,302,000	5,970.939
5	Soil	Every 6 months	24	76	870,000	66,120,000	2,834.119
<b>Total</b>						<b>502,714,000</b>	<b>21,547.96</b>

#### 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 6.6:

**Table 6.6: Proposed social monitoring program for Long Xuyen city subproject**

No.	Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
1	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>
2	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>- Assistances are made following Resettlement Plan Framework</li> <li>- 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>	
3	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,</li> </ul>	As the above

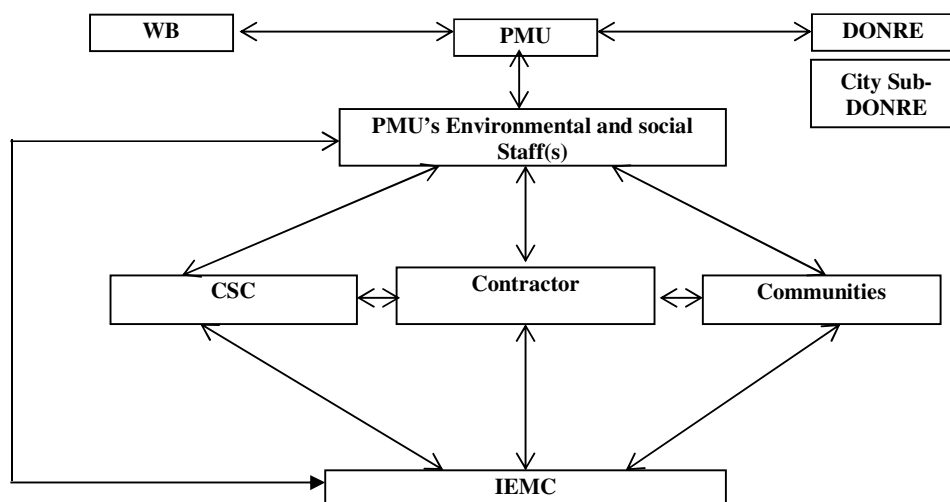
No.	Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
				barriers, warning boards. - Number of local workers (living <5km far from the sites) - Number of site visits by the grassroots health staff - Activities on traffic lane control and divergence	
4	Supervising mitigation 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
5	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
6	Supervising information release and community consultation.	- Project information is fully, timely disclosed and easy to be accessed by the local citizens. - Improve community participation in the project activities.	- Information disclose is made on wards' radio broadcast, residence information boards, cultural houses, ward People's Committee office areas... - Distribution of leaflets if necessary - Community consultation about technical study in LIAs, demand of people in project areas.	- Number of communication sessions on the radio - Number of information stations/wards/work items - Number of distributed leaflets - Number of consultation meetings; - Number of people take part in consultation meetings.	As the above

## 6.6. ROLE AND RESPONSIBILITIES FOR ESMP IMPLEMENTATION

### 6.6.1. Implementation Arrangement

The tables and figures 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 to be 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.



**Figure 6.1: Organization chart for ESMP Implementation**

**Table 6.7: Roles and responsibilities of key parties**

Community/Agencies	Responsibilities
PMU	<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) monitor and supervise ESMP implementation including incorporation of ESMP into the detailed technical designs and bidding and contractual documents; (iii) ensure that an environmental management system is set up and functions properly; (iv) be in charge of reporting on ESMP implementation to the DONRE and the World Bank.</li> <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 subproject. Specifically, ES will be responsible for: (i) helping PMU incorporate ESMP into the detailed technical designs and civil works bidding</li> </ul>

Community/Agencies	Responsibilities
	<p>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.</p>
<p>Construction Supervision Consultant (CSC)</p>	<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 subproject 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>
<p>Contractor</p>	<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 ESMP (CESMP) for each construction site area, submit the plan to PMU and CSC for review and approval before commencement of construction. 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 CESMP requirements, and the environmental specifications (ECOP).</li> <li>- Take actions to mitigate all potential negative impacts in line with the objective described in the CESMP.</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 key stakeholders to resolve these issues.</li> </ul>
<p>Independent Environmental Monitoring Consultants (IEMC)</p>	<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 phases. IEMC will also be responsible to support PMU to prepare monitoring reports on site-specific ESMP implementation.</li> <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</li> </ul>

Community/Agencies	Responsibilities
	period.
Local community	- 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.
Province and City People's Committees (PPCs/DPCs), Provincial DONRE	- 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.

### **Evaluation of PMU's existing**

#### ***Regarding project implementation experience***

So far, 18 projects financed by WB, ADB or IFC have been implemented in An Giang province. However, These project have been carried out by Long Xuyen Provincial Management Unit / Department of Agriculture and Rural Development on behalf of An Giang People's Committee.

Long Xuyen 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**

#### ***Environmental Duties of the Contractor***

The contractor firstly shall adhere to minimize the impact that may be result of the subproject 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 environmental 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 Subproject, the Subproject owner shall ensure that environmental quality monitoring requirements are established for the subproject. An IEMC appointed by PMU shall carry out the monitoring.

- IEMC will be responsible for carrying out environmental sampling, monitoring and marking report during all phases of the subproject. Environmental quality 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).
- EMC will also supply specialized assistance to PMU and ES in environmental matters.

***(iv) Environmental and Social 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 subproject 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;

***(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 6.8 below:

**Table 6.8: 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
5	IEMC	PMU	Every three-month
6	PMU	DONRE	Every six-month
7	PMU	WB	Every six-month

**6.7. TRAINING AND CAPACITY BUILDING**

The Table 6.9 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 6.9: Advanced training program on environmental monitoring management capacity**

I. Subjects	<b>PROJECT MANAGEMENT UNIT</b>
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	<b>CSC, CONTRACTORS, REPRESENTATIVES OF LOCAL AUTHORITIES (WARDS/COMMUNES), COMMUNITIES</b>
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.
III. Subjects	<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>7</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 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

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<sup>7</sup>Excluding costs for RP implementation and independent monitoring the performance of RP/EMP

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 6.10: Estimated EMP implementation cost (mil. USD)**

Content	Items of Long Xuyen 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	0.06	WB
(e) Independent environmental monitoring consulting (IEMC)	0.93	WB
(f) Capacity building programs on safeguard policies	0.01	WB

**Table 6.11: Estimated cost for IEMC (1 USD = 23.330 VNĐ)**

No.	Content	Unit	Quantity	Price (VNĐ)	Total (VNĐ)	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 AND INFORMATION DISCLOSURE**

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 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 was used for the subproject. 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, NGOs 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 subproject, local NGOs/Mass organizations, including women's unions, local authorities and other stakeholders.

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 were as follows:

- 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.

Information disclosure and public consultations are conducted during the subproject preparation and implementation processes to ensure that affected households and key stakeholders are timely informed about land acquisition, compensation and resettlement. This is also an opportunity for the affected people to participate and express their opinions with regards to resettlement implementation programs. The resettlement preparation in coordination with the representatives of the DPCs, Town PC and CPCs in the subproject area, and leaders of the villages organizes public

meetings and consultations in order to inform and guide about the next steps in a timely manner. Organizations and individuals concerned about land acquisition and impacts and resettlement had and will take part of the public meetings and consultations. Representatives of mass organizations in the subproject that area attended the meetings and consultations included the Vietnam Women's Union, and Fatherland Front and Vietnam.

Key topics covered in the public consultations are as followings:

- 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, consultation is implemented into two different rounds during environmental and social impact assessment process.

The public consultation was carried out with local communities and authorities at project area including 7 wards including: My Binh, My Long, My Xuyen, My Hoa, Dong Xuyen, My Quy, My Phuoc Ward. The first consultation was conducted from from 28-29 July 2016, which provide informations on the projects investmens and scope of ESIA process, and the anticipated potential impact. The second consultation was conducted from 27-30 October 2016 on the first draft of the ESIA. Public consultations were conducted through questionairs and public consultation meetings. The public consultation meetings were held at the Ward/Commune PC.

About 15 days prior to public consultation, the consultant informed the local authority about the prpoposed additional 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 60 and 302 respectively. The results of the two public consultation meetings are described in the following Table 7.1 and 7.2.

## 7.2. RESULTS OF PUBLIC CONSUTATION

**Table 7.1: Summary of result of the 1<sup>st</sup> public consultation results**

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
1	My Binh Ward 28/07/2016	<ul style="list-style-type: none"> <li>- Representatives People's Committee, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 1</li> <li>- Affectec households: 6</li> </ul>	<p>The status of the Lia1 area</p> <ul style="list-style-type: none"> <li>- Crowded living populations, operate in industries from low-income to very low.</li> <li>- The area of houses small to very small.</li> <li>- Environmental sanitation: poor drainage, pollution, urban aesthetic.</li> <li>- The inhabitants are mostly working people, low literacy levels.</li> <li>- Security complex, many social evils.</li> <li>- Inability to invest.</li> </ul> <p>Therefore: Looking forward to the project be done, especially coming back to the community population resides better stability, which has investment and business opportunities. There are support programs for vulnerable households.</p>	Project noted the comments and will have specific assessment of the actual situation locally to have the design plans, construction; policies, reasonable solutions, effective.
2	My Long Ward 28/07/2016	<ul style="list-style-type: none"> <li>- Representatives People's Committee, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 1</li> <li>- Affectec households: 10</li> </ul>	<ul style="list-style-type: none"> <li>- The status of environmental sanitation in the work of the ward very pollution: waste and waste water discharged directly into canals for households and accounted, live on canal.</li> <li>- Narrow roads, traffic do not warrant or obstructing the course of fire.</li> <li>- Local and community support for the implementation of project.</li> <li>- Should consult the people about the scale expansion of routes alley.</li> <li>- Have compensation policies, clear support and publicity to households.</li> <li>- The construction should be done to restrict the working hours.</li> <li>- Take measures shielding material trucks, cleaning mud out of the area when construction.</li> </ul>	Project noted all comments and will be noted as well as integration of this idea in the activities of environmental impact assessment; resettlements programs and provide appropriate mitigation measures.
3	My Xuyen	- Representatives People's	- Lia 5 area, Lia 3 area, narrow alleys, Bui Thi Xuan street flooding	Project noted the comments and

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
	Ward 28/07/2016	Committee, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 3 - Affectec households: 8	when there is heavy rain. - Proposal should have a specific plan to shorten the construction period to ensure less influence people. - Cai Son canal area (passage through the ward) was sedimentation, stagnant, causing environmental pollution, affecting the lives of people. - Construction of wastewater treatment plant in the province is currently affecting traffic, environmental sanitation in the region.	will be assessed, integrated into design plans as well as in the process of implementation of the project to minimize the impact to the residents at project area.
4	My Hoa Ward 29/07/2016	- Representatives People's Committee, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 4 - Affectec households: 11	- Suggest projects combined waste treatment, due to people put garbage under the Ton Duc Thang bridge. - Desiring to ensure the progress of construction, avoiding construction gutted, avoiding degradation. - Must have good management program, to avoid duplication and ensure the interests of the people, to monitor, inspect, supervise, promote projects completed thoroughly. - When building embankments, road management from the route Bui Van Danh, suggest cleared to create the urban landscape; avoid clearance, inadequate compensation. - Must complete the resettlement area first and then cleared to quickly stabilize their lives for the people.	Project noted the comments and will have specific assessment of the actual situation locally to have the design plans, construction; policies, reasonable solution, effectively ensure people's schedule to stabilize their lives soon.
5	Dong Xuyen Ward 28/07/2016	- Representatives People's Committee, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 3 - Affectec households: 4	- Propose improvement plans, construction management and operation of roads and embankments restrictions affecting households. - For construction work on Tran Quang Dieu street, local proposed expansion plans towards Hung Vuong Secondary School in order to limit the impact on the people. - On the ward, roads from Ong Manh canal to Kenh 2 area has no drainage system, causing lowland flooding when heavy rains.	Project noted the comments and will be assessed, integrated into the design process; the construction project is to minimize the impact to the project area residents.
6	My Quy	- Representatives People's	- During the construction process, recommend investors and	Project noted the comments and

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
	Ward 29/07/2016	Committee, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 3 - Affectec households: 6	<p>construction units to comply with the provisions of law.</p> <ul style="list-style-type: none"> <li>- Recommend investors implement satisfactory measures to ensure the livelihood of the people.</li> <li>- Delegates supported the project to be implemented, to avoid prolonged affect people's lives.</li> <li>- Some residents in the project area is very difficult, suggesting investors have the appropriate policy framework, favorable for people stabilize their lives.</li> <li>- There are 50 households living by fishing, lead, iron making area Duong Dien Nghe Street, recommended investors got information and minimize the impact..</li> <li>- The request must have water truck to watering avoid dust affects people in the region.</li> </ul>	will have specific assessment of the actual situation locally to have the design plans, construction appropriate; policies, effective solutions to minimize negative impacts on the people of the project area. Timely implementation of projects and the provisions of law.
7	My Phuoc Ward 29/07/2016		<ul style="list-style-type: none"> <li>- When dredging Cai Son canal needed to calculate the flow between Cai Son canal and Tam Bot canal, because the flow of Tam Bot canal sharply incision will affect the flow of Cai Son canal.</li> <li>- Some alley on Dong Thinh 1 was submerged, recommended consideration calculated for this region.</li> <li>- The alley in the groups 112, 113 belong to Dong Thinh 7, a width of about 1 m is very narrow, no drainage system proposed to consider raising the pavement or extended compared with the current situation will affect the residents area.</li> <li>- Suggest contractors in the construction process to ensure project quality, consistent with practice to avoid costly, affect the confidence of the people.</li> </ul>	Project noted the comments and will have specific assessment of the actual situation locally to have the design plans, construction reasonable, effective; quality assurance as well as the progress of the project



**Table 7.2: Summary of result of the 2<sup>nd</sup> public consultation results**

No.	Location, Time	Participants	Participants' Ideas	Responses from Investors and Consultants
1	My Binh Ward, 14h00 27/10/2016	<ul style="list-style-type: none"> <li>- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 5</li> <li>- Affectec households: 57</li> </ul>	<ul style="list-style-type: none"> <li>- The compensation for clearance and resettlement should harmonize the community and individual interests, and create conditions for relocated households to stabilize their lives.</li> <li>- Use rolling method to avoid prolonging the construction</li> <li>- Pay attention to the construction piling, avoid affecting the lives of residents</li> <li>- Spray water to avoid dust generation during construction</li> <li>- Ensure the safety of construction workers; take measures to handle household waste and hazardous waste generated during construction.</li> <li>- Materials transport vehicles are required to be screened and comply with the traffic law. During the construction process, measures must be taken to combat flooding affecting residents in the region</li> </ul>	<ul style="list-style-type: none"> <li>- Comply with the committed contents</li> <li>- Consider the contriubuted ideas of the residents</li> </ul>
2	My Long Ward, 9h00 27/10/2016	<ul style="list-style-type: none"> <li>- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 6</li> <li>- Affectec households: 48</li> </ul>	<ul style="list-style-type: none"> <li>- Construction by concentration method to avoid prolonging the construction</li> <li>- Consider collecting wastewater from households</li> <li>- Notice people on compensation plans as soon as possible</li> <li>- Collect the waste from the construction and construction workers to avoid environmental pollution</li> <li>- Take mitigation measures for flood at the beginning of the lane during construction. One side must be completed before continuing with the another. Spray water to avoid dust generation during construction</li> <li>- Construction of embankments on both sides to avoid landslides</li> <li>- Allocate reasonable traffic flow and make temporary construction of local roads</li> </ul>	<ul style="list-style-type: none"> <li>- Comply with the committed contents</li> <li>- Organize meetings and notify the details about the project to the people when the project is approved</li> </ul>
3	My Xuyen	- Representatives People's	- Perform electrical work safety and fire protection to avoid affecting	The commitments of residents

No.	Location, Time	Participants	Participants' Ideas	Responses from Investors and Consultants
	Ward, 9h30h 28/10/2016	Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 6 - Affectec households: 22	the residentials - Study the altitude to avoid flooded roads - Properly arrange the sewers and materials collection, avoid long set up at residents' houses, hindering their transportation - Implement the project quickly - The compensation must be clear and timely implemented to stabilize the lives of residents. - During construction, make sure of clean water; restrict production of waste at the source of the people	are focused, the mitigation measures must be fully implemented as committed
4	Dong Xuyen Ward, 14h 30/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 5 - Affectec households: 45	- The mosquitoes will grow while dredging, there needs to be sanitation teams to prevent disease and to spray sanitizer for disease reduction. - Arrange hygiene team to prevent the disease and spray sanitizer to prevent the spread of disease when dredging - Make sure that domestic wastewater of workers do not emit into the environment, affecting people in the region - Materials transport trucks must be fully covered to prevent material spillage, affecting sanitation. Issues of generated dust and emissions are included in the ESIA and mitigation measures will be applied. Strict management of workers to avoid insecurities. - Avoid construction on the rest time of the residents.	The commitments of residents are focused, the mitigation measures must be fully implemented as committed
5	My Hoa Ward, 9h 29/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 3 - Affectec households: 32	- Disclosure of information about the project, provide the appropriate policy - Materials transport trucks must be fully covered to prevent material spillage, affecting sanitation - Implement the project quickly - Pay attention to the construction piling, avoid affecting the lives of residents	Publication of detailed implementation schedule of the project in each location before the construction Consider the contriubuted ideas of the residents

No.	Location, Time	Participants	Participants' Ideas	Responses from Investors and Consultants
			<ul style="list-style-type: none"> <li>- When there is necessary relocation, arrange the resettlement sites with adequate infrastructure to ensure the lives of the people.</li> <li>- Arrange hygiene team to prevent the disease and spray sanitizer to prevent the spread of disease when dredging</li> </ul>	
6	My Phuoc Ward, 14h 28/10/2016	<ul style="list-style-type: none"> <li>- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 5</li> <li>- Affectec households: 36</li> </ul>	<ul style="list-style-type: none"> <li>- Publication of detailed implementation schedule for the community to know.</li> <li>- The vehicles must be checked and not driving beyond the speed limit allows.</li> <li>- Avoid material gathering along the route affecting regional traffic.</li> <li>- Spray water to avoid dust generation during construction</li> <li>- Disclosure of information about the project, provide the appropriate policy</li> <li>- Mitigate flooding and waterlogging</li> <li>- Construction of embankments on both sides to reduce landslide</li> <li>- Do not apply piling on rest time</li> </ul>	<ul style="list-style-type: none"> <li>- Comply with the committed contents</li> <li>- Organize meetings and notify the details about the project to the people when the project is approved</li> </ul>
7	My Quy Ward, 14h 30/10/2016	<ul style="list-style-type: none"> <li>- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 3</li> <li>- Affectec households: 29</li> </ul>	<ul style="list-style-type: none"> <li>- Avoid delaying the project</li> <li>- Provide specific and clear schedules and plans</li> <li>- Seriously implement the commitments</li> <li>- Take measures to mitigate the impact on business activities of the locals.</li> <li>- Check and verify the status of the project before construction to avoid being influenced</li> <li>- Spray water to avoid dust generation during construction</li> </ul>	The commitments of residents are focused, the mitigation measures must be fully implemented as committed

### **7.3. RESPONSES AND COMMITMENTS OF SUBPROJECT OWNER**

The Subproject Owner agrees on and acknowledges opinions/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 report and finalized the ESIA report on the basis of fully acquiring opinions/comments of the People's Committees of Wards/Communes and local communities in the subproject area.

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 had been published at the offices of Long Xuyen City People's Committee and the People's Committees of subproject wards and communes on December 29, 2016. Basing themselves on the contents of the ESIA, the local people could get the Subproject information and contribute their opinions/comments on environmental issues of the Subproject.

The draft ESIA was also sent to the World Bank office in Vietnam for its disclosure in the World Bank's Operations Portal on January 10, 2017.

## CHAPTER 8. CONCLUSIONS, RECOMMENDATIONS AND COMMITMENTS

### 8.1. CONCLUSIONS

The “*The Vietnam Scaling Up Urban Upgrading Project (SUUP) - Sub-Project of Long Xuyen City, An Giang Province*” 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. Long Xuyen project will help to improve the city’s drainage conditions, local flooding and environmental conditions, contributing to the sustainable growth of the city.

The ESIA report complies with the current environmental impact assessment requirements stipulated by the Vietnamese Government and WB’s safeguard 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 for 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 assessed with support from the baseline and statistical data as well as experiences from similar projects-assisted by the World Bank. The impacts are relatively quantified as best as they can be for three stages of project’s preparation, construction and operation. It 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 Long Xuyen, Cai Son, Ong Manh and Ba Bau 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 to ensure the management, monitoring, reporting, preparation and adjustment of measures to avoid and minimize environmental pollution during project implementation. The project owner, contractors and project management unit will be responsible for implementing this ESMP in cooperation with local state management agencies and authorities.

Two rounds of participatory public consultations were 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 Long Xuyen City and in particularly helping Long Xuyen 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 Provincial Committee (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 Chapters 5 and 6. The Client commits to 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.

## APPENDIX 1: DUE DILIGENCE FOR LONG XUYEN SUBPROJECT

Construction of the project items will cause sludge dredged from canals, solid construction waste, solid domestic waste and wastewater. Dredged sludge and solid waste will be transported to An Giang Solid Waste Treatment Complex. Wastewater will be conveyed to Long Xuyen water drainage and wastewater treatment system to meet applicable standards. Therefore, due diligence will be implemented for these 2 works.

In addition, some affected households will be resettled in Bac Ha Hoang Ho Resettlement Site. So, due diligence will be implemented for this work.

Detailed assessment is presented in Table below:

01. Project name	An Giang Solid Waste Treatment Complex, 245 tons/day
Description	<p>According to Decision No. 1873/QĐ-TTg dated 11/10/2010 of the Prime Minister on approval the construction plan of solid waste treatment plant in key economic area of Mekong Delta region towards 2020, the solid waste in Long Xuyen will be transported to An Giang Solid Waste Treatment Complex (SWTC).</p> <p>An Giang SWTC invested by An Giang Urban Environment Company Limited, is located in an area of 22.46ha in Binh Hoa Commune, Chau Thanh District, 13km from the project area. It has treatment capacity of 245 tons/day, receiving municipal solid waste, industrial waste and medical waste from Long Xuyen City, Chau Thanh District, Phu Hoa Town (Thoai Son District) and part of Chau Phu District.</p> <p>At present, the project is in infrastructure construction phase, with a waste containing place being constructed.</p> <p>Solid Waste Treatment Complex in An Giang includes 2 items: (i) a sanitary landfill for municipal solid waste with capacity 245 tons/day, is scheduled for completion and start receiving garbage in 2017; and (ii) a municipal waste treatment plant, with capacity of 245 tons/day, had been decided for investment in accordance with Decision No.267/QĐ-UBND dated 21/02/2012 of People's Committee of An Giang Province and will be completed in 2018.</p> <p><b><u>a. Municipality waste landfill</u></b></p> <p><i>Design</i></p> <p>The landfill is divided into 4 cells. They are built by the successive method in which after the first cell is full of garbage, the second one is built. The area and depth of each cell are 2,783.5 m<sup>2</sup> and 2m respectively.</p> <p>Cell structure: The bottom and edges are formed by layers in order from bottom including: compacted natural soil layer, sand layer with thickness of 600mm, Geosynthetic clay liner thickness of 10mm including: a thin layer of powder or dry bentonite covered by 2 geotextile liners, lining the whole bottom and 4 edges of the cells. Above geotextile fabric, PVC pipeline D150 is installed herringbone formation and coated reverse filter with rock 1x2 thickness 200mm to collect leachate.</p> <p><i>Leachate collection and recirculation system</i></p> <p>At the middle of each cell a manhole (1m x 1m) is constructed to collect leachate. Then, the leachate is led to collection tank (V = 50m<sup>3</sup>) by bottom pipeline. Collection tank conditions wastewater flows before entering the treatment system, settles suspended solid and circulates water back to the landfill cells in dry season</p>

to ensure enough moisture for the biochemical processes.

The leachate treatment system of the landfill has a capacity of 80 m<sup>3</sup>/day and applied the following technology: Leachate → Collection tank → UASB → Sedimentation tank → UAFB → Aeration tank → Anoxic tank → Sedimentation tank 2 → Fenton → Biological pond → Filtration → Disinfection tank → Recipient source.

Leachate is monitored regularly and pumped out periodically to reduce pressure on the waterproofing layer. The treated leachate must be reached discharge standard before entering Tu Suc Canal.

#### *Treatment process*

Waste is received from garbage truck and conveyed into cell (hazardous waste is transferred to hazardous waste landfill). It is then spread over the surface and compacted by soil compactor. After that, probiotic will be sprayed over surface before covering a soil layer to prevent birds, insects and odor emission.

When the cells is full, peak layer is covered by Geosynthetic clay liner with thickness of 10 mm, HDPE liner with thickness of 1.5 mm and soil layer with thickness of 600 mm.

#### *Transportation*

The main routes from collection points to landfill include Highway 91 and Road 941. They are 20 – 40 m wide and convenient for garbage trucks. The garbage trucks have sufficient covering and collecting system to limit the environment pollution.

### ***b. Municiple waste treatment plant***

#### *Design*

The investment items of the project include: primary classification area, factory of organic waste treatment into fertilizer, factory of waste incinerator, wastewater treatment plant and other auxiliary works.

#### *Treatment process*

The received waste is classified according to function i.e. organic waste is used for fertilizer production while the remaining components are incinerated in specialized incinerator which meet technical and environmental requirements or buried at landfill.

#### *Transportation*

Because the waste treatment plant is located in the landfill area of the integrated waste facility, its transportation is the same as landfill's transportation. In addition, combining with the internal roads of plant with width 12 – 14 m to complete transportation cycle.

#### ***Relationship with the SUUP project:***

All solid waste (dredged materials, domestic solid waste,...) from SUUP project in Long Xuyen city will be disposed at SWTC.

Current status	An Giang SWTC includes 2 items: (i) Solid waste landfill sanitary capacity 245 tons/day: being constructed, estimated to completed by 12/2016; and (ii) waste treatment plant capacity of 245 tons/day: had the investment policy in accordance with Decision No. 267 / QĐ-Committee of the Provincial People's Committee dated 21/02/2012, estimated to completed by 2018.
Current status of EIA/EMP	<p>The EIA report of the project was approved by An Giang Provincial Department of Natural Resources and Environment by Decision No.66/QĐ-STNMT dated April 9, 2011.</p> <p>Environmental impact mitigation measures proposed in EMP of the project:</p> <ul style="list-style-type: none"> <li>- The vehicles collecting, transporting waste to the complex must be fully covered and equipped with a leachate collecting system during transportation.</li> <li>- Waste collection and transportation vehicles must be cleaned before leaving waste dumps.</li> <li>- In dry season, roads within the complex scope must be sprayed with water for minimization of dust caused by transportation activities.</li> <li>- The wastewater treatment system (WTS) must be finished and operated in accordance with the approved design before the project officially receives waste.</li> <li>- All wastewater must be conveyed to the central wastewater treatment system for treatment in line with applicable standards before being discharged into receiving sources.</li> <li>- Solid domestic waste, sludge from WTS, other waste substances caused by the complex operation will be treated at the complex in line with characteristics and functions of each item.</li> <li>- Periodically twice per day, bio-products will be sprayed on waste surface for minimization of odor.</li> <li>- Bottom liner will be provided for preventing leachate from penetrating outside, ensuring completion before the project temporarily contains waste.</li> <li>- Fully covering temporary containing places with impermeable material to reduce the amount of rain water infiltrating into waste, causing leachate, leachate spill outside the waste dumps, negatively impacting surrounding environment.</li> <li>- Creating buffer zone for isolation of temporary waste containing places from surrounding environment. Planting green trees, grass for landscape of the buffer zone.</li> <li>- Periodically every 3 months, environmental quality monitoring reports are developed and submitted to An Giang Provincial Department of Natural Resources and Environment.</li> </ul>
Due Diligence review	<p>An Giang SWTC has been designed and constructed following the national standards with sufficient technical facilities for solid waste treatment. The capacity is capable to handle an increase amount of waste coming from the SUUP subproject. At the same time, environmental protection measures to be implemented by An Giang SWTC are similar to safeguard policies of the WB, so waste caused by the subproject is ensured to be treated in compliance with regulations.</p> <p>The land acquisition and site clearance were completed. To date, the project has not received any claims 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 law provisions.</p>
<b>02. Project name</b>	<b>Long Xuyen sewer system and wastewater treatment plant (Long Xuyen WTP), 30.000 m<sup>3</sup>/day</b>

Description	<ul style="list-style-type: none"> <li>- The project area includes two main investments: <ul style="list-style-type: none"> <li>▪ Wastewater treatment plant No.1 of 10,000 m<sup>3</sup>/d capacity in an area of 2.9ha in Binh Duc Ward, serving the northern area of the city (including My Binh Ward, Binh Khanh Ward, Binh Duc Ward).</li> <li>▪ Wastewater treatment plant No.2 of 20,000 m<sup>3</sup>/d capacity with 08 pumping stations, 69.2 km long wastewater collection pipeline, in an area of 5.6ha in My Hoa Ward, serving the southern area of the city.</li> </ul> </li> <li>- The wastewater treatment plant operation technology: Wastewater→ Collection tank → Vertical sand sedimentation tank → Oxidation canals→ secondary sedimentation tank→ Pumping station for water discharge → Recipient source.</li> <li>- Capital source: Korean ODA (35.6 million \$US); government budget (7.1 million \$US).</li> <li>- Investor: An Giang Utilities JSC.</li> </ul> <p><b>Relationship with the SUUP project:</b></p> <p>Wastewater from the beneficial area from Long Xuyen sub-project will be collected, conveyed and treated by the two WWTPs under this project. Concretely, WWTP from LIA 1, Long Xuyen canal will be connected and treat by WWTP at Binh Duc ward. WWTP from LIA 3, 5, 6, Hung Vuong street, Tran Quang Dieu street will be connected and treat by WWTP at My Hoa ward.</p>
Implementation situation	Construction stage is carried out from 8/2015 – 12/2017
Current status of EIA/EMP	<p>The environmental impact assessment report of the project was approved at the Decision No. 161/QĐ-UBND dated 13/9/2010 of An Giang Provincial Department of Natural Resources and Environment.</p> <p>The project has been implemented in compliance with the environmental management plan approved by An Giang Provincial Department of Natural Resources and Environment as follows:</p> <p><b>In land clearance phase:</b></p> <p>Compensation for affected objects under the project has been carried out in accordance with compensation and land acquisition policies of An Giang Province. So far, there has been no claim related to this.</p> <p><b>In construction phase:</b></p> <ul style="list-style-type: none"> <li>- Enhancing dyke, ensuring wastewater caused by leveling to be collected and preliminarily treated.</li> <li>- Waste will be collected and treated by URENCO through the contract signed by both units.</li> <li>- The periodic environmental monitoring report in this phase was developed by the project owner and submitted to An Giang Provincial Department of Natural Resources and Environment.</li> </ul> <p><b>In operation phase: The project owner will comply with the following measures:</b></p> <ul style="list-style-type: none"> <li>- Collecting all wastewater and conveying to the central WTS and operating the system for treatment of wastewater in accordance with environmental standards before discharge into receiving sources.</li> <li>- Entering contracts with competent units for collecting, treating each type of waste in compliance with solid waste management and treatment.</li> <li>- Implementing measures for isolation and mitigation of noise caused by booster pumping stations, ensuring noise and vibration to meet environmental standards during operation. Periodically checking and maintaining equipment for timely addressing incidents if any.</li> </ul>

	<ul style="list-style-type: none"> <li>- Providing adequate area for the buffer zone to isolate the wastewater treatment area from surrounding areas in accordance with TCVN 7222:2002 on general environmental requirements for concentrated wastewater treatment plants. Planting green trees and grass for landscape of the buffer zone and minimization of impacts caused by the WTS on surrounding environment.</li> <li>- Carrying out environmental protection measures, measures for prevention of environmental incidents such as landslide, fire, explosion, and incidents of the central WTS in accordance with regulations.</li> <li>- The project owner is not allowed to implement multiple items on the same road, and it is necessary to have proper traffic management plan and ensure smooth traffic during construction, especially in National Highway 91 on Vi Ba festival.</li> <li>- Implementing environmental supervision every 4 years for waste generating sources and every 2 years for surrounding environment. The results must be reported to the Department of Natural Resources and Environment for monitoring and supervision.</li> <li>- Taking responsibility of remedy and compensation for any damage and others in line with applicable laws if environmental pollution, deterioration and incidents occur.</li> </ul>
Due Diligence review	<p>Environmental protection measures to be implemented by Long Xuyen WTP are consistent with safeguard policies of the WB, so waste water caused by the subproject is ensured to be treated in compliance with regulations.</p> <p>The project is in construction phase and expected to be finished and put into operation by December 2017. To date, the project has not received any claims from affected households. Survey results showed that livelihoods of affected households have been restored. The affected people have been compensated and supported in full in accordance with related law provisions.</p>
<b>03. Project Name</b>	<b>Bac Ha Hoang Ho Resettlement Site</b>
<b>Description</b>	<ul style="list-style-type: none"> <li>- Location: My Hoa Ward – Long Xuyen City, An Giang Province.</li> <li>- Area: 40,200 m<sup>2</sup>.</li> <li>- Investment Owner: The Land Development Reserved Center – An Giang province.</li> <li>- The resettlement site was completed providing full technical and social infrastructures (roads, planted trees, water supply, drainage, lighting, electric supply, school, market,...)</li> <li>- Date of land clearance and compensation: completed by Quarter I/2010. According to Decision No. 1440/QD-UBND dated 07/07/2009 of An Giang PPC on the on approving compensation, allowance and resettlement plan for AHs phase 1, Bac Ha Hoang Ho Residential Area in My Hoa Ward – Long Xuyen City Project, the total number of AHs is 108 HHs, of which 68 AHs have their agriculture land affected only without house on land; and 40 AHs affected residential land and house on land. 32 HHs were relocated and 07 HH were severely affected (losing more than 20% of their production land).</li> </ul> <p><b>Relationship with the SUUP project:</b></p> <p>The City will buy land plots from this site to accommodate the affected households under the SUUP. This is considered as a linked project.</p>
<b>Current status</b>	Construction stage: 2011-2013.
<b>Detail of EMP/EIA</b>	- The Environmental Impact Assessment (EIA) for the construction of the Bac Ha Hoang Ho Residential Area in My Hoa Ward – Long Xuyen City Project was not available for the due diligence review due to the EIA requirement was not regulated and enforced back in 2009.



		<p>- No environmental issue was recorded during project construction and operation period.</p>
Due review	Diligence	<p>On 07/07/2009, An Giang PPC issued a Decision No. 1440/QD-UBND on approving the Compensation, Support and Resettlement Plan for the project's AHs with an amount of VND 19,150,237,965 VND, in which:</p> <ul style="list-style-type: none"> <li>+ Compensation, allowance cost for land: 15,529,088,013 VND;</li> <li>+ Compensation for assets on land: 1,293,378,540 VND;</li> <li>+ Compensation for trees, crops: 222,332,644 VND</li> <li>+ Cost for allowance, support policies, progress reward: 57,109,097 VND;</li> <li>+ Cost for compensation implementation: 307,193,101 VND;</li> <li>+ Contingency cost (10%): 1,740,930,724 VND.</li> </ul> <p>The compensation plans were posted at My Hoa Ward PPC. The compensation payment started in Q4/2009 and was completed in Q1/2010.</p> <ul style="list-style-type: none"> <li>- Status of relocated HH: Currently, 32 displaced households due to the project are relocated in the Bac Ha Hoang Ho Resettlement Area in Q3/2010. After receiving compensation and assistance, households rented houses for accommodation during the construction of the resettlement area; they received a rental allowance for this purpose. Once the RS has been completed, they could relocate in the RS. In general, resettlement had very little impact on their living conditions as they were relocated in the same area.</li> <li>- HH affected due to the loss of agriculture land: Severely affected households, losing more than 20% of their production land were entitled to buy land plots in the resettlement area. In addition, households and individuals which are directly engaged in agricultural production for land to be acquired from 5,000m2 or more, after the land acquisition is implemented and projects' land funds are available, projects' compensation committees will consider and propose to City People's Committees to decide to allocate one more land plot (01) for one household in accordance with the planning of such approved projects.</li> <li>- Livelihood restoration for the affected households: Most of the households with livelihood affected got priority assistance by being allocated resettlement plots at convenient locations in order to change jobs; they also received several other allowances for life stabilization. Affected farmers, received an additional cash allowance of corresponding level of support for each performance is VND 3,000,000 for training/career change purpose. Severely affected HHs (loss of more than 20% total productive land) could change their livelihood to do other services/businesses and have now stable living conditions after resettlement.</li> <li>- A total <b>03 households</b> submitted complaints, these HHs mainly complained about problems regarding mistakes during detail measurement survey and inventory. Their requests have been resolved satisfactory to PAPs by the Compensation and Resettlement board and relevant stakeholders. Currently, there is no pending issues or complaints not being solved during the implementation of the project.</li> </ul>

## **APPENDIX 2 - LONG XUYEN DREDGED MATERIALS MANAGEMENT PLAN**

### **2.1. Location of Dredging, Volume and Characteristics of Dredged Materials**

Location of Dredging, Volume and Characteristics of Dredged Materials.

### **2.2. 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 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 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 An Giang Solid Waste Treatment Complex.

An Giang Solid Waste Treatment Complex is located in Binh Hoa commune, Chau Thanh district, 20 km far 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.

### **2.3. 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.

**The number of Sediment samples**

Volume of dredged (m <sup>3</sup> )	No of Sediment Samples
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 CDMF.
- 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 CDMF 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.

**2.4. Potential Impacts and Mitigation Measures for Dredging and Embankment lining****Potential Impacts and Mitigation Measures**

Impacts and Description	Mitigation Measures
<b>AT DREDGING AND TEMPORARY LOADING AREAS</b>	
<p><b><i>Odour and air pollution, nuisance</i></b></p> <p>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 workers, local residents and cause public nuisance.</p>	<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> <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 sediment 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 sediment loads when loading near sensitive receptors or longer than 48 hours unavoidable.</li> </ul>

Impacts and Description	Mitigation Measures
<p><b><i>Dust and nuisance</i></b></p> <ul style="list-style-type: none"> <li>- Temporary loading of sediment at the construction site cause nuisance to the public;</li> <li>- Dry and wet mud may be dropped along the dredging area and on transportation route causing nuisance to the public and traffic safety risks.</li> </ul>	<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><b><i>Traffic Disturbance</i></b></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><b><i>Social Disturbance</i></b></p> <ul style="list-style-type: none"> <li>- 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;</li> <li>- Conflicts may also be arisen if workers, waste, materials, equipment etc. are present outside the construction corridor.</li> </ul>	<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><b><i>Landslide and soil subsiding risks at dredging area</i></b></p> <ul style="list-style-type: none"> <li>- Relative deep excavation or cut and fills on the embankments that create slopes may lead to landslide and soil subsiding at the slops or excavated areas, particularly in rainy weather;</li> <li>- Deep excavation also cause risks to the existing buildings nearby, particularly the weak structures or located too close to the deep excavation area.</li> </ul>	<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 Environmental Consultant of the CES identify weak structures that may be at risk and determine appropriate mitigation measures accordingly;</li> <li>- Consider and select appropriate dredging method that allow minimising soil subsiding risks, for example carry out stepped excavation, stabilise slops in parallel to dredging;</li> <li>- Apply protective measures such as sheet piles at risky locations.</li> </ul>
<p><b><i>Water Quality Degradation</i></b></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</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</li> </ul>

Impacts and Description	Mitigation Measures
contain high solid contents. Muddy water entering irrigation ditch will cause sedimentation. Aquatic livestock in the canal would also be affected by turbid water.	to resettle before continuing. Observe water colour at 20 m upstream and stop dredging when water colour there started to change.
<b>Increased Safety risk for the Public</b>	<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>
<b>Health and Safety risk to the workers</b> <ul style="list-style-type: none"> <li>- The health of workers may be affected due to exposure to odour and other contaminants from sediment</li> <li>- Risk of being drown</li> </ul>	<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>
<b>Others</b>	<ul style="list-style-type: none"> <li>- Other relevant measures specified in ECOP or proposed by the contractors as necessary.</li> </ul>
<b>MATERIAL LOADING AND TRANSPORTATION</b>	
<b>Dust and nuisance, traffic safety risks</b> Dust or wet materials may be dropped along the transportation route	<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>
<b>AT FINAL DISPOSAL SITE</b>	
<b>Landslide and soil subsiding risks at final Disposal site</b> 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	<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 45°;</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>
<b>Soil and Water Quality Pollution</b> <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>

## 2.5. Specific Guidance for Dredging at Cai Son, Ong Manh, Ba Bau canals

- 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.