PEOPLE'S COMMITTEE OF VINH LONG PROVINCE
PEOPLE'S COMMITTEE OF VINH LONG CITY

VIETNAM SCALING UP URBAN UPGRADING PROJECT SUBPROJECT OF VINH LONG CITY, VINH LONG PROVINCE

(Final)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Vinh Long – February 2017

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VIETNAM SCALING UP URBAN UPGRADING PROJECT
VINH LONG CITY SUB-PROJECT
VINH LONG PROVINCE

PROJECT OWNER	CONSULTANT
PEOPLE COMMITTEE OF VINH LONG CITY	**INTERNATIONAL ENGINEERING CONSULTANT JOINT STOCK COMPANY (INTEC)**

VINH LONG – February 2017

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATION

Ahs	Affected Households
CC	Climate change
AC	Asphalt concrete
CeC	Cement concrete
CMC	Construction monitoring consultant
CTUDR	Can Tho Urban Development and Resilience Enhancement Project
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
MKD	Mekong detal
EIA	Environmental impact assessment
ESIA	Environment and Social Impact Assessment
ECOP	Environmental Code of Practice
EMC	External Monitoring Consultant
EMP	Environmental Management Plan
EMS	Environmental monitoring system
FS	Feasibility study
LIA	Low-income area
MOC	Ministry of Construction
MUDP	Management of Urban Development under Urban Development Agency
NUUP	National urban upgrading program
ODA	Official Development Assistance
PPMU	Project Management Unit
PPU	Project Preparation Unit
PSC	Project Steering Committee
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
RP	Resettlement Plan
P/CPC	Provincial/City People's Committee
UDA	Urban Development Agency
URENCO	Urban Environment Company
WB	World Bank

CHAPTER 1. INTRODUCTION AND PROJECT DESCRIPTION

1.1. BACKGROUND AND OBJECTIVES OF PROJECT

1.1.1. General Background of the Project

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

Like other municipalities across the country, the Mekong Delta region is experiencing a rapid urbanization at a rate of 25%, bringing positive changes to cities in the area. Yet there are more development needed to address current urban challenges, including but not limited to: a) an existence of low income areas (LIAs) b) A boom but not well planned infrastructure c) An asynchronous social and technical ỉnastructure system; d) A degraded drainage system; e) increasing environmental pollution. The situation in Mekong Cities is even worsened by the imminent climate change threats, namely drier dry season and wetter wet season, extreme weather events, saline intrusion and sea level rising.

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

Vietnam Government has operated two urban upgrading projects financed through the World Bank during the period from 2004 to 2017, namely the Vietnam Urban Upgrading Project (VUUP) in 4 cities of Nam Dinh, Hai Phong, Ho Chi Minh, and Can Tho and the Urban Upgrading Project in Mekong Delta (MDR-UUP, involving 6 cities of Can Tho, Cao Lanh, My Tho, Tra Vinh, Rach Gia and Ca Mau). The project has significantly transformed the urban areas, changing perceptions of urban management and project management for the cities involved. In view of the Government, the upgrading of cities in the Mekong Delta are special priorities as this will increase the city's resilience and help reduce the city's vulnerabilities to water related risks.

The proposed Vietnam Urban Upgrading project (SUUP) is in alignment with the Government's priority, stock taking the ongoing investments and the built up experiences in the areas. Specifically, the project will strengthen the integrated planning capacity of the seven project cities in early stages of urbanization (Bac Lieu, Ben Tre, Long Xuyen, Soc Trang, Tan An, Vi Thanh and Vinh Long), improve connectivity of priority infrastructure in the urban core and upgrade selected LIAs. Investments under the project will promote a risk-informed approach to infrastructure design and construction (including screening disaster and climate risks, promoting green/permeable infrastructure, storm-water storage etc.). The selection of infrastructure sub-projects has been prioritized to ensure: (i) benefits to the urban poor; (ii) alignment to long-term sustainable urban development goals and attention to urban resilience; (iii) adherence to key principles of compact urban design and universal accessibility; and (iv) technical and economic soundness. These activities will be complemented by technical assistance to local governments to enhance the cities' capacities in urban planning, land management and city resilience.

Investment designs will incorporate climate and disaster risks, and all master plans developed will seek to steer future urban growth into less hazardous areas and incorporate low carbon development principles. During project preparation, the design of feasibility studies has been supported by a grant by the Global Facility on Disaster Reduction and Recovery (GFDRR), where a team of experts is working closely with the cities to ensure that resilience aspects are integrated within the technical design of investments. The GFDRR grant is also being used to carry out an overall assessment of coordinated urban planning capacity of each of the seven local governments, with an aim to highlight the needs for capacity building and recommendations for revision of the master plans. In addition, incorporation of universal accessibility for the elderly and disabled within designs of roads and upgraded urban space is being carried out in collaboration with the Tokyo Development Learning Center (TDLC).

Climate Change Co-Benefits: The primary threat that climate change poses to investments under this project is through increased flood risk. The level of exposure of infrastructure investments to flooding exacerbated by climate change varies across project cities based on elevation and proximity to the sea. Mitigation measures recommended by the GFDRR team during preparation stages and incorporated into design include (i) Increasing the drainage capacity of canal systems, and (ii) Preserving green spaces for water retention within city limits. Climate-all engineering designs will incorporate climate and disaster risks. All master plans

developed will take into climate and disaster risks and seek to steer future urban growth into less hazardous areas and incorporate low carbon development principles.

1.1.2. Project objectives

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

1.1.3. Project Components

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

Component 1: Upgrading tertiary infrastructure in Low Income Areas (LIAs)

The Project will support tertiary investments in about 30 LIAs, covering about 650 ha, including: (a) construction, rehabilitation, and upgrading of roads and lanes; (b) construction and rehabilitation of drains; (c) 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; (d) improvement of water supply including the installation of metered domestic connections; (e) provision of metered domestic connections for electricity and public lighting in residential lanes and streets; and (f) 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) based on extensive community consultations and social surveys to identify priority investments. Investments are designed with flexible standards, attention to universal accessibility and screened to minimize social and environmental impacts. Attention has also been paid to align inundation solutions at the tertiary investments with recommendations from the hydrological modelling at the primary and secondary scale. The consultation process and updating of CUPs is on-going throughout the project cycle, from upstream identification through to construction.

Component 2: Priority Primary and Secondary Infrastructures

Component 2 provides support to improve priority networked infrastructure in line with the broader city development agenda, and with a view to increasing connectivity between 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. Assessments of disaster and climate risk will be used to inform the technical design of investments. An initial hydraulic model will be developed for the catchment areas of the upgrading sites and integrated with existing urban plans for flood and salinity intrusion control, drainage, and waterways investments. Investments that increase urban connectivity of roads and drainage networks are prioritized to encourage compact urban development and reduce flood risk within the core city and particularly for populations living in LIAs.

Component 3: Resettlement Sites

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

Component 4: Implementation Support and Capacity Building

This component will provide support for project implementation as well as capacity building in the following areas: (i) undertaking review of Master Plans, sectoral plans and existing strategies, (ii) support for better land use planning, (iii) technical inputs on the design of green

and resilient infrastructure; (iv) promoting the development of public spaces and infrastructure using principles of accessibility for disabled and elderly, and (iv) strengthening the capacity of cities with regard to leveraging ICT in city planning functions.

The seven cities will revise their master plans within the project cycle, particularly with a view to incorporating a climate risk-informed perspective. This component will directly support the revision of master plans and simultaneously strengthen the integrated urban planning processes through this exercise. Additional grant funds may need to be raised by the task team to ensure a greater hands-on support to the cities for a credible re-drafting the master plans in line with the principles of compact city design, public transport oriented development, mixed land use and future needs for affordable housing.

Component 4 also focus on providing support to improve the government capacity for project implementation, particularly to strengthen project coordination, implementation, monitoring and evaluation, including independent monitoring of safeguards, financial auditing, and project management. One city will be selected as the coordinator for implementation, and will receive additional support for taking on this role. While there is a reduced coordination role of the MOC as compared to previous urban upgrading operations, but the agency will continue to stay involved from a knowledge sharing and capacity building perspective in the project. It will also provide some support activities such as for monitoring and evaluation to track urban indicators.

1.2. BASIC OF LAWS, LEGISLATIONS AND REGULATIONS

1.2.1.National Regulations and Technical Basic

a) 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;
- Law on Water Resources No. 17/2012/QH13 passed by the National Assembly on 21 June 2012;
- 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;
- Construction Law No. 50/2014/QH13 issued on 18 June 2014 and took effect since 01 January 2015;
- Law No. 27/2001/QH10 on fire protection and prevention dated 29 June 2001 of the National Assembly;
- 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. 25/2013/ND-CP of 29 March 2013 of the Government on environmental protection charges for wastewater;
- Decree No. 174/2007/ND-CP of 29 November 2007 on environmental protection charges for solid waste;
- Decree No. 88/2007/ND-CP of 28 May 2007 of the Government on urban and industrial park water drainage;
- Decree No. 179/2013/ND-CP of 14 November 2013 on sanction of administrative violations in the domain of environmental protection;
- 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. 140/2006/ND-CP of the Government dated 22 November 2006 on regulations for establishment, appraisal, approval and organization of implementing of strategies, planning, plans, programmes and development projects;
- Decree No. 38/2015/ND-CP of 24 April 2015 of the Government on management of waste and discarded materials;
- Decree No. 80/2014/ND-CP of 06 August 2014 of the Government on drainage, and wastewater treatment and took effect since 01 January 2015;
- Decree No. 59/2015/ND-CP of 18 June 2015 of the Government on management of construction investment projects;
- Decree No. 83/2009/ND-CP of 15 October 2009 of the Government on amending and supplementing a number of articles of Decree No. 12/2009/ND-CP of the Government on management of investment projects on the construction of works;

- 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. 22/2010/TT-BXD of 03 December 2010 of the Ministry of Construction on labor safety in work construction;
- Circular No. 09/2009/TT-BXD of 21 May 2009 of the Ministry of Construction detailing the implementation of a number of articles of Decree No. 88/2007/ND-CP of 28 May 2007 of the Government on urban and industrial park water drainage;
- Circular No. 36/2015/TT-BTNMT of 30 June 2015 on hazardous waste management;
- Circular No. 19/2011/TT - BYT of 06 June 2011 of the Minsitry of Health guiding labor hygiene, laborers' health and occupational diseases;
- Circular No. 16/2009/TT-BTNMT and 25/2009/BTNMT of the Ministry of Natural Resources and Environment on the issuance of National technical regulations on environment;
- Circular No. 32/2013/TT-BTNMT of 25 October 2013 of the Ministry of Natural Resources and Envrionment on the issuance of national technical regulations on environment;
- Circular No. 10/2007/TT-BTNMT of 22 October 2007 on guiding quality assurance and control in environmental monitoring;
- 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;
- Decision No. 16/2008/QD-BTNMT dated 31 December 2008 of the Ministry of Natural Resources and Environment on the issuance of national technical regulations on environment;
- Decision No. 22/2006/QD-BTNMT dated 18 December 2006 of the Ministry of Natural Resources and Envrionment on compulsory application of Vietnam's standards on environment;

b) Applicable Vietnam's Technical Standards and Regulations

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

+ Water quality:

- QCVN 08:2015/BTNMT - National technical regulation on surface water quality.
- QCVN 09:2015/BTNMT - National technical regulation on underground water quality.
- QCVN 14:2008/BTNMT - National technical regulation on domestic wastewater.
- QCVN 40:2011/BTNMT - National technical regulation on industrial wastewater.
- QCVN 25:2009/BTNMT - National technical regulation on wastewater of the landfill sites: Permitted maximum concentration of pollution parameters in wastewater of the solid waste landfill sites when discharging into receiving sources.

+Air quality:

- QCVN 05:2013/BTNMT – Air quality – National technical regulation on ambient air quality.
- QCVN 06:2009/BTNMT – Air quality – Permitted maximum concentration of hazardous substances in ambient air.
- TCVN 6438:2001 - Road traffic means - Permitted maximum level of exhaust gas.

+ Quality of soil and sediment:

- QCVN 03:2015/BTNMT – Soil quality - National technical regulation on the allowable limits of heavy metals in the soils.
- QCVN 15:2008/BTNMT - Soil quality - National technical regulation on the pesticide residues in the soils.
- QCVN 43:2012/BTNMT - National technical regulation on sediment quality in fresh water areas.

+ Noise and vibration:

- QCVN 26:2010/BTNMT - National technical regulation on noise.
- TCVN 5948:1999 - Acoustic - Noise emitted by accelerating road vehicles - Permitted maximum noise level.
- QCVN 27:2010/BTNMT - National technical regulation on vibration.

+ Water supply and drainage:

- TCVN 7957:2008 - Drainage and sewerage - External Networks and Facilities - Design Standard
- TCXDVN 33:2006 - Water Supply - Distribution System and Facilities. Design Standard.

+ Labor safety and health:

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

c) Legal documents related to the Subproject

- Decision No. 758/QĐ-TTg dated 08/ 06/ 2009 Approving the National Urban Upgrading Program in Period of 2009-2020;
- Decision No. 1659/QĐ-TTg dated 07/11/2012 of Prime Minister approving the National Urban Upgrading Program in period of 2012-2020;
- Decision No. 445/QĐ-TTg dated 07/4/2009 of the Prime Minister approving modification of the master plan for development of vietnam's urban system by 2025 with vision to 2050;
- Decision No. 2623/QĐ-TTg in 2013 of Prime Minister on approval of the scheme "Vietnam's urban development for response to climate change";
- Decision No. 403/QĐ-TTg in 2014 of Prime Minister approving national action plan on rapid growth;
- Decision No. 11/2012/QĐ-TTg dated 10 February 2012 of Prime Minister approving the master plan on development of transport in the Mekong river delta key economic region through 2020, with orientations toward 2030;

- Decision No. 1397/QĐ-TTg dated 25 September 2012 of Prime Minister approving irrigation planning in Mekong River Delta from 2012 - 2020 and orientations to 2050 in relation to climate change, high sea rise;
- Decision No. 1581/QĐ-Ttg dated 9 October 2009 of Prime Minister approving the construction plan on MKRD toward 2020 and vision to 2050;
- Decision No. 245/QĐ-TTg dated 12 February 2014 of the Prime Minister approving the master plan on socio-economic development of the Mekong delta key economic region through 2020, with orientations toward 2030;
- Decision No. 939/QĐ-TTg dated 19 July 2014 of Prime Minister approving the master plan on socio-economic development of the mekong river delta till 2020;
- Decision No. 1810/QĐ-TTg dated 04 October 2013 of Prime Minister approving the orientation, criteria of using WB fund in period 2014-2018 and following years;
- Aide Memoire of World Bank team on identifcation of the Vietnam Scaling Up Urban Upgrading Project from 21 to 29 March 2016;
- Aide Memoire of World Bank team on preparation of the Vietnam Scaling-Up Urban Upgrading Project from 6 to 14 October 2016;

d) Documents and Data Prepared by the Subproject Owner

- The feasibility study report description of the project "Viet Nam scaling up Urban grading Vinh Long city sub-project". The report was approved by the People's Committee of Vinh Long City in conjunction with the consultant.
- The designs of the project "Viet Nam scaling up Urban grading Vinh Long city sub-project".
- The relevant legal documents were provided by People's Committee of Vinh Long City.

1.2.2. Safeguards Policies and Guidelines of WB

The ESIA is carried out in compliance with the World Bank's 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 Vinh Long subproject:

- Environmental Assessment (OP/BP 4.01)1
- Involuntary Resettlement (OP/BP 4.12) 2
- Natural Habitats (OP/BP 4.04) 3
- Indigenous People (OP/BP 4.10);
- Physical Cultural Resources (OP/BP 4.11) 4 .
- Project on International Waterways (OP/BP 7.50)5.

World Bank Group Environmental, Health, and Safety Guidelines[6]

- 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 VINH LONG CITY SUB-PROJECT

1.3.1.Vinh Long Sub-project location

Vinh Long City is located in the centre of the Mekong Delta, lying between the Tien River and Hau River (Co Chien river). The geographical coordinates of Vinh Long are 105057' - 106000' East Longitude and 10013'- 10015' North Latitude, stretching over 60 km along the western bank of Hau River. It borders with Tien River to the north, with Long Ho district to the South East; with Chau Thanh district of Dong Thap province to the West. The city has 11 administrative sub-units, including 7 wards and 4 communes, covering a total area of 48.01 ha, of which there is 23.76 ha of agricultural land. According to the Census 2014, Vinh Long City has a population of 141,136 people and 96.3% of the population are working in agriculture sector. The construction works of the project will be taken place in 5 wards which are ward 1, 2; 3, 4 and 9.

1Full treatment of OP/BP 4.01 can be found at the Bank website: http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,contentMDK:20543912~menuPK:1286357~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html

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

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

4 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

5 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

6The EHS Guidelines can be consulted at www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines.

Figure 1.1: The administrative map of Vinh Long Province

1.3.2. Detailed Description on Vinh Long sub-project investments

The sub-project of Vinh Long follows the structure of the main project, having 4 components as the following:

Component 1: Tertiary Infrastructure Upgrading in Low Income Areas

- Tertiary Infrastructure Upgrading for 03 LIAs (LIAs 1, 3, and 4), including a total area of 49.9 ha and 4,715 people.

Component 2: Priority Primary and Secondary Infrastructures

- Dredging, embankment and construction of road along both sides of Kinh Cut Canal with a length of 540m. The road includes 6m width, 3m width of sidewalk on each side, culvert and manhole for drainage and wastewater system, and lighting and trees.
- Dredging, embankment and construction of road along both sides of Cau Lau Canal with a length of 760m. The road includes 4m width, culvert and manhole for drainage and wastewater system, and lighting and trees.
- Upgrading P2-P9 road with a total length of 1.9km, width of 6m, 3m width for sidewalk on each side, culvert and manhole for drainage and wastewater system, and lighting and trees.
- Construction of Bo Kenh Street in Ward 3 with a total length of 2.2km, with the width of 14m, and 6m width for pavement on each side, culvert and manhole for drainage and wastewater system, and lighting and trees.
- Construction of Vo Van Kiet road with a total length of 0.62 km, width of 16m and 7.5m width for pavement on each side, culvert and manhole for drainage and wastewater system, and lighting and trees.

Component 3: Resettlement Sites

- Resettlement area is available in ward 4. Purchasing land lots for resettled households.

Component 4: Implementation Support and Capacity Building.

- Capacity building includes technical assistance, support for implementation, enhancing capacity and mitigation measures for environmental protection and Improving capacity for urban planning integrated with resilience for climate change.

Table 1.1: The project's physical work components

No.	Investment Items	Description of Proposed Investments
1	**Component 1: Tertiary Infrastructure Upgrading in 3 LIAs, covering total area of 49.9 ha and involving 4,715 people**	
	Upgrading and widening of alleys	**Proposed work includes:** • Widen existing main alleys of average 2.5m width to the width of 4.0 to 5.5 m with concrete/asphalt structure, with the total length of 4.4 km. • Widen and upgrade existing small alleys to the minimum width of 2.0 m with concrete structure, with the total length of 4.52 km. • Provide concrete sewerage system with box/pipe's diameter from D400-800, total length of 8.75 km. The wastewater from household will be collected to the wastewater receptors and to be treated under a WWTP funded by ADB. • Provide water supply pipes D63-100, with the total length of 13.12 km • Provide street lighting, waste bins and garbage trolleys. • Dredging, embankment and tree landscaping for 4.1km small canals in LIA1,3,4 with the following details: In LIA 1: 0.98 km long of 3 small canals of existing 5 - 8m wide. In LIA 3: 1.5 km long of 6 small canals of existing 3 - 10m wide. In LIA 4: 1.66km long of 5 small canals of existing 4 - 9m wide The embannkment structure combines of vertical UPVC pile of 2m high (after dredging) and soil revetment with slope of 1:1.25. This soft structure will be greened by grass.
2	**Component 2: *Priority Primary and Secondary Infrastructures***	
2.1	Upgrading Bo Kenh Road (Ward 3)	• Upgrade the existing Bo Kenh 3-m wide earth road to the asphalt road, with the width of 14 m, and 12 m pavement (2x6m). The total upgrading length: 2.2 km. • Construction of drainage system of total 3km storm-water concrete pipe D600 and 3km wastewater UPVC sewer pipe D220 along 2 sides of the road. • Provision of street lighting and tree planting along the sidewalk.
2.2	Upgrading P2-P9 (Ward 2, 9) Road connecting national way 53 and national way 1A	• Upgrading the existing 3-4 m wide concrete P2-P9 road to the asphalt road of 19.5 m (10.5m road bed and 2 side pavements of 4.5m each), total length of 1.9 km. • Construction of drainage system of total 3.5km storm-water concrete pipes D600 and 3.5km wastewater UPVC sewer pipes D220 along 2 sides of the road.

No.	Investment Items	Description of Proposed Investments
		• Provision of street lighting and tree planting along the sidewalk.
2.3	Construct and upgrading Vo Van Kiet Road, connecting to the city center in the areas of the ward 2,3,4.	• Construct Vo Van Kiet asphalt road with total length of 0.62 km, width of 16 m and 15 m sidewalks (2x7.5 m). • Construction of drainage system with 3.5km storm-water concrete pipe D800 and 3.5km wastewater UPVC sewer pipe D220 along 2 side of the road. • Provision of street lighting and tree planting along the sidewalk.
2.4	Embankment and upgrading of Cau Lau and Kinh Cut Canals	**<u>Embankment and upgrading of Cau Lau canal</u>** • Dredging Cau Lau canal from current 22-28m wide, 3.76m depth to the designed width of 22-28m wide, and depth of 5.3 m, total length of 0.86 km • The canal structure of Cau Lau combines of 2-step soil revetment (a sallow step of 1m wide; a steep step of 1:1.5 slope and 2.37m wide) and a vertical concrete pile of 3.78 m height from the canal bottom. The steep slope of the revetment will be covered by grass while landscaping trees will be planted on the shallow part. • Construction of operational roads at the two sides of the embankment of 4.0 m road wide and 1 m each side for segregation row (by flower pots). Total length is 0.86Km. • Installation of drainage system along 2 sides of the operational roads with stormwater concrete pipe D=600 m, wastewater UPVC D200. Pipe length is 0.86km each side. • Installation of street lighting. **<u>Embankment and upgrading of Kinh Cut Canal</u>** • Dredging Kinh Cut canal from the existing 15-20m wide, 2.76m deep to the designed 18-20m wide and 5.3m depth. Total canal length is 0.54 km. • The canal structure of Kinh Cut combines of 2-step soil revetment (a sallow step of 0.63m wide; a steep step of 1:1.5 slope, 1.58 m height and 2.37m wide) and a vertical concrete pile of 3.78 m height from the canal bottom. The steep slope of the revetment will be covered by grass while landscaping trees will be planted on the shallow part. • Construction of operational roads at the two sides of the embankment. Left side of the canal will be provided with a 4.0 m wide operational road, canal adjacent sidewalk of 3m wide and residential sidewalk of 2m wide). Right side of the canal: the operational road will make use of the current Nguyen Du street, which is 6 m wide. The sidewalk along the canal side will be 3 m and the sidewalk adjacent to the residential house is 2m. • Installation of drainage system along 2 sides of the operational roads with stormwater concrete pipe D=600 m, wastewater UPVC D200. Pipe length is 0.54km each side • Installation of street lighting.
3	**Component 3**: **Resettlement Sites**	
	Resettlement areas at ward 4.	• RAs at ward 4 with total area of 9.4 ha are available. The project will purchasing land plots for resettled households.
4	**Component 4**: ***Implementation Support and Capacity Building.***	
		• Support for improving capacity for project implementation

No.	Investment Items	Description of Proposed Investments
		(management capacity for social safeguards, finance, procurement, monitoring and evaluation, including audits and learning inside/outside Vietnam). • Support for strengthening the capacity of MOC and participating cities for strategic and integrated urban planning, land management and utilization of GIS and enhanced capacity for disaster and climate risk-informed urban planning.

Figure 1.2 below presents the summary of all investments proposed by Vinh Long City.

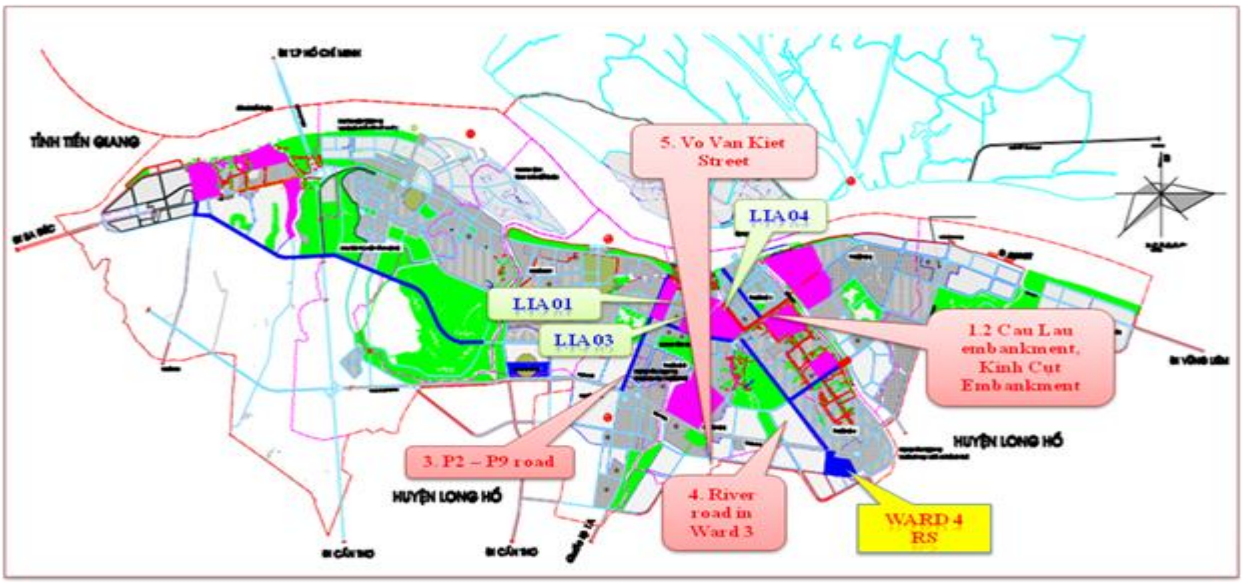


Figure Error! No text of specified style in document.1.2. Layout of investment items of Vinh Long subproject

1.3.3. Construction methods

The road construction process typically includes the flowing work:

Site clearance: this is the first phase of the construction work, providing a clean site for the construction to be implemented quickly and efficiently. During this period, site leveling and reallocation of basic infrastructure such as power lines/ poles, cable telecommunication lines, water supply pipes will be conducted.

Construction phase: The constructions of alley, roads, canal dredging under component 1 and 2 will involve processes of excavation of soil material, transportation of construction materials, road compacting and leveling, asphalt layering, embankment/ road enforcement and installation of sewer systems, road lighting, tree planting...

Canal dredging and embankment include steps similar to the road construction processes but also have different steps because of dredging. Dredging is the process of excavating or removing sediments from the bottom of rivers/canals for the purpose of improving drainage capacity of the canals. At Kinh Cut canal, the hydraulic dredging method will be applied as the canal width is sufficient for barge carier. It is involved with a hydraulic crane of either backhoe or front shovel model. Dredging materials are carried on the barge to the disposal site. In Cau Lau, there are many bridges cutting through and narrow cross sections, the dredge materials will be deposited onsite temporarily before being transported to the disposal site by trucks.

The construction of embankment will be done by 50-100 m incremental segments in which the two ends of the segment will be blocked and water will be channeled via pipes or pumped out prior to the construction of the embankment's foot and slopes.

The dredging and construction processes should not be implemented during extreme weather events such as heavy rain, big floods or hurricane.

List of machinery and equipment estimated to be used

Table 1.2 provides a list of key equipment deployed for construction work. Depending on the nature of work, contractor capacity, and weather conditions the use of equipment may vary.

Table 1.2: The proposed list of equipment, machines use for project

No.	Machine	Component 1			Component 2					Component 3
		LIA 1	LIA 3	LIA 4	Upgrading Bo Kenh road	Upgrading P2-P9 road	Construction of Vo Van Kiet road	Kenh Cut Canal	Cau Lau Canal	Resettlement area
1.	Excavators with one bucket, bucket capacity of 0,8m3	1	1	1	3	2	5	3	5	3
2.	Bulldozers 108 CV	1	1	1	3	2	5	3	5	3
3.	scraper 1,20m3	-	-	-	3	-	-	-	-	-
4.	Self-propelled graders 108CV	1	1	1	2	1	4	2	4	2
5.	Excavator 2m3	1	1	1	2	1	4	2	4	2
6.	Road roller 10T	1	1	1	3	2	6	3	7	2
7.	Wheeled Compactors 16T	-	-	-	2	2	3	3	3	2
8.	Watering Car 5m3	1	1	1	2	2	4	3	4	2
9.	Crane 130T	1	1	1	2	2	3	2	4	2
10.	Mortar mixers	4	4	4	4	3	6	6	6	7
11.	Water pumps	1	1	1	3	2	3	3	3	2
12.	Asphalt machines	-	-	-	2	1	3	3	3	2
13.	Pile presses	-	-	-	-	-	1	1	1	2
14.	Generator	1	1	1	1	1	1	1	1	1
15.	Tipper cars	2	2	2	5	3	6	6	8	6
16.	Bending mowers	3	3	3	10	4	8	8	8	6
17.	Electric welding machines	3	3	3	10	2	6	6	6	5
18.	Welding transformers	1	1	1	4	2	2	2	2	4
19.	Toad compactor	5	5	5	5	4	6	5	6	5
20.	Concrete Drill	3	3	3	4	1	2	2	2	2

1.3.4. Demand for Raw Materials, Fuels and Disposal Sites

a) Construction materials:

According to the feasibility study report of the project "Upgrading and expanding urban Vietnam - subproject Vinh Long City, Vinh Long Province", the demand for raw materials used for the construction project are presented in the following table 1.3:

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

No.	Items	Weight					
		Cement (kg)	**Sand (m^3)**	**1×2 stone (m^3)**	**Asphalt (kg)**	**Macadam type 1 (m^3)**	**Macadam type 2 (m^3)**
1.	LIA 1	544,067	628	1,194	9,418	-	1,732
2.	LIA 3	481,960	528	1,030	-	-	1,548
3.	LIA 4	900,095	987	1,923	-	-	2,891
4.	Upgrading Bo Kenh Road	73,265	1,364	1,333	375,756	3,591	4,988
5.	Upgrading P2-P9 road	84,833	2,065	1,984	580,114	5,544	7,700
6.	Construction of Vo Van Kiet Road	21,208	1,071	1,000	310,775	2,970	4,125
7.	Kenh Cut Canal	41,645	280	324	69,746	-	1,166
8.	Cau Lau Canal	29,306	42	76	-	-	-
9.	Resettlement Area	**2,176,380**	**6,965**	**8,864**	**1,345,809**	**12,105**	**24,150**
Total							

b) Supply sources

Materials such as sand, earth materials and gravel will be purchased from Can Tho or from An Giang the nearby provinces.

- Steel will be purchased at factories in Can Tho and Ho Chi Minh City. Cement will be purchased from factories in Kien Giang, Can Tho.
- Hollow brick, solid brick, pavement tiles and glazed brick will be bought from Ho Chi Minh City, Long An, Dong Nai, Binh Duong province.

Locations of potential sources, capacities and operation permits are listed in Tables 1.6.

All the materials shall be tested for the quality according to the current regulations. If the materials do not meet the technical standards, the contractor shall change to the other qualified sources. Demands for materials and technical supplies will be in accordance with the construction progress.

The material supply will take into account the depreciation due to transport and unloading.

Table 1.4: Locations of Potential Stone and Sand Sources

Item	Sand sources	Stone sources	Earth Sources
Supplier/Companies (Will be identified at later stage)			
Location	Tan Chau of An Giang	Dong Nai, An Giang	Nearby
Distance from project (km)	10-60	150	
Capacity (m^3)	2,000 m^3 to 5,000 m^3	2,000m^3 to 5,000m^3	2,000m^3 to 5,000m^3
Transportation	Domestic Waterway	Domestic Waterway	Road
Environmental License	Obtained by supplier	Obtained by supplier	Obtained by supplier

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

c) Fuel and Power Supply

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

d) **Water Supply**

Water sources for work execution will mainly come from Co Chien and Long Ho rivers. For construction areas that are afar from the water sources or the water is under quality , water tank trucks shall be used for transferring water to the construction sites.

For domestic water use, depending on conditions of given sites, water can be supplied from the available centralized water supply schemes or the permitted groundwater wells at the construction sites. Where water schemes are not accessible, water from wells will be purified through an on-site simple filter system and/or clean water in tanks is supplied to ensure the hygienic/clean water is available for use.

e) Wastes and Waste Treatment

The construction works in Vinh Long project include roads, canal embankment, sewage installation, green space development thus the waste generated during the construction work will be typically solid waste, sludge and domestic waste and wastewater. There is no hazardous waste generated as according to the quality test of sludge, metals are under acceptable limits but organic content is higher. Thus sludge is classified as organic contaminated sludge. The amount of waste is estimated based on the scale of the proposed investments.

Table 1.5: Solid waste and sludge generated from construction work

Components	Excavated soil (m^3)	Dredged Sediments (m3)	Landfilling (m3)	Domestic wastes (kg)
Component 1	15,427.500	17,406.000	28,790.000	1,610
Component 2	75,545.000	39,000,000	176,040.000	5,760
Total	**90,972.500**	**56,406.000**	**204,830.000**	**7,370**

Excavated soils: The amount of excavated soil estimated to be 91,000 m^3 from the constructions of connecting roads between ward 2 and 9, Bo Kenh Road, Vo Van Kiet Road, operational roads

behind the canal embankments, among others. This soil is reused for leveling where needed or disposed at Hoa Phu landfill.

Dredged Sediments: The estimates of sludge is about 56,406 m^3 from the installation of sewage system in 03 LIAs, improvement and embankment of Cau Lau and Kenh Cut canals. According to the analyses, the sediments from the canals and lake 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 Hoa Phu landfill.

Hazardous waste: will be collected and temporarily stored in the repository located in the construction area before being transported out for treatment at an appropriate waste treatment facility as according to the contract between the contractor and waste facility.

Domestic Waste: This waste generated from the activities of workers on site. It is estimated about 240 kg/ day and added up to total about 7,3 tons

Waste Treatment Facilities and Disposal Sites

Vinh Long currently has 2 waste facilities: Hoa Phu landfill and Phuong Thao Waste Treatment Plant (WTP). Both facilities are located in Hoa Phu commune, Long Ho District of Vinh Long City, 13 km far from Vinh Long City.

Waste from canal dredging and other solid waste from the project will be transported to these sites for treatment or landfilling. The contractor should make an assessment on the capacity and treatment technology of the facilities to make sure the waste to be treated appropriately and compliantly with the regulations. It has also to make an agreement with the local authorities on their waste management plans. What ever the option selected, it has to be justified based on cost-effective analysis and get agreements by the local authorities. Observations on the disposal sites are summarized as follows:

Hoa Phu Disposal/ Landfill Site:

Hòa Phú disposal site (18.36 ha) receives the solid waste and domestic waste from Vinh Long City and 5 districts of Măng Thít, Long Hồ, Tam Bình, Bình Tân and Vũng Liêm of Vinh Long province. The site managed by One Member Vinh Long Public Utility Ltd and operated since 2012 with total landfilling capacity of 86,000 tons. Currently it received 70,000 tons already and daily load of about 120 tons.

The sludge will be physically screened to remove garbage before being dumped to waste cells, sprayed with biological enzyme and covered with 20 cm layer of sand to minimize bad odor. After 2- 3 months the sludge is dried out then can be used for leveling the disposal site.

The leachate from the landfill is stored in a lagoon next to the sanitized landfill. The leachate is often pumped back to the landfill to increase the moisture, accelerating the biological degradation processes. Water level in the lagoon is measured and controlled to avoid overflow, especially in the rainy season. The treatment of leachate in the pond follows chemical and biological treatment, disinfection and being discharge to the natural lake.

Phuong Thao Waste Treatment Plant:

Phuong Thao WTP (8 ha) deploys a treatment technology from Germany (300 tons/ day), destructing the original waste volume by 93%. The investment started in 2009 however the plant was closed in 2013 after 9 months of operation due to lack of input waste, low treatment fee and other legislation obstacles. The WTP resumes to work since September 2016 after 2 years of

closing with the support from the province authority in renovating the equipment and leveraging the treatment fee so the company can make a return. Currently, it receives daily load of 215 tons/ day from different districts in the province such as from Vinh Long City (120 tons), Long Ho (26 tons), Binh Minh (17 tons), Mang Thit (8 tons), Binh Tan (10 tons), Tam Binh (19 tons) and Vung Liem (15 tons). The WTP can treat domestic waste, medical waste and industrial waste. It is understood that the SWP does not recover the heat generated from waste incineration. The contractor/ province authority should check on whether the emitted smoke is toxic to the environment.

Transportation dredged sediments and other waste from construction site to the waste treatment plant and landfill needs to be in good cover to ensure the waste does not leak along the transportation route. Due diligence on disposal site is included in Annex 2.

1.3.5. Project areas of influence

The Project areas of influence (AOI) are mainly determined by the locations of the LIAs that are the main focus of Project interventions, but including ancillary aspects of the project such as the disposal sites for the dredged materials and solid wastes coming from the project. The LIAs selected for upgrading works comprise a relatively small but in the core area of the city, scattered along the canals. The upgrading of primary and secondary infrastructure involves improvements of connecting roads and installation of wastewater drainage. The resettlement sites are located within 3-5 km close to where people currently live.

The project's area of influence extends beyond its actual locations, mainly through the ongoing discharge of drainage and wastewater flows. Beside the footprints of project components 1, 2 and 3, AOI extends further a distance of 500 m beyond, considering sensitive receptors within that area, including residential areas, schools, hospital, religious buildings and traffic system. This distance is selected based on the most significant impact which is noise caused by pilling works to sensitive receptors. The area of influence is variable and dependent on either direct or indirect impacts and the affected resource. The ecology boundary extends 1 kilometer from the project area and surface water's boundary is ranging between 50m upstream and 50m downstream.

Dust, noise, vibrations and degraded quality from odors and exhaust fumes will mainly be confined close to the LIAs and construction sites, but nearby schools and temples may be affected. Local traffic and the larger connector roads will be affected beyond the actual sites as a result of materials transport to and from the LIAs and construction sites. Businesses, public and religious facilities, such as schools, pagodas and churches in the vicinity of actual construction sites, are particularly affected by traffic disruptions. As an important mitigation measure, the implementation of the project will be in two phases. This means that through good planning, coordination, scheduling and construction, the areas affected by the construction activities will be limited.

The need for the disposal of excavated unsuitable material and of dredged materials will extend the area of influence of the project to the transportation corridors, i.e. canals and rivers for transport by barges, and the disposal sites in Hoa Phu commune. Moreover, the need for good quality gravel and sand as construction materials extends the area of influence to quarries and borrow sites, at times well outside the city boundaries. The ESIA review showed that existing permits for legal excavation cover the project's needs but during project implementation, full compLIAnce with local environmental regulations dealing with sand extraction, will have to be enforced and monitored. Generally, large quantities of construction materials, such as gravel and stones from the provinces will be transported by barge on rivers and canals, extending the area of influence but reducing impacts.

Transportation routes between the construction sites and disposal sites run through:

- Pham Hung, Vo Van Kiet route: collecting solid and construction waste and domestic waste from the construction area LIA 1 and P2-P9 Road;

- Le Thai To route: Collecting solid and construction waste and domestic waste from the construction area of LIA 3 and embankment of Cut canal

- Mau Than route: Collecting solid waste and domestic waste from construction areas of LIA ; embankment of Kinh Cut and Cau Lau canal and Upgrading Bo Kenh road;

- National Highway No. 53: Collecting solid waste and domestic waste from construction areas of Bo Kenh road and P2-P9 road.

Table 1.6 below tabulates the detailed footprints generated from the project and sensitive receptors bounded within the area of influence.

Table 1.6: The area of influence and the sensitive receptors subjected to project activities

No.	Components	Location	Area of Influence and Sensitive Receptors	
			Air, Noise and Vibration	Aquatic Ecology
1.	**Tertiary infrastructure upgrading in 03 LIAs (LIA 01, 03, 04)**			
1.1	LIA 01	Ward No.2	Resident area (within distance of 10-150 m), Church (150 m), Long An pagoda and Truong To Secondary School.	
1.2	LIA 03	Ward No.2	Resident area (10-150 m); Chanh toa church (70 m), Hoa Sen Kindergarten, Ngoc Thuan Monastic, Giac Hoa Pagoda.	Cau Lo River
1.3	LIA 04	Ward No.3	Resident area (10-150 m); Vinh Long Oratory (55 m), Toa Giam Muc church (50 m), Nguyen Du Market (50 m), Tan Giai communal house, Long Hoa Pagoda, Ngo Quyen High School.	Cau Lo River; Kinh Cut River
2.	**Enhancing connectivity with road construction, canal dredging and embankment improvements**			
2.1	Upgrading Bo Kenh road connecting new urban area and the RA at ward 4 with the old urban area	Ward No.3 and 4	Resident area (10-250 m).	
2.2	Upgrading P2-P9 road connecting NH 53 and NH 1A	Ward No.2 and 9	Resident area (10-250 m), Church (150 m), Long An pagoda (80 m), Truong To Secondary School.	
2.3	Construction of Vo Van Kiet connecting the city center with Wards 2,3,4	Ward No.2 and 3	Resident area (10-250 m), Vinh Long University of Technology Education; Vinh Long Teacher Training College.	Cau Lo river

No.	Components	Location	Area of Influence and Sensitive Receptors	
			Air, Noise and Vibration	**Aquatic Ecology**
2.4	Embankment of Kenh Cut canal	Ward No. 3	Resident area (10-250 m), Vinh Long Oratory (55 m), Toa Giam Muc church (50 m), Nguyen Du market	Cau Lo river and Co Chien river (one of the band of Tien river)
2.5	Embankment of Cau Lau canal	Ward No. 4	Resident area (10-250 m); Cau Lau Market; Loan Trâm Poly-Clinics; Hưng An Tự; Clinic of No1. Ward.	Long Ho River and Co Chien River (one of the branch of Tien River)
3.	**Resettlement Area**			
3.1	Resettlement Area at Ward No.4	Ward No.4	Resident area (10-500 m)	
3.2	Resettlement Area at Ward No.9	Ward No.9	Resident area (10-500 m)	

1.3.6. Implementation Arrangements

❖ **General information**

a) Line Agency: People's Committee of Vinh Long province.

- Address:No. 88, Hoàng Thái Hiếu Street, Ward No. 1, Vinh Long city, Vinh Long province

- Telephone:0703.823100 Fax: 0703.823774

b) Project's owner: People's Committee of Vinh Long city.

- Address: No. 79; 30/4 street, Ward No. 1, Vinh Long city, Vinh Long province

- Telephone: 0703 822143 - 0703 824383 Fax: 0703.834951

c) Proposing agency: People's Committee of Vinh Long city.

- Address: No. 79; 30/4 street, Ward No. 1, Vinh Long city, Vinh Long province

- Telephone: 0703 822143 - 0703 824383 Fax: 0703.834951

Project's management and implementation: Project's owner directly manages the implementation of the project.

❖ **Implementation arrangements:**

f) Viet Nam Government and the World Bank

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

g) People's Committee of Vinh Long province will

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

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

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

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

Organize and direct the implementation the approved plans, periodically reporting to the Ministry of Construction.

Approve the feasibility study report of Vinh Long's subproject.

h) Project's Owner –People's Committee of Vinh Long city:

Develop and implement the procurement plan in compLIAnce with the law on procurement

Provide information and documents related to the contract and advise the setting up and implementation of programs and projects; to be responsible for the legal basis and the reLIAbility of the information and documents provided; to record and keep documentation of programs and projects in accordance with the law.

Take full responsibility for management and utilization of investment capital from the preparation, investment and implementation. Exploit the possibility of investment return to repay the on-lended ODA.

Perform supervision, project assessment, management and exploitation of the programs and projects;

Take full responsibility for errors or violations committed in the course of program/project management which cause adverse effects on the economy, society, ecology, environment and national prestige

Be responsible in accordance with the law to compensate for any economic loss or to change the project's owner for any delay or violation with the investment decisions and approved documents or technical assistance, causing loss, waste and corruption, affecting the objectives and overall effectiveness of the programs and projects;

Other rights and responsibilities as prescribed by law.

Investment Fund And Implementation Progress Of The Project

Table 1.7: Total investment fund of project

TT	Items	Unit: USD ($)		
		IDA fund	**IBRD fund**	**Counterpart fund**
I	**Component 1: Tertiary infrastructure upgrading 03 LIAs**	**7,253,656**	**-**	**545,822**
1	LIA 1	2,677,864		134,771
2	LIA 3	1,788,733		258,311
3	LIA 4	2,787,059		152,740

TT	Items	Unit: USD ($)		
		IDA fund	**IBRD fund**	**Counterpart fund**
II	**Component 2: Upgrading LIA connecting roads, canal dredging and embankment improvements**	**7,897,898**	**12,395,881**	**2,670,710**
1	Embankment of Cut Cannal	4,100,458		898,473
2	Embankment of Cau Lau Cannal	3,797,439		808,625
3	Upgrading P2-P9 road		3,823,046	294,250
4	Upgrading Bo Kenh road (P3)		5,177,808	287,511
5	Construction of Vo Van Kiet		3,395,027	381,851
III	**Component 3: Resettlement Area**			**1,221,698**
IV	**Component 4: Strengthen urban management ability**	**1,377,372**		**2,341,532**
	Total (I+II+III+IV)	16,528,925	12,395,881	6,779,762
C	VAT:10%*(A+B) **not including compensation cost and PMU cost**	1,652,893	1,239,588	301,228
D	Contigency cost (10%)	1,818,182	1,363,547	708,099
E	Grand	20,000,000	14,999,015	7,789,089
F	**Toatl ODA, Counterpart fund**	34,999,015		7,789,089
G	Total investment fund	42,788,104		
	Percentage	46.7%	35.1%	18.2%

Implementation Progress Of The Project

Table 1.8: Implementation Progress of the Project

No.	Component	Phase 1 (2017-2018)	Phase 2 (2019-2022)
1	Component 1	LIA 1, LIA 3, LIA 4	
2	Component 2	Construction of Bo Kenh street Embankment and constructio of road along both sides of Kinh Cut and Cau Lau river	Upgrading P2-P9 Vo Van Kiet road
3	Component 3	Buying land for resettlement of affected HHs	
4	Component 4	Implementing a part of work items for PMU such as buying equipment, capacity improvement…	

1.4. METHODS TO BE APPLIED DURING THE IMPLEMENTATION OF ESIA

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

1. ***Checklist:*** This method is a common approach which is widely to applied for defining the study area, sampling sites, identifying influence/impact areas, sensitive areas may be affected by the project's activities during pre-construction and construction phases.
2. ***Rapid assessment:*** Empirical emission factors and coefficients were applied for calculating fugitive exhausts and dust (TSP) emission; predict noise and vibration generation spreading over nearest settlements; greenhouse gas emission; solid and hazardous wastes; etc. For air emissions, Sutton model…., was adopted to modeling emissions of dust and exhausted gases as a rapid assessment for the project's activities. Further, WHO's rapid inventory source techniques (1993), including Environmental Assessment Sourcebook (Volume II, Sectoral Guidelines, Environment, World Bank, Washington D.C 8/1991) and Handbook of Emission, Non-Industrial and Industrial source, Netherlands) were deployed for these rapid assessments.
3. ***Expert adjustment:*** This method was deployed with the experts' knowledge and experience, in associated with site investigation, on socio-economic development situation, inhabitants' life, cultural and religious asset; natural environment (current status of baseline conditions on air, water and soil quality); regional and local climate characteristics such as hydro-meteorology, geology, geography, topology, and landscape; and ecology (flora and fauna characteristics); etc.
4. ***Matrix*****:** This technique was applied for the prediction of potential impacts caused by the project activities. This matrix is set up based on sources causing impacts and potential objects affected by the project.
5. ***Comparison:*** Results of survey on natural environment and laboratory analysis were compared with national technical regulations on the physical environment components to assess the baseline conditions of the environments in the project area.
6. ***GIS mapping:*** Use GIS, coordinate to available maps (such as topographical map) and special soft-wares (such as MapInfo, AutoCAD) to create comprehensive maps serving ESIA process, including: maps of sampling sites for flora and fauna survey; maps of sampling sites for air quality and surface water quality.
7. ***Field investigation and survey:*** Based on available environmental data and maps (topographical map, existing land use map of Vi Thanh city, etc), the implementation of on-site measurements, sampling, investigations and field surveys on natural environment components (air, water, soil and flora and fauna) in the project area was conducted throughout the year both in dry and rainy seasons.
8. ***Sample analysis:*** All water, air and soil samples collected in the field were stored and brought the laboratory for analyzing at Technology centers, Department of Defense.
9. ***Public consultation***: Public consultation is used to help identify opportunities and risks, improved subproject design and implementation, and increase subproject ownership and sustainability. Public consultation is specifically required by the World Bank's environmental and social safeguard policies. A meaningful public consultation will be used. This is a two-way process in which beneficiaries provide advice and input on the design of the proposed subproject that affect their lives and environment, promotes dialogue between governments, communities, and implementing agencies to discuss all aspects of the proposed subproject. The feedbacks from consultation will be incorporated into the subproject ESIA and design. Those affected by the subproject include those resettled and those in the nearby communities affected by subproject impacts, intended beneficiaries of the subproject, key interest groups – depends upon the project, local mass organizations, including women's unions, local, state and central governments, other donor and development agencies, and other stakeholders.
10. ***Disclosure of information:*** Disclosure of the subproject information including the subproject safeguards and instruments will allows the public access to information on environmental and social aspects of the subprojects. Disclosure is mandated by policies for the WB's Environmental Assessment, Involuntary Resettlement, and Indigenous Peoples. The

subproject safeguards and instruments will be disclosed in country and in local languages and at the World Bank Infoshop, like all consultations, it is an ongoing process during the subproject preparation and supervision process.

11. ***Statistical and data processing*****:** All statistical data and documents acquired from local levels (Commune, Ward and City levels), as well as on-site measurements were processed and expressed in tables, figures and charts for interpretation. This data is systematized according to time, adjusted to serve the determination of natural and socio-economic environment situation; the analysis of trend in environmental change in the project area. These data are very crucial to make the basis of environmental impact assessment and prediction when implementing the project, as well as proposing countermeasures.

CHAPTER 2. NATURAL, ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS OF THE PROJECT AREA

2.1.GEOGRAPHIC CONDITIONS

2.1.1.Geological conditions

Vinh Long City has a flat terrain which is slightly tilted in different directions: high in the Northeast, low in the southwest, high from Co Chien River and lower inward to the field. This area has a network of rivers and canals interlaced with evlevation ranging from 1 to 1.5 m above sea level (Hon Dau national landmark). Inner areas include wards 1, 2, 3, 4,5, 8 and 9 with base elevation ranging from 1.4 to 2.5 m, while Tan Ngai, Truong An, Tan Hoi, Tan Hoa communes have base elevation of 1.0 to 1.5 m and that of fields of 0.5 - 1.0 m.

Main types of geomorphology:

Land strip along Tien River: This area is alluvial enriched annually during flood season. Its terrain is 0.3 to 0.6 m higher than common elevation of the inland fields. Its surface is mainly used for agricultural production (fruit gardens, paddy rice field) and development of housing, ports, public construction and traffic.

Inner area: Land surface has been leveled for public works, housing, offices, roads with elevation +1.5 to + 2.5 m concentrated in wards 1, 2, 4 and 9, ward and commune facitilies, and some residential areas. Low density of construction, non-synchronous construction period has led to some high land parcels and some low land parcels (causing temporary flooding when there is high tide).

Delta: This is the remaining part of the city, used for agriculture production (rice fields, fruit gardens). To protect agriculture during flood season, canals were constructed with elevation +2.0 to + 2.2m to function as containing ponds with area of 100-300 ha.

Geological, tectonic characteristics:

Like many other areas in Mekong Delta, Vinh Long province has Kanozoi loose sedimentary soil located on Mezoic bedrock, with considerable thickness, around 800-1000 m. Sediment types can be classified into the following main layers:

- Holocene layer (QIV): located on surface to depth of about 35-48m. This is young sediment, including sand and clay. Grain components are from fine to medium.

- Pleistocene layer (QII-III): The depth from 88 to 207m, containing sand and gravel and clay with marine sediments.

- Pliocene layer (N2): The thickness from 304 to 359m, containing sandy clay with medium particles.

- Miocene layer (N 1): The thickness from 420 to 440m, containing sandy clay with medium particles.

Irrigation and infrastructure facilities are mainly built on Holocene layer which has soft sediments. This layer has a high clay content with lots of organic impurities, usually in water-saturated status, so it has poor load-bearing capacity. According to the survey documents of drilling lake in My Thuan and some geology documents, it has soft soil with poor load-bearing capacity so when implementing construction, foundation treatment is necessary. For canals, their banks contain soils with high content of dust and clay, usually in condition of water saturation. Therefore, during design, construction and operation management, it is necessary to have protection and treatment measures to prevent erosion along canals. Materials used for

construction are only river sand and clay, and other materials must be transported from other places, such as Ha Tien or from the Southeastern.

2.1.2.Climate condition, hydrographic and oceanographic

Climate characteristics

a) Climate conditions:

Vinh Long city is located in tropical monsoon area with all year-round warm, humid weather, high temperatures, and stable throughout a year. Every year, the whole region is affected by two monsoons which are North-East monsoon, taking place from November, December to March, April of the next year. South-West monsoon occurs from May, June to October - November. South-West monsoon plays an important role in climate variability in the entire region due to high humidity, causing continuous heavy rains during rainy season. Duration and intensity of monsoons decides climate pattern in seasons each year. In general, the rainy season coincides with the South-West monsoon, from May to November, lasting 6- 7 months, and dry season coincides with the northeast monsoon season, from December to April of the next year, lasting 5 months.

b) Temperature Characteristics:

Mekong Delta in general, Vinh Long City in particular has high annual temperatures, ranging from 26.5-27.4^{0}C. April is the hottest month with average temperature from 27.6-28.6^{0}C, the highest average temperature varies from 35.7 to 38^{0}C. January is the coldest month with average temperature from 24.9-25.2^{0}C, the lowest average temperature is from 17.0-19.0^{0}C. Average temperature among different months varies between 2.9-3.4^{0}C.

Due to climate fluctuations, the month with highest and lowest temperature of a year may change. Among all monitored years, 80-90% has the highest average temperature in April and 10-20% in May. The lowest average temperatures occur in January accounting for 85%, December about 15% among all monitored years.

A day usually has the highest temperature at 1- 2 pm and the lowest temperature usually at 3-4 am. The biggest daily amplitude is in dry season (7-8^{0}C) and the lowest is in rainy season (6-7^{0}C), the absolutely lowest is 16.2^{0}C for a short time during the day. Average temperatures above 35.^{0}C lasts 4-5 days in dry months. 206 days / year has an average temperature of 26.0 - 28.0^{0C}.

c) Humidity Characteristics:

In Mekong Delta, humidity pattern is closely related to and decided by rain pattern. Annual relative average humidity is from 83.1 to 84.7%. September and October have the highest average relative humidity, ranging from 88.0 to 89.4%. January and February have the lowest average relative humidity, ranging from 76.0 to 81.2%.

d) Evaporation Characteristics:

Annual average evaporation amount (Piche) in Vinh Long is 930 mm, which is lower than that of the entire Mekong Delta which is about 1000 mm and some neighboring provinces such as Tra Vinh: 1,137 mm, Can Tho: 1,148 mm. In dry season, because of much sunshine and low air humidity, evaporation amount is high. The highest is in March of about 115 mm. In rainy season, evaporation amount is lower compared to that of dry season, September and October have the lowest evaporation amount which is 51-53 mm.

e) Wind Characteristics:

Two windy seasons are made of the northeast and the southwest monsoon. The former usually starts from November in the northeast and a little bit later in the Southwest, ending in April in the area near East Sea and a little bit earlier in West Sea. The main component is eastern wind accounting for 50 ÷ 70% of all occurrences during the month.

The latter normally starts from May in West Sea, a little bit later in East Sea, usually ending in early October in West Sea and a little bit earlier in East Sea. The main component is western wind which makes up 40 ÷ 50% of all occurrences during the month. The average wind speed is 1.2 ÷ 2.5 m / s, the highest wind speed varies from 20 ÷ 24 m / s.

f) Sunshine characteristics:

Mekong Delta in general and Vinh Long City in particular has high number of sunshine hours. The average number of sunshine hours per year is from 6.4 to 7.7 hours / day. February, March and April have the highest number of sunshine hours (average 8-10 hours / day). August, September and October have the lowest number of sunshine hours (average 5-6 hours / day). High number of sunshine hours per day is favorable characteristics for plant growth and development. It's a good condition for intensive cultivation of short-day crops.

g) Rainfall:

Mekong Delta in general, and Vinh Long City in particular has abundant and relatively stable annual rainfall. Spatially, annual rainfall variation is quite clear. Vinh Long City has an average annual precipitation of 1400-1900 mm which is comparable to the entire Mekong Delta.. Monsoon pattern gives Vinh Long province in general and Vinh Long City in particular a rainy season and a dry season which are considerably contrary. Rainy season starts from May to the end of November, coinciding with the period of the southwest monsoon, the rainfall during rainy season accounts for 93-96% of annual rainfall. Dry season begins in December and end in April of the next year, coinciding with the northeast monsoon with total rainfall making up14 -17% of annual rainfall.

The annual average number of rainy days in Vinh Long City is relatively high (on average103-127 days / year). Similar to annual rainfall, the number of rainy days in a year tends to decrease gradually from the southwest to the northeast of the province

During rainy season, rainfall increases from May (154-216 mm) and reaches the highest level in September-October (215-329 mm), then gradually decrease, in November average rainfall reaches only about 115-154 mm.

Hau River area has high rainfall, and rainy season starts earlier than Co Chien River (in Can Tho and Dai Ngai) in May the average rainfall reaches 174 -216 mm, while in Vinh Long and Tra Vinh, rainfall reaches only 154-173 mm.

During dry season, except for the first and the last months of the season (XII and IV), rainfall is around 50 mm with approximately 3-8 rainy days. During months at mid dry season, rainfall reaches approximately 10 mm with 1-2 rainy days. February has the smallest rainfall from 2-8 mm.

h) Rainfall characteristics on max days:

Rain in Mekong Delta in general, Vinh Long City in particular is affected by southwest monsoon and tropical low pressure activities in East Sea. During rainy season, there are usually long-lasting heavy rains, occuring frequently in the first months of rainy season (V-VI). Generally, there are 1-2 heavy rains (40-50 mm / day), creating significant buffer layer of water from July to August and increasing flooding depth in September and October. Analysis of rainy day document recorded at Vinh Long station shows the possibility of rainfall on max days corresponding to different levels:

During September and October, likelihood of daily rainfall reaching more than 50 mm is the highest (38.39 to 51.61%); during remaining month, it reaches 16.13 to 35.48%.

Rainfall on a max day in September and October is relatively stable. Therefore, the average rainfall on a max day in September and October is the highest (51.1-56.5 mm), in remaining months, average rainfall on a max day reaches only 39.5-46.5 mm.

September and October have about 60-70% of rainfall on 5 max days including rainfall on 3 max days and 1 max day (rainfall on 3 max days always includes rainfall of 1 max day). In remaining months, the likelihood of coverage of rainfall in 5 max days within 3 max days doesn't exceed 50% of monitored years.

i) Rainfall of short-duration rains

For urban areas in general and Vinh Long City in particular, the situation of flooding and drainage capacity are closely related to short-duration rains. In studied area, there are no stations which record short-duration rains by themselves. Therefore, the calculation of short-duration rains for research of drainage in Vinh City Long is based on short-duration rain document of Cang Long station (Tra Vinh Provice) 37 km from Vinh Long City center to the southeast.

According to "Temporary regulations on summarizing annual dangerous weather phenomena " of National Centre for Hydrometeorological Forecasting, heavy rain is one with amount of 51-100 mm in 24h which can affect on human life.

Analysis of statistical documents on short-duration rains (2000-2009) at Cang Long station shows that rains usually occur for a short period of time 30 to 120 minutes, with some rains lasting 2.5 to 3.0 hours or more. On average, the number rains lasting 3 hours or more is 8.4 rains/ year (15 rains in 2001, 11 rains in 2003 and 2008 and less than 10 rains in remaining months). On average, every 2 years, there are 3 rains with rainfall of 50 mm or more. 3-hour rain with rainfall of 106 mm is the highest which recorded during 16-19h on October 29, 2000. On average, rainfall of 3-hour rains is 72.1 mm every year.

According to results of a survey on flooding situation, Vinh Long City is usually flooded with 3 hour or more rains, especially in areas where drainage or sewer system is not capable of draining out storm water. This serves as the basis for identifying rainfall patterns and designing storm water drainage system for Vinh Long City.

Hydrological characteristics

Vinh Long city is under the irregular semi-diurnal regime from the East sea via 2 major rivers of Tien and Hau, Mang Thit river and a system of canals. Water level and amplitude of tide in the rivers are relatively high, tide spreading high, in flood season, the tide amplitude is around 70 - 90 cm in rainy season and in dry season, the tide amplitude varies from 114 – 140cm. Co Chien river is one branch of Tien river, with length of 59km running through Vinh Long with average width ranging from 800-2,500 m, depth 20 – 40m, flow rate in dry season from 1,530 – 5,800m3/s and from 9,900 to 13,400 m^3/s in rainy season. Hau river is the second major branch of Mekong River running through Vinh Long with length of 46km, with average width ranging from 1,500 -3,000m; depth 15 – 30m, flow rate in dry season from 1,175 – 4,900m3/s and from 9,100 to 13,150 m^3/s in rainy season.

Mang Thit river connecting Tien (Co Chien) and Hau rivers with estuary at the Tien river greater than that of the Hau river. Due to impacts of high tide from Co Chien river and Hau river, Mang Thit river flows 2 ways in and out the estuaries, specifically, in high tide, water runs in from Quoi An and Tra On estuaries and when tide descends, water runs out to the sea via these two estuaries, the water adjacent area of these two directions is Ba Ke estuary (Thay Hanh intersection) 17km from Hau river. Mang Thit river is not affected by salinity so it always has

fresh water to supply for agricultural, industrial activities and daily activities of people in the area. However, due to the low-lying terrain of the land in northern area of Mang Thit river, it is very difficult for water drainage.

Water level and amplitude of tide in the rivers are relatively high, tide spreading high, in flood season, the tide amplitude is around 70 - 90 cm and in dry season, the tide amplitude varies from 114 – 140cm and in combination with the inner canal system, it can be provide self-irrigation for the cultivated lad, help the crops and plant grow well.

Climate and weather condition are very favorable for agriculture in intensive crops and for development of natural biodiversity. However, the rainfall only concentrating in 6 months of rainy season and with alluvial flood from the upstream of the Mekong creates localized inundated area, affecting agricultural production and living condition of people as well as biological environment of the area.

2.1.3. Natural Resources

- *Natural Resources:*

Land use/Soil type: The land is formed by the deposit of retrogradation sea during the Holocene period (5,000 – 11,200 years ago) under impacts of the Mekong River. Soil type of Vinh Long city is categorized as alluvium sedimentation, sand ridge soil; soil from river dredging.

- *Surface water resources:*

Vinh Long has a river network of Tien, Co Chien, Hau and Mang Thit together with canals distributed densely in the entire of its land therefore surface water is sufficient to supply for domestic, irrigation, aquaculture, agriculture and industrial usages. According to the monitoring at Can Tho hydromet station, water level averaged from several years in the dry season (April) is from 495 to 1,220m^3/s, and in the flooding season (October) is from 12,200 to 17,600m^3/s; At My Thuan on Tien River, the flow on dry season is from 898 to 1,900m3/s, and at Cổ Chiên River of the same time is from 618 to 887m3/s. The water availability is not only sufficient for the provincial usages but can also supply to the neighboring provinces such as Trà Vinh, Bến Tre, Hậu Giang, Cần Thơ.

- *Groundwater resources:*

Vĩnh Long is also rich in groundwater with exploitable amount of 183,657 m^3/day. Groundwater found in 7 layers in which the shallow layer distributed within 100 - 150m depth and deep layer is at 350 m depth. The monitoring data from 2008 shows that the water level is not significantly decreasing.

- *Mineral resources:*

Vinh Long province is poor in terms of mineral resources. River sand is distributed mainly in the rivers of Co Chien, Tien, Pang Tra, Hau, with a total reserve of 129.8 million m^3. Clay, the raw material for production of brick, tiles, and ceramic products, has a reserve of 200 million m^3 of good quality.

- *Forest resources:*

Situated in the center of the Mekong Delta, Vinh Long is the only province that does not have forest. There are about 140,00 ha of land planted with scattered trees. The flora here has been replaced by the agriculture ecosystem and planted trees. Vinh Long is famous for its fruit tree orchards in islands where there are many specialiy fruits which are valuable for both agriculture economy and ecotourism. The fauna comprises mainly domestic animal and aquatic species. The fresh water fishery resources in the rivers of Tien and Hau, ponds, lakes, and streams are a great potential for capture and aquaculture. There are precious and rare animals such as weasel, viper,

squirrel, boucal, crocodile, etc. and some imported animals such as ostrich, guinea-fowl, and monkey

- *Biological resources:*

a. Terrestrial ecosystems

Terrestrial ecosystems in Vinh Long include agroecosystems, urban ecosystems and industrial zones. These ecosystems are artificial ones with poor and unsustainable living organism composition.

According to results of the report "Basic study, overall environmental assessment, studying and building guidelines and regulations on environmental protection for prioritized manufacturing and business sectors in Vinh Long" of the Institute of Environmental and Sustainable Development (2002), higher flora and fauna were recorded in Vinh Long as follows:

- Higher plants: 218 species with their 65 families, 30 orders, 2 phylums (Polypodiophyta and Magnoliophyta).

- Fauna (birds, mammals, reptiLIAs, amphibian): 103 species with their 50 families, 20 orders in four classes of fauna (mammal, bird, reptiLIAs and amphibian classes).

* The fauna recorded in Vinh Long include:

- Stork, birds, sparrow, spotted doves, suamp hen, ducks, chickens, geese, ...

- Cats, dogs, cows, buffaloes, goats and pigs.

- Amphibia amphibians (frogs): Represented by Kaloula pulchra, Microhyla, Bufo melanostictus, Rhacophorus leucomystax, Rana rugulosa),…

- ReptiLIA: Represented by Hemidactylus frenatus, Mabuya multifasciata, Acanthosaura lepidogaster, Elapidae, Trimeresurus steinegeri, Columbridae),...

b. Aquatic ecosystems

Aquatic ecosystems are river ecosystems and pond ecosystems. River ecosystems have medium and relatively stable biodiversity. Pond ecosystems have poor biodiversity.

- According to report "Assessment of fishery resources, protection measures and aquatic resources development in Vinh Long " of the Aquaculture Research Institute No.II and Sub-Department of Fisheries Resources Protection dated 12/2006, there are 132 species of algae, 93 species of zooplankton, 69 benthic species. Most of them are freshwater species.

- The results of the survey, sampling and analysis of phytoplankton, ephemera, benthic fauna at two big rivers (Tien and Hau rivers) in Vinh Long province in 11/2009 implemented by Ho Chi Minh City Institute for Environment together with Vinh Long Center of Technological Sciences for Natural Resources and Environment show that identified species compositions include:

+ Phytoplankton: 75 species of algae have been identified in which Chrysophyta (24 species) dominates, followed by Cyanophyta (22 species), Chlorophyta (20 species), the Euglenophyta (8 species), Dinophyta (1 species). Average algae density reaches 2,100 individuals / liter.

+ Ephemera: 52 species have been identified in which Rotatoria dominates with 27 species, followed by plankton (10 species), Copepoda (7 species), Lavar (4 species), Cladocera (3 species), Ostracoda (1 species). Average density reaches 74,000 individuals / m^3.

+ Benthic fauna: 26 species of 13 families, 6 classes and 4 phylums. Mollusca dominates species composition.

The number of identified species varies from 15 - 20 species. At the sampling point in Tien river (in Vinh Long City) 20 species are found and at Hau river (Tan An Thanh commune - Binh Tan district) 15 species are found. In other places , the number of species varies from 16 - 18 species.

At the sampling points, there are Limnodrilus hoffmeisteri, Branchiura sowerbyi - showing that water is contaminated by organic substance; the sampling point at Tra On town - Tra On district has the highest density of Limnodrilus hoffmeisteri with 260 individuals / m^2 and Branchiura sowerbyi with 210 individuals / m_2. This shows that the water environment in the province is being suffered from organic contamination. It is necessary to come up with solutions to protect valuable freshwater resources and biodiversity in the province.

According to Resolution No. 21/NQ-HDND dated 03 August 2016 on adoption of biodiversity conservation planning in Vinh Long province 2015-2020 and vision to 2030, Co Chien river corridor; Hau river corridor located in Vinh Long is one of six routes planned for biodiversity corridors. In the project area, there are no protected areas, national parks nor planning area for biodiversity protection.

c. Terrestrial Biological Resources in the Subproject Area

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

d. Aquatic Biological Resources in the Subproject Area

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

2.2. EXISTING ENVIRONMENTAL QUALITY IN THE PROJECT AREA

To evaluate the quality of environmental components at the project area, the city and consultants coordinated with Centre for Technology Enviroment Treatment to carry out the survey, measurement and sampling of environment components in accordance with Vietnam standards and analyzing in the laboratory, as well as collecting relevant information and data. For detailed results of each analyzed sample, refer to the Annexes. The methods of measurement and sampling, storage, transportation, treatment and analyzing of samples in laboratory are carried out in compliance with regulations of Vietnam's applicable standards.

2.2.1.Air quality

a) Sampling locations: Air samples are collected from 20 different locations in the project rea and the surroundings following guidelines from technical regulations on. Appexdix 3 provides the exact positions of these sampling sites. The sampling map is shown in Appendix 4. The air samples are analyzed for common air pollutants, including total suspended particles (TSP), SO_2, NO_2 and CO gases and the results are presented in Table 2.1.

b) Analysis results

Table 2.1: Measurement results of ambient air environment in the project area

No	Location	TSP (mg/m^3)	CO (mg/m^3)	NO_2 (mg/m^3)	SO_2 (mg/m^3)
1	KK1	0.163	1.142	0.051	0.042
2	KK2	0.21	1.126	0.052	0.044
3	KK3	0.247	6.342	0.064	0.057
4	KK4	0.255	2.73	0.055	0.043
5	KK5	0.145	7.241	0.066	0.052
6	KK6	0.194	2.11	0.058	0.047
7	KK7	0.167	1.625	0.053	0.046
8	KK8	0.215	8.24	0.065	0.053
9	KK9	0.236	4.24	0.068	0.055
10	KK10	0.183	3.631	0.052	0.046
11	KK11	0.158	1.142	0.051	0.042
12	KK12	0.149	1.126	0.052	0.044
13	KK13	0.235	6.342	0.064	0.057
14	KK14	0.186	2.73	0.055	0.043
15	KK15	0.228	7.241	0.066	0.052
16	KK16	0.189	2.46	0.058	0.046
17	KK17	0.214	4525	0.06	0.049
18	KK18	0.195	3.32	0.057	0.045
19	KK19	0.224	5183	0.063	0.052
20	KK20	0.228	5267	0.065	0.054
Test method		*TCVN 5067-1995*	*HD03-PT-CO*	*TCVN 6137-2009*	*TCVN 5971-1995*
QCVN 05: 2013/BTNMT: National Ambient Air Quality Standards (1 hour on average)		**0.3**	**30**	**0.20**	**0.35**

Results of ambient air samples taken in the project area are within the allowable limit. Concentrations of total suspended particular (TSP), NO_2 and SO_2 are lower than allowable limit specified in the National Ambient Air Quality Standard (QCVN 05: 2013/BTNMT). However, 9

of 20 samples of KK2, KK3, KK4, KK8, KK9, KK13, KK15, KK17, KK19, KK20 show high concentration of CO (> 30 mg/m^3). CO is the incomplete oxidation gas resulted from combustion process thus, the elevated concentration of carbon monoxide might be resulted from firewood or coal stove burning for cooking at residential areas. Overall, the project area has relatively clean air environment but air pollution was likely to be contaminated due to the construction work thus appropriate environmental measures should be provided by contractors.

At these sites, noise and vibration level are also measured. Sampling results are tabulated in Table 2.2.

Table 2.2: Measurement results of noise and vibration level in the project area

No	Sampling location	Noise (dBA)	Vibration (m/s^2)
1	KK1	54-63	0.003
2	KK2	56-67	0.004
3	KK3	63-74	0.006
4	KK4	53-63	0.004
5	KK5	62-71	0.005
6	KK6	55-63	0.004
7	KK7	53-60	0.003
8	KK8	59-67	0.006
9	KK9	62-73	0.005
10	KK10	58-69	0.004
11	KK11	54-63	0.003
12	KK12	56-67	0.004
13	KK13	63-74	0.006
14	KK14	53-63	0.004
15	KK15	62-71	0.005
16	KK16	56-67	0.005
17	KK17	57-70	0.007
18	KK18	56-68	0.006
19	KK19	59-72	0.007
20	KK20	61-72	0.008
Test method		TCVN 7878/2-2010	TCVN 6963:2001 *(EL - CALC version 1.1.08)*
QCVN		55-70 (+)	0.03 (++)
		No. 26: 2010/BTNMT - National Technical Regulation on noise	*No. 27:2010/BTNMT- National Technical Regulation on vibration.*

Vibration in the project area is within the allowable limit (QCVN 27: 2010/BTNMT). Noise level is within the allowable limit (QCVN 26: 2010/BTNMT) except for 06 locations namely KK3, KK9, K13, KK15, K19 and K20 where it is slightly higher (from 1 to 3 dBA) than the limit. It is due to the fact of high volume of traffic at the time of measuring.

2.2.2. Surface water quality

a) Sampling location: Surface water is sampled in canals, rivers subjected to the project's civil work and of the surroundings. 12 locations and samping map with detailed coordinates are presented respectively in Appendix 3,4.

b) Analysis results

According to the monitoring results of surface water quality in the project area, as indicated in Table 2.2, surface water quality at NM1, NM2, NM6, NM7, NM8 and NM9 in Cau Lau and Kenh Cut rivers are containminated with organic substance. Chemical oxygen demand (COD_5) is higher than the allowable limit set forth in QCVN 08: 2015/BTNMT, the National Technical Regulation on Surface water quality in which B1 standards are applicable to water used for irrigation purposes and B2 standards are applicable to other usages.

Biochemical oxygen demand (BOD5) is higher the allowable limit set forth in QCVN 08: 2015 (B1 type) with value in the range of 0.2 mg/l - 13.7 mg/l. Because Cau Lau and Kenh Cut rivers are currently receiving waste and domestic wastewater from households living along the two rivers' embankments.

The slightly high level of pollutants in the surface water at several monitoring sites near to Mau Than market such as NM9, NM10, NM12 explained by the direct discharge of waste water and garbage from households along the canals/river. In addition, sewage system in the city is incomplete and Cau Lau and Kenh Cut canals are among the wastewater receiving bodies. Table 2.2 as below shows water quality measuring results in the project area.

Remark (for Table 2.2). Applicable standard follows QCVN 08: 2015/BTNMT (Column B1)-National technical regulations on surface water quality; ND- not detected

Table 2.2: Results of surface water quality in the project area

No.	Symbol	pH	Total suspended solids (TSS)	Dissolved oxygen (DO)	Chemical oxygen demand (COD)	Biochemical oxygen demand (BOD 5)	Ammonium (NH4+) (measured by N)	Nitrite (measured by N)	Nitrate (NO3-) (measured by N)	Phosphate (PO43-) (measured by P)	Chloride (Cl^-)	Fe	Surface active agent	E. Coli	Coliform
		-	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	MPN/ 100ml	MPN/100 ml
1	NM1	7.6	39.8	4.23	**32.4**	**17.3**	ND	0.005	1.987	0.163	23.62	1.247	0.632	10	$36x10^2$
2	NM2	7.82	48.7	3.18	**47.2**	**24.6**	ND	0.009	2.573	0.214	24.3	1.362	0.78	30	$39x10^2$
3	NM3	7.55	35.4	4.37	**30.1**	15	ND	0.003	1.812	0.158	23.47	1.25	0.563	20	$34x10^2$
4	NM4	7.51	31.6	4.46	28.1	14.2	ND	0.005	2.32	0.146	21.75	1.192	0.547	40	$32x10^2$
5	NM5	7.45	32.8	4.5	29.7	**15.3**	ND	0.005	1.695	0.137	22.1	1.187	0.486	20	$31x10^2$
6	NM6	7.57	40.6	4.18	**33.5**	**17.8**	ND	0.006	1.737	0.165	23.37	1.245	0.68	50	$37x10^2$
7	NM7	7.62	46.3	3.76	**45.4**	**23.7**	ND	0.008	1.932	0.201	23.97	1.358	0.742	70	$38x10^2$
8	NM8	7.81	47.6	3.42	**46.9**	**23.6**	ND	0.007	2.377	0.194	23.85	1.357	0.764	40	$37x10^2$
9	NM9	7.76	45.2	3.58	**44.7**	**23**	ND	0.006	2.963	0.178	23.52	1.36	0.757	60	$36x10^2$
10	NM10	7.47	30.2	5.15	27.3	13.8	ND	0.008	1.53	0.137	21.54	1.188	0.542	50	$31x10^2$
11	NM11	7.43	28.6	5.22	26.3	13.1	ND	ND	1.126	0.134	21.32	1.179	0.53	40	$29x10^2$
12	NM12	7.52	32.1	4.98	28.6	**15.2**	ND	0.005	1.634	0.148	21.64	1.195	0.548	50	$33x10^2$
QCVN 08: 2015	**B1**	**5.5-9**	**50**	**≥ 4**	**30**	**15**	**0.9**	**0.05**	**10**	**0.3**	**350**	**1.5**	**1**	**100**	**7500**
	B2	**5.5-9**	**100**	**≥ 2**	**50**	**25**	**0.9**	**0.05**	**15**	**0.5**	**-**	**2**	**1**	**200**	**10,000**

Remark: QCVN 08: 2015/BTNMT (Column B1)- National technical regulations on surface water quality. which B1 standards are applicable to water used for irrigation purposes and B2 standards are applicable to other usages. ND- not detected.

2.2.3. Groundwater quality

During the ESIA, we was not able to sample groundwater as there are no boreholes or dug wells in the city. The sampling would be complicated and expensive. We rely on the monitoring data of the city. According to Vinh Long city's Environmental Status Monitoring Report, all quality standards were met except for clorua concentration which is higher than the allowable limitset forth in national technical regulation on ground water quality (QCVN 09: 2015/BTNMT) during 2010-2014. In 2015, this concentration dropped under the allowable limit. The groundwater is often contaminated with Coliform (Table 2.3)

Table 2.3: Ground water quality in Vinh Long city during 2010 - 2015

No	Parameter	Unit	2010	2011	2012	2013	2014	2015	QCVN 09: 2015/BTNMT
1	pH	-	7.70	7.39	7.00	6.68	7.36	7.26	5.5-8.5
2	Iron	mg/l	0.06	0.23	0.61	0.58	0.58	0.667	5.0
3	Manganese	mg/l	0.27	0.35	0.66	0.69	0.72	0.14	0.5
4	Hardness	mg/l	220.55	281.13	470.50	439.50	414.57	736.88	500
5	Chloride	mg/l	**351.83**	**225.60**	**408.34**	**355.43**	**358.00**	**64.43**	**250**
6	Sulfate	mg/l	25.38	35.00	34.38	30.38	32.75	95.8	400
7	Nitrate	mg/l	0.16	0.12	0.21	0.30	0.50	0.012	15.0
8	Arsenic	mg/l	0.0105	0.0054	0.0077	0.0066	0.0122	0.027	0.05
9	Cadmium	mg/l	ND	ND	ND	ND	ND	ND	0.005
10	Coliform	mg/l	4	76	144	23	4	**22.63**	**3**

2.2.4.Current sate of waste water quality

a) Sampling location: Wastewater samples are also collected at some locations in the residential areas of LIAs and of canal embankment work (Appendix 3). The sampling map is shown in Appendix 4.

b) Analysis results: Collected wastewater samples are analyzed for 11 criteria according to the standards for wastewater quality (QCVN14/2008: BTNMT). The results are presented in Table 2.4.

Table 2.4: Waste quality measurement results

No	Criteria Test	Unit	Results					QCVN 14: 2008/BTNMT (Column B)
			NT1	NT2	NT3	NT4	NT5	
1	pH	-	7.32	7.36	7.29	7.4	7.26	5- 9
2	Suspended Solids	mg/l	74.5	75.3	62	76.8	59.4	100
3	COD	mg/l	87.46	90.1	79.6	92.5	71	-
4	BOD5 (200C)	mg/l	44.3	45.2	41.8	46.73	37.2	50
5	Ammonium	mg/l	3.52	3.574	3.12	3.68	2.963	10
6	Sulfur (by H2S)	mg/l	1.863	1.87	1.465	1.925	1.835	4
7	Nitrate	mg/l	7.546	7.562	6.827	7.7	5.625	50
8	Phosphate	mg/l	1.65	1.664	1.455	1.732	1.251	10
9	Total surface active agent	mg/l	1.976	1.89	1.782	1.98	1.362	10
10	Animal fats and	mg/l	0.832	0.843	0.774	0.876	0.581	20

No	Criteria Test	Unit	Results					QCVN 14: 2008/BTNMT (Column B)
			NT1	NT2	NT3	NT4	NT5	
	vegetable oils							
11	Coliform	MPN/100ml	$45x10^2$	$46x10^2$	$43x10^2$	$47x10^2$	$40x10^2$	5,000

Notice: (-) Not regulated ;

QCVN 14:2008/BTNMT: National Technical Regulation on domestic wastewater quality

Analysis results show that wastewater samples taken are within the allowable limit set forth national technical regulation on domestic waste water (QCVN 14:2008/BTNMT-column B) Thus, wastewater at locations in the project area is partly pre-treated before being discharged into the environment.

2.2.4. Soil quality

a) Sampling location: Soil samples are taken in the project areas, along road, bridges and in LIAs. Exact locations and sampling map are provided respectively in Appendix 3, 4.

b) Analysis results: Soils are analyzed for heavy metals (copper, lead, zinc, cadmium and arsenic) as regulated in the Standards (QCVN 03:2015/BTNMT). The results showed that the metal contents (Cd, As, Zn, Hg, Cr (VI), Fe, Pb, Cu) in soils in the project areas are much lower than the allowable limit of QCVN 03: 2015/ BTNMT- National technical regulation on the allowable limits of heavy metals. Results conducted by the City during 2011-2015 (Vinh Long environment report) confirmed the fact that soils are not contaminated with heavy metals and plant protection chemicals (Organochlorine and Organophosphate). The surface soils stripped during the construction can be treated as normal waste.

Table 2.5: Results of measuring soil quality in the project area

Code	Parameter				
	Copper (Cu)	Lead (Pb)	Zinc (Zn)	Cadmium (Cd)	Arsenic (As)
	mg/kg dry soil	mg/kg dry soil	mg/kg dry soil	mg/kg dry soil	mg/kg dry soil
Đ 1	1.652	1.328	6.465	0.11	0.122
Đ 2	2.731	1.412	6.514	0.143	0.118
Đ 3	1.89	1.287	6.327	0.12	0.134
Đ 4	1.62	1.493	6.731	0.16	0.13
Đ 5	1.783	1.42	6.05	0.114	0.146
Đ 6	2.511	1.596	6.352	0.125	0.113
Đ 7	1.84	1.383	5.837	0.12	0.139
Đ 8	2.37	1.319	7.23	0.14	0.126
Đ 9	2.73	1.62	5.729	0.115	0.128
Đ 10	1.922	1.786	6.835	0.19	0.134
Đ 11	2.826	1.81	6.748	0.186	0.142
Đ 12	2.547	1.824	6.81	0.173	0.139
QCVN 03: 2015/BTNMT	100	70	200	1.5	15

2.2.5. Sediment quality

a) Locations: Details of locations, maps where sediment samples are taken are provided respectively in appendix 3, 4.

b) Analysis results

Table 2.6: Sediment quality measurement results

Code	Parameter							
	Copper (Cu)	**Lead (Pb)**	**Zinc (Zn)**	**Cadimi (Cd)**	**Asen (As)**	**Total Hydrocacbon**	**Chlorinated Pesticides**	**P Pesticides**
	mg/kg dry soil	**mg/kg dry soil**	**mg/kg dry soil**	**mg/kg dry soil**	**mg/kg dry soil**	**mg/kg dry soil**	**mg/kg dry soil**	**mg/kg dry soil**
TT 1	9.152	0.867	11.12	0.693	0.021	ND	ND	ND
TT2	11.413	1.12	13.45	0.82	0.047	ND	ND	ND
TT3	9.181	0.928	10.97	0.712	0.039	ND	ND	ND
TT4	8.195	0.896	12.3	0.725	0.032	ND	ND	ND
TT5	8.67	0.752	9875	0.71	0.019	ND	ND	ND
TT6	10.3	0.926	12.6	0.723	0.045	ND	ND	ND
TT7	11.78	0.94	13.42	0.847	0.041	ND	ND	ND
TT8	11.92	0.955	12.71	0.82	0.036	ND	ND	ND
TT9	10.21	0.95	12.87	0.952	0.043	ND	ND	ND
TT10	8.73	0.764	10.43	0.631	0.031	ND	ND	ND
TT11	8.791	0.812	10.38	0.547	0.033	ND	ND	ND
TT12	9.03	0.79	11.2	0.725	0.037	ND	ND	ND
QCVN 43:2012/ BTNMT (fresh water)	197	91.3	315	1.5	17	100	-	-
QCVN 07:2009/BTNMT Ctc (mg/l)	**-**	**15**	**250**	**5**	**2**	**-**		
QCVN 03:2015/BTNMT (Agriculture Land)	**100**	**70**	**200**	**1.5**	**15**	**-**	-	-

Notice: (-) Not regulated; ND: Not detected; QCVN 43: 2012/BTNMT National Technical Regulation on sediment quality.

The results show that concentrations of heavy metals in sediment in the project area are much lower than the allowable limit set forth in the national technical regulations on sediment quality (QCVN 43:2012/ BTNMT). These concentrations are also below the acceptable limits of hazardous waste as specified in QCVN 07:2009/BTNMT and QCVN 03:2015/BTNMT (National technical regulation on the allowable limits of heavy metals). Hazardous elements such as total hydrocarbons, chlorinated pesticides and pesticides are not detected. Therefore, the sediments from the canal dredging work are neither hazardous nor contaminated with heavy metals. 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 would 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 Hoa Phu Landfill.

2.2.6. Aquatic environment quality

a) Sampling location: Details of locations, maps where aquatic environment quality samples are taken are provided respectively in appendix 3, 4.

b) Analysis results

Table 2.7: Aquatic fauna and flora monitoring results

No	Testing criteria	Unit	Testing method	Results						
				TS1	TS2	TS3	TS4	TS5	TS6	TS7
1	**Phytoplankton**	**Cells/liter**								
1.1	*Lyngbya sp*	Cells/liter	10200 APHA 1995	30	20	30	25	45	30	35
1.2	*Coelosphaerium sp*	Cells/liter	10200 APHA 1995	20	15	15	15	25	20	25
1.3	*Pediastrum duplex*	Cells/liter	10200 APHA 1995	20	15	20	15	27	18	24
1.4	*Pediastrum simplex var.duodenarium*	Cells/liter	10200 APHA 1995	30	20	40	30	25	23	34
1.5	*Cyclotella meneghininana*	Cells/liter	10200 APHA 1995	50	45	50	40	45	40	55
2	**Zooplankton**	**Individuals/m^3**								
2.1	*Asplanchna priodonta*	Individuals/m^3	10200 APHA 1995	6000	5000	6000	5000	5500	5700	6100
2.2	*Anuraeopsis fissa Gosse*	Individuals/m^3	10200 APHA 1995	4000	3000	3000	3000	4400	3200	3700
2.3	*Mesocyclops leurkarti*	Individuals/m^3	10200 APHA 1995	7000	6000	7000	7000	7100	6300	6800
2.4	*Bivalvia*	Individuals/m^3	10200 APHA 1995	6000	5000	6000	5000	6500	5200	6100
3	**Benthic fauna (total)**	**Individuals/m^3**								
3.1	*Dero sp*	Individuals/m^3	10500 APHA 1995	35	30	40	40	40	35	20
3.2	*Pomacea bridgesi*	Individuals/m^3	10500 APHA 1995	50	35	50	40	35	30	40
3.3	*Coerbicula moreletiana Prime*	Individuals/m^3	10500 APHA 1995	25	20	25	25	29	35	22
3.4	*Lymmogonus fossarum*	Individuals/m^3	10500 APHA 1995	50	40	60	50	40	45	50
3.5	*Grandiderella lignorum*	Individuals/m^3	10500 APHA 1995	40	30	40	30	20	25	30

Characteristics of species composition: the analysis results found that 14 aquatic fauna and flora species in surface and bottom layers of water bodies.

All analyzed species are freshwater species without any detected brackish and marine water species in the area (data on brackish and marine water species is not presented herein).

Phytoplankton such as Lyngbya sp, Coelosphaerium sp, Pediastrum duplex and Cyclotella meneghininana indicates oxygen is available at moderate amount and is consistent with the dissolved oxygen content detected in surface water samples being greater than 4 mg/l.

The number of zooplankton speices such as Asplanchna priodonta, Anuraeopsis fissa Gosse (with freshwater habitats in neutral pH conditions) found in water, which shows that the area is not impacted by salinity intrusion. However, these species are capable of decomposing organic debris and living in the environment with abundant nutrition. This illustrates that surface water in the area is partly contaminated by organic matter and microorganisms. This happens because most of sampling locations near are within residential areas. Domestic wastewater from households is discharged to canals after pretreatment with 3-chamber septic tank. Particularly, in some cases, domestic wastewater is not pre-treated before being discharge. This is also consistent with the results of surface water analysis in which COD, BOD 5, TSS and colifform are high against the B1 column standard, QCVN 08-MT:2015/BTNMT.

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

The density of zooplankton in the survey area varies significantly, especially with the development of high numbers of protozoa with densities from 3000 - 7000 cells/m3. Protophyta and benthic fauna has modest number just from 30-70 individual/m3. However, the development of protozoa and protophyta is completely consistent with surface water analysis results in the area.

2.3. SOCIO-ECONOMIC CONDITIONS

2.3.1. Economic Development Situation

Up to 2015, Vinh Long city has well mobilized all local resources and results from previous years to continue attracting investments in the development of all economic sectors; increasing investment in development of economic infrastructure, urban - rural agriculture and social welfare; successfully implementing social policies, solving employment issues for people, reducing poverty, providing healthcare service and improving material and spiritual enjoyment for people; improving the quality of education and training; stably remaining mechanism at all levels and promoting the development of economic structure in the direction of trade-services, industrial and agricultural sectors. Economic structure of Vinh Long city in 2015 includes 64% of commercial -services, 32% of industrial and handicaft and 4% of agriculture and fisheries.

2.3.1.1. Trades and services

From 2010 to 2015, total retail sales of goods and services reached over 49,330 billion dongs, with average increase in 5 years of 19.36%. In which, value in 2011 reached over 6,692 billion dongs, increasing 24% in comparison with year 2010; in 2012 reached over 8,293 billion dongs, increasing 23.93% compared with 2011; in 2013 reached over 9,915 billion dongs, increasing 19.55% compared with 2012; as estimated, in 2014 the value reached over 11,362 billion dongs, increasing 14.6% compared with 2013 and in 2015 reached over 13,067 billion dongs, over 15 % from value in 2014. Total retail sales by economic sectors in 2015 includes 72% of trading, 20% of hospitality/hotel-restaurant, 1% of traveling –tourism and 7 % of service.

Trade and service sector of Vinh Long city have developed strongly and firmly both in number of participants, number of laborers, capitals and efficiency. The types of business such as enterprises, cooperatives, small business have also developed significantly, services diversified especially financial and banking service, vocational training, high technology…With the

existence and development of different types of companies, enterprises and individual business households, many domestic enterprises have invested in constructing shopping malls, supermarkets, entertainment activities, festival activities ... to serve the demand for production and consumption as well as to meet the the demands of people for entertainment and relaxation, contributing a major part in accelerating the development of trades and services sector in the area.

Vinh Long city is also a hub for tourists to visit neighboring areas. According to date of the Department of Culture, Sports and Tourism, there are 13 travel agents and 1 representative office, 78 hospitality facilities (6 2-star hotels, 34 1-star hotels, 15 guest houses, 23 homestays), 42 historical relics of national and provincial levels, over 150 waterways means and passenger cars.

2.3.1.2.Industrial – handicraft sector

Value of industrial-handicraft section in the last five years from 2010-2015 has reached over 13,410 billion dongs, with average growth level of 4.16 %. In which, in 2011, the value reached over 2,507 billion dongs, decreasing 3.1% comparing with 2010; in 2012 the value reached 2,365 billion dongs, decreasing 5.66 % in comparing with 2011; in 2013 the value reached over 2,555 billion dongs, increasing 8.03 % comparing with 2012; in 2014, estimated over 2,849 billion dongs, increasing 11.51 % comparing with 2013 and in 2015 reaching over 3,134 billion dongs, over 10% comparing with 2014.

Over the past years, despite of facing many difficulties in industrial production, Vinh Long city has focused on directing the implementation of policies and national, provincial directions in an effective and timely manner to support for the enterprises. Industrial-handicraft products in the city are relatively diversified with various types, in which some sectors have developed well and stably like marine products processing, ceramic, salted duck egg, shoes making, fertilizer, river sand exploitation, centrifugal culvert…Getting these results is thanks to the investment in equipment, technology, increase in product quality, decrease in price and increase in competitiveness in the market in the country and all over the world, bringing high economic efficiency and contributing into economic growth in the area.

2.3.1.3.Agricultural-aquacultural production

Productivity of agricultural – aquacultural sectors in the city was over 2,281 billion dongs, production increase rate was 1.54%, lower than the previous year of 2.46% (Resolution's criteria of annual increase of 3%). In which, the year 2011 reached over 490 billion dongs, increasing 9.9% comparing with 2010; in 2012 reached over 483 billion dongs, decreasing 1,47% in comparison with 2011; in 2013 reached 467 billion dongs, decreasing 3.23% in comparison with 2012, estimated 2014 over 430 billion dongs, decreasing 8.06% comparing with 2013 and as estimated, value in 2015 was over 409 billion dongs, decreasing 1.74% comparing with 2014.

Vinh Long city has changed of agricultural structure toward urban development, thereby reducing cultivation and farming area; applying science and technology into agricultural production, mainly in selecting and breeding species, shifting the production mechanism, constructing farming models for bonsai and flowers, developing the model of special marine products. However, the shifts are small and unsynchronous, not bringing economic value for the city as the setforth criteria of increasing 3% per year.

In the mean time, the area of agricultural land of the city decreased more and more; during the period, rice area has decreased 281.8ha (equal to 20,45%), crops area decreased 57.5ha (7.76%). Moreover, longan which is the main fruit tree in the city has been affected seriously and unrecoverable from the witches broom disease (473.69ha), and the aquacultural breeding has been decreased dramatically of 256 cages (decreasing 79.26%).

2.3.2.Social conditions

Table 2.8: Area, population and population density in the project area

No.	Ward	Area (km2)	Population (people)			Population density (people/km^2)
			Total	Male	Female	
1	Ward 1	0.94	13,204	6,052	7,152	14,047
2	Ward 2	1.53	16,283	7,988	8,295	10,642
3	Ward 3	3.75	17,511	8,577	8,934	4,670
6	Ward 4	3.38	13,898	6,680	7,218	4,112
7	Ward 8	4.70	11,778	5,657	6,121	2,506

(Source: Statistical yearbook of Vinh Long city,2014)

Number of poor households and nearly poor households in the project area, based on SES conducted, is as follows:

No	Ward	Results of the survey in 2015			
		Poor households		Nearly poor households	
		Number of HH	Percentage	Number of HH	Percentage
1	Ward 1	15	0.91	57	1.6
2	Ward 2	79	2.48	131	4.1
3	Ward 3	58	1.6	67	1.87
4	Ward 4	90	3.8	81	3.4
5	Ward 8	80	2.5	27	0.9

(Source: Socio-economic survey, 06/2016)

2.3.2.1. Ethnicity

Presence of many ethnicities in one location forms typical features of culture, custom and living habitats of each region, each country. However, ethnic minority usuall gets limitations in accessibility to necessary conditions for socio-economic development due to people's living habitats and awareness, providing them slower progress in comparison with general development of the country. Thus, it is required to have incentive policies supporting ethnic minorities to facilitate their accessibility and catching up to the development of the country and the world and at the same time reserve unique nature of each ethnicity.

The survey showed that there are 3 major ethnic groups living in the project area. Kinh people accounting for the major percentage (99.6%), Chinese accounting for 0.3% and Khmer accounting for 0.1%. The percentages of ethnic minority accounts for a very small part in the amount of people participating in the survey. According to the Ethnic minority policy of Viet Nam government and the donor, it is very important to support people of ethnic minority to integrate with other lives. The survey shows that people of ethnic minorities are usually shy to make comments or join in discussions. Therefore, it is required to help these people participate more proactively into community's activities and contribute more ideas in the discussion in the area. However, ethnic minorities in the project area has not lived scatteredly in their own community but they live within Kinh people and share normal daily activities with Kinh people. Thus, it is not required to have a separate action plan for these ethnic minorities.

2.3.2.2.Gender

Surveying results showed that women still play a key role in doing housework, cleaning and caring for children, 63% of women in the family in charge of main housewife, 71.1% women in charge of cleaning, 72.5% of women in charge of taking care of children. There is relative

gender equality but not much when both genders participate in doing housework (35.6%), cleaning (27.6%) and taking care of children (26.3%).

Gender equality is found in some aspects: 71.5% households said both husband and wife agreed for children's education. 70.1% made decision for job changing, 79.1% agreed for bank loans and investment in doing business.

There is also equality in ownership of property in households: 41.8% households in the survey said they shared ownership of property, 36.8% ownership of property were men's and for women, this percentage is rather high, 21.3%, reflecting in following table:

Table 2.9: Ownership of property in households

		Ownership of property			Total
		Female	Male	Both	
Ward 1	Number	40	89	53	182
	Percentage (%)	22.0	48.9	29.1	100.0
Ward 2	Number	64	112	67	243
	Percentage (%)	26.3	46.1	27.6	100.0
Ward 3	Number	37	57	74	168
	Percentage (%)	22.0	33.9	44.0	100.0
Ward 4	Number	45	73	42	160
	Percentage (%)	28.1	45.6	26.3	100.0
Ward 8	Number	6	1	141	148
	Percentage (%)	4.1	0.7	95.3	100.0
Total	Number	192	332	377	901
	Percentage (%)	21.3	36.8	41.8	100.0

(Source: Socio-economic survey, 06/2016)

There is difference in two genders in participation in community's meeting or organizations as follows:

Table 2.10: Gender and participation in community's activities

			Ward 1	Ward 2	Ward 3	Ward 4	Ward 8	Total
Participation in community's meeting	Female	Number	91	88	66	61	33	339
		Percentage (%)	50	36.20	39.30	38.10	22.30	37.60
	Male	Number	15	3	4	25	57	104
		Percentage (%)	8.20	1.20	2.40	15.60	38.50	11.50
	Both	Number	76	152	98	74	58	458
		Percentage (%)	41.8	62.6	58.3	46.3	39.2	50.8
Participation in community's organization	Female	Number	31	29	22	26	29	137
		Percentage (%)	17.0	11.9	13.1	16.3	19.6	15.2
	Male	Number	3	3	4	25	64	99
		Percentage (%)	1.6	1.2	2.4	15.6	43.2	11.0
	Both	Number	148	211	142	109	55	665
		Percentage (%)	81.3	86.8	84.5	68.1	37.2	73.8

			Ward 1	Ward 2	Ward 3	Ward 4	Ward 8	Total
Other	Female	Number	114	103	37	71	6	331
		Percentage (%)	62.6	42.4	22.0	44.4	4.1	36.7
	Male	Number	38	51	58	31	3	181
		Percentage (%)	20.9	21.0	34.5	19.4	2.0	20.1
	Both	Number	30	89	73	58	139	389
		Percentage (%)	16.5	36.6	43.5	36.3	93.9	43.2

(Source: Socio-economic survey, 06/2016)

In general, there is still a little gender inequality in some aspects relating to family's chores, property ownership and activities in community, which is reflected in feedbacks of households in the survey.

2.3.2.3. Vulnerable households

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

In 901 households being surveyed in the 5 wards, the vulnerable households account for 47.1%. Percentage of social policy household is highest accounting for 6.66%, then poor household accounting for 5.77%. Women – headed househols accounting for 3% and household with handicapped member accounting for 2.2%. Percentage os vulnerable households in wards as follows:

Table 2.11: Vulnerable households

		Vulnerable households					Total
		Poor household	Women-headed household	Social policy household	Household with handicapped member	Others	
Ward 1	Number	7	3	9	5	158	182
	Percentage (%)	3.85	1.65	4.95	2.75	86.81	100
Ward 2	Number	3	9	23	7	201	243
	Percentage (%)	1.23	3.70	9.47	2.88	82.72	100
Ward 3	Number	2	6	15	5	140	168
	Percentage (%)	1.19	3.57	8.93	2.98	83.33	100
Ward 4	Number	38	4	11	1	106	160
	Percentage (%)	23.75	2.50	6.88	0.63	66.25	100
Ward 8	Number	2	5	2	2	137	148
	Percentage (%)	1.35	3.38	1.35	1.35	92.57	100
Total	Number	52	27	60	20	742	901
	Percentage (%)	5.77	3.00	6.66	2.22	82.35	100

(Source: Socio-economic survey, 06/2016)

From the survey, the percentage of poor households in ward 4 is highest, equivalent to 23.75%. Ward 2 having women-headed households highest of 3.7% then ward 3 with 3.57 %.

Households of social policy getting highest percentage in ward 2 and ward 3, in which the percentage in ward 2 is 9.5%, handicapped household is 2.9%. Ward 3 having the highest percentage of handicapped households of 3%, and households of social policy of 8.9%.

2.3.2.5.Education and health in the project area

- **Education**

Education quality of Vinh Long city has been improved and upgraded. Percentage of graduates from school of all levels is 99%. There are more and more students getting awards in internaltiona, national exams and getting highest marks in university entrance exams.

As the survey's results, among 901 people participating in the interview, percentage of college and university is highest (30.6%), highschool level (27.9%), secondary level (25.9%), and other educational levels. In 901 people being interviewed, the illiterate percentage is only 0.3% reflecting that educational background of people is more and more improved.

Table 2.12: Educational background of the people participating in the survey

		Ward 1	Ward 2	Ward 3	Ward 4	Ward 8	Total
Illiterate	Number	0	1	1	1	0	3
	Percentage (%)	0	0.4	0.6	0.6	0	0.3
Primary school	Number	23	18	17	40	13	111
	Percentage (%)	12.6	27.2	10.1	25	8.8	12.3
Secondary school	Number	36	66	40	42	49	233
	Percentage (%)	19.8	27.2	23.8	26.3	33.1	25.9
Highschool	Number	73	70	37	25	46	251
	Percentage (%)	40.1	28.8	22	15.6	31.1	27.9
College, university	Number	46	83	65	45	37	276
	Percentage (%)	25.3	34.2	38.7	38.7	28.1	30.6
Post graduate	Number	4	5	8	7	3	27
	Percentage (%)	2.2	2.1	4.8	4.4	2	3
Total	Number	182	243	168	160	148	901
	Percentage (%)	100	100	100	100	100	100

(Source: Socio-economic survey, 06/2016)

In general, educational level of people in the project area is relatively high. Participation, contribution of comments and ideas for the construction of the project are diversified, various and practical.

- Health

Environmental pollution and bad habits in daily life of the community can lead to disease and directly affect people's physical and mental health as well as working capability. The survey show that most of people are interested in healthcare programs, 91.5% households participating in health insurance and only 77 households (8.5%) not participating in health insurance. This shows that awareness of people in the project are abouth social welfare is very high. When asking about percentage of people getting sick over the last 2 months, 46.9% housholds said that there were member getting sick. Results are presented in following table

Table 2.13: Popular diseases in households

		Popular diseases					
		Cold, fever	**Headache**	**Typhoid**	**Trauma**	**Diarrhea**	**Dengue**
Ward 1	Number	66	36	5	9	2	1
	Percentage (%)	88	48	6.80	12.20	2.70	1.40
Ward 2	Number	120	58	0	0	1	0
	Percentage (%)	90.90	43.90	0	0	0.80	0
Ward 3	Number	98	54	16	1	2	0
	Percentage (%)	94.20	51.90	15.40	0.10	1.90	0
Ward 4	Number	78	16	3	4	0	10
	Percentage (%)	85.70	17.60	3.30	4.40	0	11
Ward 8	Number	20	20	0	5	37	0
	Percentage (%)	13.50	13.50	0	3.40	25	0
Total	Number	382	184	24	19	42	11
	Percentage (%)	69.50	33.50	4.40	3.50	7.70	2

(Source: Socio-economic survey, 06/2016)

From the survey's results, the most prevalent diseases in community are cold (69.5%), headache (33.5%), other sickness (Typhoid, Diarrhea, Dengue) also mentioned but not with high percentage, not in series or epidemic but only seasonally and infrequent. Diseases can cause direct and indirect impact on community, causing many worries and tiredness for sick people and their families. Acknowledging fully about these popular diseases can help to find out effective measures for preventing and protecting community's health.

Main reasons for the diseases are environmental pollution (23.2%), flies and mosquitoes (18.9%) and other reasons (bad habits, awareness of communities in disease prevention and periodically health check and other reasons…). From the practical observation and feedbacks from people, main reasons for the diseases is the poor environmental sanitation, improper storage of foods and drinks leading to the infection of disease agents, even wastes around houses, pathways and public areas…

Improvement of community's awareness in environmental sanitation and change in habitat and daily activities are very vital and urgent. This is not responsibility of people in protecting their own health but also responsibility of authorities of all levels in the project area. Enhancement of people's health is to protect precious labor force for the State. To achieve this goal, authorities in the area need to carry out propaganda movement, in which 92.8% households said that there is propaganda in their places for raising awareness of people in terms of environmental sanitation and health protection.

2.3.2.6.Labor, employment, income-expenditure

- *Labor, employment*

Results of the survey show that, main employment in the project area is small business (accounting for 25.1%), wage employment from state agency (20.2%), retired staffs (15.9%); only 5.9% people are unemployed. Ward 2 and ward 3 have the highest percentage of unemployment and hired jobs. Ward 2 has 26% of people doing hired job and ward 3 has 7.1%. The area having highest percentage of unemployment is ward 3 with 6%. Main income sources of households are reflected in following table:

Table 2.14: Employment of the surveyed people

		Ward 1	Ward 2	Ward 3	Ward 4	Ward 8	Total
State officier, staffs	Number	33	50	35	40	24	182
	Percentage (%)	18.1	20.6	20.8	25	16.0	20.2
Retired	Number	21	43	39	14	26	143
	Percentage (%)	11.5	17.7	23.2	8.8	17.6	15.9
Agriculture, fishery, forestry	Number	0	2	7	6	13	28
	Percentage (%)	0	0.8	4.2	3.8	8.8	3.1
Worker	Number	16	16	13	2	10	57
	Percentage (%)	8.8	8.8	6.6	1.3	6.8	6.3
Small industry and handicraft	Number	2	12	5	1	2	22
	Percentage (%)	1.1	4.9	3	0.6	1.4	2.4
Trading/service	Number	58	63	36	43	26	226
	Percentage (%)	31.9	25.9	21.4	26.9	17.6	25.1
Unemployed	Number	8	9	10	21	5	53
	Percentage (%)	4.4	3.7	6	13.1	3.4	5.9
Hired jobs	Number	15	25	12	23	21	96
	Percentage (%)	8.2	26	7.1	14.4	14.2	10.7
Other	Number	29	23	11	10	21	94
	Percentage (%)	15.9	9.5	6.0	6.3	14.2	10.4
Total	Number	182	243	168	160	148	901
	Percentage (%)	100	100	100	100	100	100

(Source: Socio-economic survey, 06/2016)

- *Income - Expenditure*

Employment and main income source of the head of household affect significantly income and expense in each household. Results from the survey show that most of households have income of medium level and there is big gap in incomes of households in the same area. Average monthly income per household in the project area is 8.3 million dongs/household/month.

Table 2.15: Average income capita in the project area

Ward	Average income / HHs/month (VNĐ)	Member/HHs (per)	Average income per/month (VNĐ)
Ward 1	7,529,000	4.98	1,512,000
Ward 2	8,314,000	4.23	1,965,000
Ward 3	9,718,000	4.21	2,308,000
Ward 4	7,845,000	4.2	1,868,000
Ward 8	8,433,000	4.93	1,711,000
Average	8,353,000	4.48	1,865,000

(Source: Socio-economic survey, 06/2016)

The average income per captita concluded from the surveyed people is presented in follow table:

Table 2.16: Average income per capita in the project area

Income		Ward 1	Ward 2	Ward 3	Ward 4	Ward 8	Total
< 900	Number	0	1	0	0	0	1
	Percentage (%)	0	0.4	0	0	0	0.1
900 - 13000	Number	8	7	4	23	1	43
	Percentage (%)	4.4	2.9	2.4	14.4	0,7	4.8
1300 - 2000	Number	15	16	8	13	5	57
	Percentage (%)	8.2	6.6	4.8	8.1	3.4	6.3
2000 - 5000	Number	68	76	72	37	38	291
	Percentage (%)	37.4	31.2	42.8	23.2	25.7	32.3
5000 - 7000	Number	79	107	73	69	85	413
	Percentage (%)	43.4	44	44	43.1	57.4	45.8
> 7000	Number	12	36	11	18	19	96
	Percentage (%)	6.6	14.8	6.5	11.2	12.8	10.7
Tổng	Number	182	243	168	160	148	901
	Percentage (%)	100	100	100	100	100	100

(Source: Socio-economic survey, 06/2016)

As in the poverty norms applied by Viet Nam MOLISA for period 2016 – 2020 regulated by Government under Decision No.59/2015/QĐ-TTg dated 19/11/2015, poor households are:

Poor households: Households in urban areas having average monthly income per capita from 900,000 – 1,300,000 VND and deprived of at least 3 indicators measuring deprivation of access to basic social services.

Near poor households: Households in urban areas having average monthly income per capita from 900,000 – 1,300,000 VND and deprived of less than 3 indicators measuring deprivation of access to basic social services.

Medium household: Households in urban areas having average monthly income per capita from 1,300,000 – 1,950,000 VND.

Comparing income per capita via surveying and poverty norms of MOLISA, we have 44 HHs (4.9%) with income poor households and near poor household, 57 HHs (6.3%) with income medium household. In which, 0.1% households having income less than 900,000

VND/per/month, 4.8% having income 900,000 – 1,300,000 VND/per/month; income from 5 – 7 millions accounting for the highest percentage (45.8%), income from 1.3 – 2 millions/per/month and 2 – 5 millions/per/month accounting for 6.3% and 32.3% respectively. Income of over 7 million/household/month accounting for 10.7%.

Stability of income plays a decisive role in the lives of the whole family. Assessment for the stability of household income is considered to be one necessary criteria. Survey results showed that 75.2% of households said their household income quite stable. In the project area, the stability of household income is relatively high.

The income level of the household decides the expenditure of households and percentage of expenditure generally accounting for ¾ income of the household every month. On average, for 901 households participated in this survey, their average income is 8.4 million dongs/household/month and average spending about 6.6 million dongs/household/month. Thus, households spend 78.6% of their income for their monthly expenditure. Good and rich households usually have greater expenditure than poor and medium households and generally all expenses for education, health care, electricity, water, travel, helping others ... of good and rich households are higher than those of poor/medium households.

Land ownership of households

Results of survey on the legal status of land showed that 65.2% HHs had land-use right certificate, 25.32% HHs had no LURC's but with claim on land and 9.48% HHs had no legal right or claim in land. This information is very important, especially for AHHs in the project area.

Social Network and Support Systems

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

Government Programs

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

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

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

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

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

Mass Organizations

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

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

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

Non Governmental Organizations (NGOs)

Vinh Long City is the home of a strong network of NGOs both national and international. The main fields where NGOs are involved are poverty reduction and health care (Merry Year International, COMINGO, PACCON), education (NMA, AAV). NGOs may also be key partners for the implementation of the project especially regarding climate change adaptation and income restoration.

Citizen Groups

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

2.4. INFRASTRUCTURE CONDITIONS

2.4.1.Transport System

- ***Regional transportation system***

Vinh Long city is a transportation hub for the entire Mekong Delta region. Many national highways (NH) and provincial ways run across the city, including:

+ The NH1A from My Thuan bridge runs through Vinh Long city toward Can Tho bridge. The national way when comes to Vinh Long becomes roads Pham Hung and Nguyen Hue, serving as the city's main roads.

+ The NH 53 connects the NH 1 at Pham Hung road from Vinh Long city to Tra Vinh province. When comes to the city, it becomes Pho Co Dieu street.

+ The NH 80 connects NH 1 at My Thuan bridge to Sa Dec city.

+ The NH 57 connects NH 53 (Pham Thai Buong street) through Dinh Khao ferry toward Ben Tre province.

+ Provincial road 31 (PR902) runs from Thieng Duc bridge to Vung Liem.

+ The inter-provincial bus station located at the intersection of NH1 and NH53 with area of 1.7ha.

- ***City transportation system***

Main roads: The road network in the center of city includes major roads from the central areas extending outward with lanes from 12-24m such as Le Thai To street, 3/2 street, Trung Nu Vuong, Pham Thai Buong, 30/4, Tran Phu, Nguyen Hue streets….

- ***Waterway***

The city has an interlacing system of waterways, connecting most of residential areas and main markets, including Cai Doi, Cai Cam, Cai Ca, Cau Lau, Kinh Cut, Long Ho rivers and some other canals…At present, some rivers have been narrowed due to people's encroachment and uncontrolled construction in the urban development process over the past years.

- ***Current roadway status***

Survey results show that roads are made of concrete (55.3%), asphalt roads (30.7%), gravel roads (12.5%) and dirt roads (1.4%).

According to local people's opinions, "road are in good quality" is about 45.9% on average. Opinions on good roads are differs among people in different wards, namely ward 1 (59.9%), ward 2 (49.4%) and ward 3 (35.8%), ward 4 (43.8%), ward 9 (37.2%). In-depth interview and group discussions also show that the roads being qualified as "good" are asphalt and concrete roads. Households also said that the evaluation in the questionaires is relatively correct. Most complains on road quality is about the narrowness of roads (43.3%), then about the inundation (19.8%) , and low base elevation (11%) and other concerns.

Network of lane roads leading to the household and commune/ward roads in the project area has not been evenly distributed, failing to meet the needs of urban development in the current conditions. Asphalt roads only concentrate in main areas and national highways or roads in central areas. Majority of people said that the narrow roads make difficult to travel, especially for public services such as waste collection, ambulance car, firefighting ...

2.4.2. Water Supply System

Vinh Long City has a drinking water treatment plant, Truong An water plant with total capacity of 35,000m3/day. Its raw water takes in from Co Chien River. The city provides a good coverage of drinking water supply (96.4%) with daily use of 126 l/person for total 30,477 households.

Survey results showed that most of households in the project area use tap water (97.2%). Rain water is still used in domestic activities of people, with percentage of 13.9%. There is an increasing trend of people buying water in 20l cans for cooking purposes. Only 1.1% of households (mainly in ward 3) are still using open and unhygienic water from canals/ponds, bearing a health risk. 87.3% of households have one source of wates, 10.9% of households have 2 water sources and only 1.8% of households take water from 3 water sources. The survey showed that the water quality of the city is relatively good and stable. Still, people complain about smells of water (5.1%) and 1 household said water is not clear and clean.

2.4.3. Solid Waste Collection and Treatment

Collection of solid waste in the area is not thoroughly implemented. Only 73.1% of solid waste is collected. The remaining amount is treated by either burning or throwing into canals, causing environmental pollution. The collection of waste only in central wards by using simple vehicles and methods.

Previously, Vinh Long city used a landfill in Tan Ap Hamlet, Tan Xuan, Tan Ngai ward, with total treatment capacity of 5,500m3. At the present, this landfill was closed and the city use an alternate landfill of 2ha in Hoa Phu commune, Long Ho district, which is 13 km from the center

of the city. The landfill is able to extend 2 more hectares from current land available at the site however it is the decision the City to make.

Due to the use of outdated methods of waste treatment and the area is insufficient to meet demand in the future, Vinh Long province is planning to build a new landfill for solid waste disposal and treatment right at the Phu Hung landfill with total area of 6ha.

Survey with local communities confirms the fact of which waste is collected over 80% in ward 2, 3, 4 and 100% in ward 1. Waste collection in Ward 9 is rather low, only 31.8%. The fee for waste collection varies, ranging from 10-15 thousand dongs/household/month. The fee applied differently for households living by road sides and for ones living in the alley. 77.8% of the households surveyed responded that the waste is collected daily, 6.8% said that waste collected 2-3 times/week, only 0.2% of households said the waste collected once in a week. It can be concluded that management of waste in this project area is relatively good.

Overall, community survey about the waste collection service reveals the services are "good" from 56.8%, "relatively good service" from 34.1% and "medium quality" from 8% of opinions given by people interviewed.

However, there is still lack of waste collection service in some places and therefore waste is treated by households. 142 households in the survey said that they had various ways of treating the waste. Common ways are burning and burying (61.3%) and dumping into garden or vacant land (accounting for 21.1%).

In the in-depth interviews and group discussions about waste collection, most households expressed their interest in having waste collected and properly treated. However, some households said that they are not interested in this because of the waste collection fee they have to pay and the usual practices of burying or burning, or dumping waste they do. Other reasons given are among the alley too narrow so the collection vehicles can not move in, the need of mobile dustbins...

- Environmental pollution

38,8% households stated that they are living in polluted environment. These statements differ among wards (30.8% at Wad 1, 52.4% at ward 3, 41.9% at ward 4, 35.8% at ward 2 and 35.1% at ward 9). 11.1% people said the environment is seriously polluted. The situation might get worst if proper mitigation is not in place in the future.

People also voiced on the reasons for pollution. 77.35% people said it is due to the overflow of wastewater, waste, and flood in rainy season; 46.6% peope said it is due to air pollution and 28.6% people think it is because of lack of waste collection and treatment; 28% said it is due to stagnant water; 22.1% people think it is due to pollution from domestic waste; 16.5% people think it is pollution from wastewater/ gas emission and 3.8% said it is over noise.

Related to the pollution mitigation measures, most households provided no feedbacks, saved for few comments such as "it is the task of the local authority and we have no ideas about that", or "we can not do anything because environmental pollution is a common issue and there must be a guidance from the authorities".

2.4.4. Power System

Power source: Vinh Long city is connected to the national grid of 220KV-Western region Ho Chi Minh city- Cai Lay – Tra Noc via Tra Noc substation 220/110/66KV-(100+160)MVA and at-site power source from Vinh Long diesel power plant. In addition,Vinh Long 220kV substation 220/110/22KV - (2x125)MVA is being constructed in the city.

Lighting system: All main roads in the city have been equipped with lighting system. Roads in the residential area have been invested but asynchronously.

Results from the survey show that 96.7% households have separate power meters. The remaining households (30 households) share the power meters with others, mostly in Ward 3 where the project will have many investments such as canal embankment, LIA upgrading and road construction.

Power demand is surplus its supply therefore the city is still suffered from power shortage, resulting in revolving power cuts in some peak hours. Voiced on the frequency of power cuts in the project area, 71.7% people said that there few power cuts in their places; 14.3% households thought it happens 1-2 times/month while few other said it is about 3-5 times/month. In general power black out is 1-2 times/month and it is rotated to ensure sufficient power for domestic and public usages.

Regarding the current intensity in domestic use, most of households (54.4%) responded that the power is strong enough, while 45% households said the power intensity is normal.

2.4.5. Drainage and Sewage Treatment

Vinh Long city has one common drainage system with total length of 66,2km. There is no separate drainage system for wastewater and storm water. Most of the sewers are round culverts Φ300 -Φ1000, discharging wastewater into canals. In rainy season, combining with storm water, the drainage can't function fast enough, resulting in local flooding in some road and streets of the city up to 0.3m - 0.5m.

- ❖ Community responses to water drainage system

61,3% households said that their wastewater is discharged into the common drainage system. 70% of the drainage network is located in Ward 1, 2 and 3 while 20% of the network covers Ward 3, 4 and 9. Direct discharge of wastewater into canals/rivers in the project area causes serious pollution for the canal/river, affecting public health, reducing drainage capacity in flood season and increasing flood risk in the areas.

Most people voiced on the issue of drainage system quality in which 58.3% people thought that the water drainage system operated well at all cases while 35.5% said the system functions poorly, especially in heavy rain. Detailed views are presented in Table 2.17 below.

Table 2.17: Quality of water drainage system

		Quality of water drainage system					Total
		Good draining in all cases	Poor draining in heavy rain	Poor draining in small rain	Poor draining even in no rain	No idea	
Ward 1	Number	111	63	1	2	5	182
	(%)	61.00	34.60	0.50	1	2.70	100
Ward 2	Number	181	47	5	8	2	243
	(%)	74.50	19.30	2.10	3.30	0.80	100
Ward 3	Number	72	70	13	13	0	168
	(%)	42.90	41.70	7.70	7.7	0.00	100
Ward 4	Number	102	52	2	1	3	160
	(%)	63.8	32.50	1.30	1	1.90	100

		Quality of water drainage system					Total
		Good draining in all cases	Poor draining in heavy rain	Poor draining in small rain	Poor draining even in no rain	No idea	
Ward 8	Number	59	88	0	0	1	148
	(%)	39.90	59.50	0	0	0.7	100
Total	Number	525	320	21	24	11	901
	(%)	58.30	35.50	2.30	2.70	1.20	100

(Source: Socio-economic survey, 06/2016)

2.5. ENVIRONMENTAL AND SOCIAL CONDITIONS AT SPECIFIC SUBPROJECT LOCATIONS

The urban upgrading project will be implemented in ward 1,2,3,4 and 9 of Vinh Long City. The core urban area center mainly includes populated residential areas in between fields and gardens. There are Cau Lau and Long Ho rivers, which run into Co Chien river, providing water for one branch of Tien river as well as rivers and canal network inside the area. Section 2.3 above provides baseline environmental conditions in Vinh Long city and this section will further characterize the specific environmental and social conditions at the project site, helping to identify the site-specific impacts and mitigation measures for the project activities.

2.5.1. Low Income Areas

The main investments for LIAs include upgrading and widening of existing alleys, construction of drainage system, dredging of some small canals and provision of lighting systems, trash bin and garbage trolleys. The collected wastewater from subproject activities will be conveyed to the city's sewage system funded through ADB project.

Several canals within LIAs are to be improved from the current stagnant and polluted states. The distribution of canal improvement work is:

- In LIA 1: 0.98 km long of 3 small canals of existing 5 - 8m wide.
- In LIA 3: 1.5 km long of 6 small canals of existing 3 -10m wide.
- In LIA 4: 1.66km long of 5 small canals of existing 4 -9m wide

The embankment structure combines of vertical UPVC pile of 2m high (after dredging) and soil revetment with slope of 1:1.25. Grass will be planted on the embankment slope.

The upgrading work in LIAs will affect total 402 households of which 398 households will be partially affected and 4 households will be relocated due to land acquisition. The acquired land will be 4,158 m^2, comprising of 3,322m^2 residential land, 613m^2 agriculture land and 224m^2 public land. There will also be a replacement of 10 tombs, which are currently located within affected residential land.

The specific social and environmental conditions for each LIAs are presented below:

- ***LIA 1***

LIA 1 of ward 2 is surrounded by 3 main streets of Vinh Long city namely Nguyen Hue street, Vo Van Kiet street and Pham Hung street with high traffic density. The remaining side of LIA 1 is adjacent to many rice fields and gardens of Ward 9 (see Figure 2.1). LIA 1 covers 10 ha of land and has high population density, which is about 10,642 people/km^2. Although being located in the city center, LIA1 is lack of most basic infrastructures: earth roads with width less than 2.5 m still account for majority of alleys and roads in the LIA (55%); drainage system is incomplete

comprising of combined sewers, open ditch and manholes; only 10% wastewater is collected; lighting system is only at 30% coverage.

The environmental monitoring results of air, surface water, sediment and aquatic environment quality in the area confirm that in LIA 1 the air quality is relatively good, surface water is contaminated with organic substances however, sludge from water drainage systems around LIA 1 is not contaminated with heavy metals (see detailed in section 2.3)

Sensitive points include Long An pagoda, Nguyen Truong To high school and a church. (see section 2.6 for more details)

The transportation route between LIA 1 construction site and disposal site runs through Pham Hung (or Vo Van Kiet → Nguyen Hue → Đinh Tien Hoang) → QL1A → Hoa Phu landfill. The average distance is approximately 12 km.

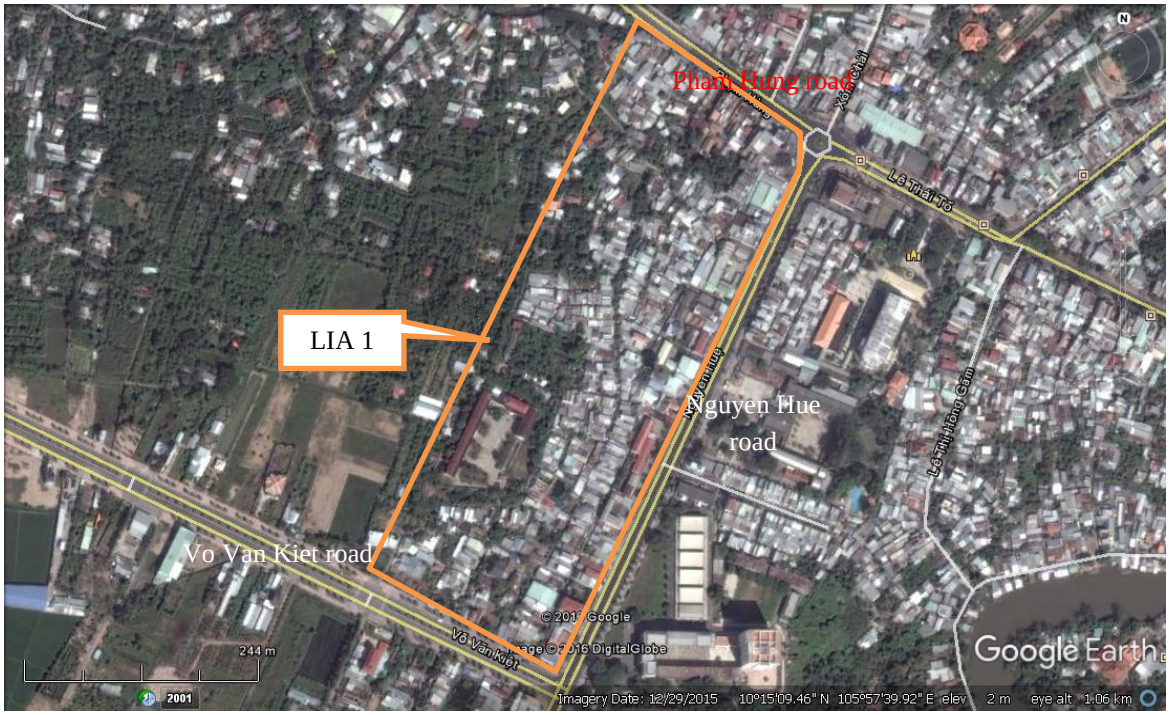


Figure 2.1: Social and environmental status in LIA 1

Alleys in LIA 1

Alleys in LIA 1

❖ ***LIA 3***

LIA 3 area is 15.8 ha, located in Ward 2, within the city center. Residents of LIA 3 mainly live in the northern area adjacent to Le Thai To Street; in the southern part, residential households are scattered between fields and gardens; the eastern part is adjacent to Cau Lo, the main

tributary of Co Chien River. The average population density is 10,642 people /km2. The basic infrastructure is relatively poor. Wastewater from 80% of households has not yet been collected, being directly discharged into surrounding canals and Cau Lo River. The polluted open earth canals cause bad odor and are potential sources of infectious and water borne diseases. Dirt alleys covers 85% of total alleys and alleys with lighting system are about 30%.

Alley in LIA 3

Waste is directly discharged into the environment

Cau Lo River

Figure 2.2: Map of LIA 3 and snapshots of alleys and drainage system in LIA 3

Results on environmental monitoring shows that air quality in LIA3 is very good but surface water is slightly contaminated with organic substances (see detailed in section 2.3).

Investments in LIA 3 include PCRs and sensitive receptors include: Long An pagoda, Ngoc Thuan monastic, Gia Hoa pagoda, Vinh Long University of Education, Hoa Sen Preschool (see sections 2.6 for more details).

Vehicle transportation of construction and waste materials is conducted via the following route: Le Thai To (or Hoang Hoa Tham) Str. → Nguyen Hue Street → Đinh Tien Hoang Str. → National way 1A → Hoa Phu landfill.

The average distance of disposal transportation route is approximately 12.5 km.

- ***LIA 4***

LIA 4 covers 21 ha, located in Ward 3 in the center of the city. Residents of LIA 4 mainly live along Cau Lo, Kinh Cut river and Mau Than street (see Figure 2.3). The average population density in LIA 4 is 4,670 people /km^2. Most alleys are made of earth/soil materials. Water drainage system is a mixture of combined wastewater and storm water pipes, open ditches and manholes. Wastewater from 50% of total households has not yet been collected and discharged directly into surrounding open canals.

Resident houses along aleys in LIA 4

Small cannal in LIA 4

Households along Kinh Cut river

Figure 2.3: Map of LIA 4 and snapshots of alleys and drainage system in LIA 4

PCRs in LIA4 includes Vinh Long Cathedral, Chanh Toa Church (see sections 2.6 for more details)

Results of environmental monitoring confirmed that air quality in LIA4 is very good but surface water is contaminated with organic substances (see detailes in section 2.3).

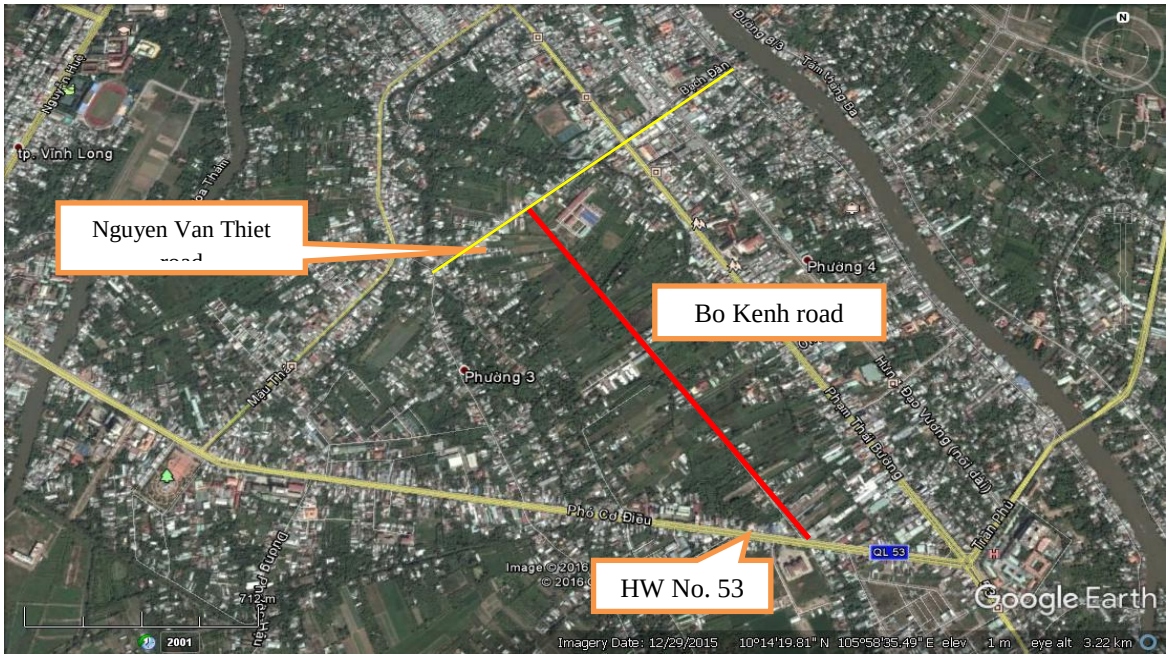
Vehicle transportation of construction and waste materials is conducted via the following route: Mau Than road→ National way 53 → Dinh Tien Hoang Str. → National way 1A → Hoa Phu landfill.

The average distance of disposal transportation route is approximately 13.5 km.

2.5.2. Road, bridge upgrade and construction project area

- *Bo Kenh road area*

Bo Kenh road runs in parallel with a canal that is now silted and dried out. The area in the surroundings is garden land with very little construction footprint. People live far from the road and distributed more densely at the national way 53 end (see Figure 2.5). The investment will transform the current 3m wide dirt road into a concrete asphalt road of 14 m wide with a sidewalks at each side. The total upgrading length is 2.2 km. Because of the road construction, there will be 304 households affected of which 290 households are to be affected partially and 14 household are to be reallocated. The total land acquisition is 38,687m^2 of which residential area is 10,0470m^2; agriculture land is 25,063m^2 and public land is 3,576m^2. People have changed the purpose of land use from agriculture to garden land. About 50 tombs will be reallocated due to the proposed construction.



Asphalt concrete section (begin from HW No.53 with the lengh of 850 m)

Earth section with the length of 450 m

Resident area along Bo Kenh road

Figure 2.4: Map of the proposed Bo Kenh Road and the road sections.

Results on environmental quality monitoring confirmed that air quality in Bo Kenh area is very good but surface water is contaminated with organic substances (see section 2.3).

Transportation routes between the road construction site and disposal site is conducted via the following route: National way 53 → Dinh Tien Hoang Str. → National way 1A → Hoa Phu landfill.

The average distance of disposal transportation route is approximately 13.5 km

- ***P2-P9 road area***

The existing P2-P9 road is an 2-m wide alley, locates between ward 2 and 9. The road is 1.9 km long, intersects with 03 main city crowded roads i.e. Pham Hung, Vo Van Kiet and Nguyen Hue

street (see Figure 2.6). The road alignment comprises of 03 sections; the two sections from km00-km 0+440, and from km 1+045-km 1+900 at the two ends are narrow concrete alley, while the middle section of 605m km long, 4 m wide currently runs along side of a small open canal contaminated with domestic wastewater. The road has no sidewalk, lighting system, water supply and drainage system. The investment will be provided to upgrade the entire road to a concrete asphalt road of 1.9km long, 10.5m wide and 2 sidewalks of 4.5 m wide each side. The middle section will turn the open canal into a closed drainage box and road segment. A complete drainage system and basic road infrastructures will be provided. The construction in P2-P9 road would acquire total 25,532.8 m2 of which 2,010.4 m^2 is resident land, 15,070.6m^2 is public land and 8451.8 m^2 is agriculture land. About 30 tombs will be reallocated.

Figure 2.5: Map of P2-P9 road area

Results on environmental quality monitoring show that the air and surface water quality in the area are good (section 2.3)

Transportation routes between P2-P9 construction site and disposal site run through Pham Hung road (or Vo Van Kiet road) → Nguyen Hue road → Dinh Tien Hoang road → National way 1A → Hoa Phu landfill. The average distance of disposal transportation route is approximately 12 km.

There are no PCRs but sensitive receptors are residential areas of ward 2 and ward 9 and Cau Lo River along this route.

- *Construct Vo Van Kiet street*

The proposed Vo Van Kiet road is 0.62 km long, intersects with the Nguyen Hue at the starting point and with Mau Than road at the ending point.

It is possible to divide Vo Van Kiet road into 2 sections. The first one is 0.29 km, located in ward 2, cutting across Nguyen Hue road and running through the area adjacent to Vinh Long University of Technical Education and Vinh Long Education College. The second one is of 0.33 km long, is located in ward 3, running through sparse population area among rice fields and gardens and cutting across Mau Than road. The two sections will be connected by a bridge,

which will be covered by another project. It is planned that the bridge will be constructed using provincial fund during the period from 2017 to 2020.

Due to the construction work, 26,242 m^2 of land would be acquired in which residential land is 11,165 m^2, public land is 9,049m^2 and agriculture land is 6,027 m^2. About 20 tombs will be reallocated. Similarly to P2-P9 road and Bo Kenh road area, the land use along this route has been changed from agriculture to garden land and cash crop field.

Results on environment quality monitoring show that the construction area has very good air quality, however, surface water environment contaminated with organic substances (see section 2.3). Currently, domestic wastewater from residential area is not collected. The construction of Vo Van Kiet road will also include a complete drainage system to collect storm water and wastewater, lighting system and trees on the sidewalks. The wastewater pipe will be connected to the interceptor of the WWTP funded by ADB during 2017-2020.

Transportation route between Vo Van Kiet construction site and the disposal site runs through Pham Hung road → Nguyen Hue or (Mau Than) road → National way 53 → Dinhh Tien Hoang road → National way 1A →Hoa Phu landfill. The average distance of disposal transportation route is approximately 12.5 km.

The starting point of Vo Van Kiet road

The ending point of Vo Van Kiet road

Figure 2.6: Map and snapshots of Vo Van Kiet road

2.4.3 Cau Lau and Kinh Cut river areas

Kinh Cut river is a branch of Cau Lo river with the length of 540 m, width of 15-20 m; connecting with Cau Lau river and running into Long Ho river with the length of 760 m, width 20-30m. At present, the issue of encroachment leads to the fact that the riverbed width is narrowed down and pollution is widespread. There are 5 small bridges across the rivers , connecting ward 3, ward 4 and ward 1. Running in parallel with Cau Lau river and cutting across Kinh Cut river is the road Mau Than - Hai Thang Chin with high traffic volume. Kinh Cut and Cau Lau are tertiary canals. (see Figure 2.8)

Kinh Cut river

Cau Lau River

Figure 2.7: Map and snapshots of Cau Lau and Kinh Cut canal

Results of environmental sampling confirm that air quality in the area is very good but surface water is contaminated with organic substances (see detailed in section 2.3)

Sensitive points along Kinh Cut river area include: Toa Giam Muc, Thanh That Vinh Long;

The upgrading activity of the Kinh Cut canal will affect 177 households of which 49 households will be affected partly and 128 households will be relocated. Land acquisition will be 17,552.3m^2 in which residential land is 6,850.4 m^2; no agriculture land will be acquired. About 36 tombs will be relocated

Sensitive points in Cau Lau river area: Cau Lau market. Upgrading of the Cau Lau canal will affect 164 households of which 140 households will be affected partly and 24 households will be relocated. Land acquisition is about 11,251.1m2 will be acquired of which residential land is 5,888.7m2 and agriculture land is about 2,703.04 m2. About 22 tombs will be relocated.

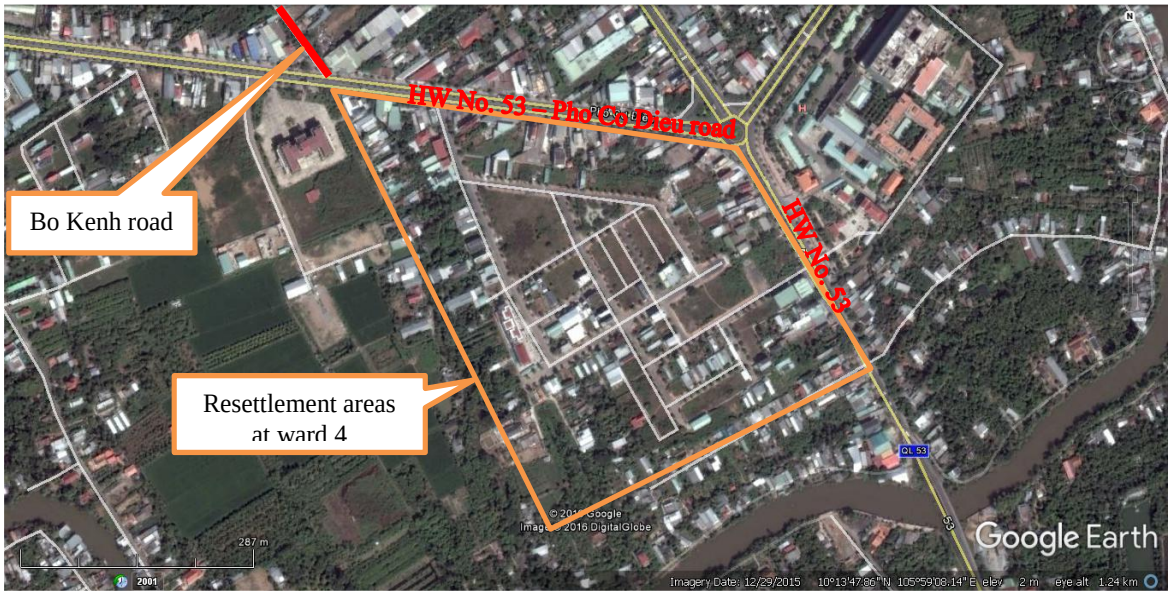
Road transportation route from Kinh Cut and Cau Lau canal to the disposal site runs through

Hai Thang Chin road → Mau Than road→ NH No.53 → Dinh Tien Hoang road → NHNo.1A → Hoa Phu landfill. The average distance is about 13.5 km

Inland waterway route: Tien river →Co Chien river→Long Ho or Cau Lo river → Kinh Cut and Cau Lau cannal. The average distance is about 100 km

2.5.3. Component 3 - Resettlement area in Ward 4

The project will purchase 259 land plots of the resettlement area in Ward 4. The resettlement area of Ward 4 already has provided complete infrastructure including road, lighting, water supply, waste collection and treatment system. Besides, there is a preschool in the resettlement area in Ward 4. Both of these two resettlement areas are located along National Highway No. 53 with high traffic volume.



Land plots and road within the site

Sao Mai kindergarten in the site

Figure 2.8: Resettlement area in Ward 4

2.6. SENSITIVE CULTURAL ON THE PROJECT AREA

The project does not have any direct impacts to the historical and cultural, religious, schools and health facilities during land acquisition. However, during the construction phase, the impacts

will be at some extent due to the transportation of construction materials bypassing these sensitive points. The concerning facilities in the project area and the surroundings are considered below.

2.6.1. Physical Cultural Resources

Vinh Long city has 5 national monuments, including Long Thanh communal house, That Phu Temple (Ward 5) and Tan Hoa communal house (Tan Hoa Ward); Van Thanh temple (Ward 4) and Cong Than temple (Ward 5). The provincial monuments are among Cuu Hu Banian Tree (Ward 1); Dinh Ho temple (Ward 4); Long Khanh Pagoda (Ward 5). Tân Giai Temple (Ward 3); Tân Ngãi Temple (Tân Xuân hamlet, Tân Ngãi commune); Minh Hương Hội Quán (Ward 5); Vạn Linh pagoda (Tân Nhơn hamlet, Tân Hòa commune); Trường An church (Ấp Tân Quới Tây, Trường An commute). In the project area, there are three pagodas, namely Giac Hoa in LIA 03; Long Hoa in LIA 4; Long An in LIA 1. Therefore, impacts on the three pagodas are of special concerns and mitigation measures are to be putting in places.

2.6.2. Sensitive Facilities

List of sensitive facilities in the project components will be presented in table 2.19; table 2.20, 2.21, 2.22, 2.23 and 2.24, respectively.

Table 2.19: List of Sensitive Facilities in LIA1

No.	Name/Picture	Distance to Works (m)	Specific Description
1	**Long An Pagoda** 	Located in LIA 1	Located in No.40 of an alley of Nguyen Hue street with a distance of approximately 40 m to Nguyen Hue street.
2	**Church** 	150m	Located on one side of Binh Lu Bridge, facing toward Pham Hung street, approximately 150 m from P2-P9 street and LIA 1.
3	**Nguyen Truong To High School** 	Located in LIA 1	Located in alley of Vo Van Kiet road in LIA 1, approximately 130 m from the main road Vo Van Kiet.

Table 2.20: List of Sensitive Facilities in LIA3

No.	Name/Picture	Distance to Works (m)	Specific Description
1	**Giac Hoa Pagoda** 	Located in LIA3	Located in LIA 3, facing toward Le Thi Hong Gam. It is about 10 m from Le Thi Hong Gams street. The street is narrow, not main street.
2	**Ngoc Thuan Monastic** 	Located in LIA3	Located in LIA 3, facing toward Ngo Quyen street. The Ngo Quyen is narrow and small street
3	**Vinh Long University of Technology Education** 	5	Located facing toward Nguyen Hue Street. The area is densely populated with high traffic flow and approximately 20 m far from LIA 1. The left side of the school is adjacent to Vo Van Kiet Street. The back of the university is adjacent to the resident of LIA 3.
4	**Vinh Long Teacher Training College** 	5	Located next to Vinh Long University of Education and Training. The front of the school is facing toward Nguyen Hue Street. This area is densely populated with high traffic flow and approximately 20 m far from LIA 1. The right side is adjacent to Vo Van Kiet. The back of the university is adjacent to LIA 3.
5	**Hoa Sen Kindergarten**	Located in LIA3	Located in LIA 3, facing toward Ly Thai To Street- One way. The traffic flow is at average in the area.

No.	Name/Picture	Distance to Works (m)	Specific Description
			

Table 2.21: List of Sensitive Facilities in LIA4

No.	Name/Picture	Distance to Works (m)	Specific Description
1	**Long Hoa Pagoda**  **Tan Giai communal house** 	Located in LIA4	Located in an alley of LIA 4 area.
2	**Temporary Grave** 	Located in LIA 4	Located in an alley of LIA 4 area.
3	**Ngo Quyen High School** 	Located in LIA 4	It is about 2 meters from the Mau Than Street. The area has always high traffic flow.
4	**Vinh Long Oratory** 	55m	Located in Nguyen Van Be and Vo Thi Sau junction, facing toward Vo Thi Su street, high traffic flow, in a residential area. It is about 55 meters from LIA 4 and Cut River canal.

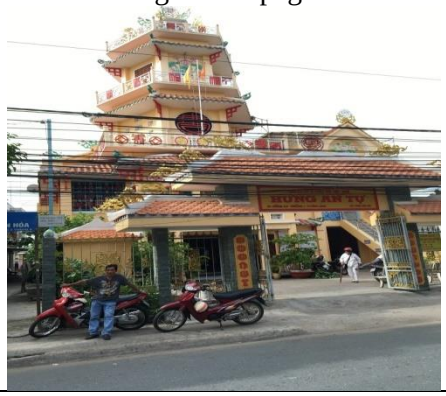
Table 2.22: List of Sensitive Facilities Vo Van Kiet Street in Vinh Long City

No.	Name/Picture	Distance to Works (m)	Specific Description
1	**Vinh Long University of Technology Education** 	5	Located facing toward Nguyen Hue Street. The area is densely populated with high traffic flow and approximately 20 m far from LIA 1. The left side of the school is adjacent to Vo Van Kiet Street. The back of the university is adjacent to the resident of LIA 3.
2	**Vinh Long Teacher Training College** 	5	Located next to Vinh Long University of Education and Training. The front of the school is facing toward Nguyen Hue Street. This area is densely populated with high traffic flow and approximately 20 m far from LIA 1. The right side is adjacent to Vo Van Kiet. The back of the university is adjacent to LIA 3.

Table 2.23: List of Sensitive Facilities in Kinh Cut canal in Vinh Long City

No.	Name/Picture	Distance to Works (m)	Specific Description
1	**Toa Giam Muc/ Church** 	50m	Located in 3/2 street. The left side is adjacent to Tran Van On Street, approximately 50 from the one end of Kenh Cut canal.
2	**Nguyen Du Market** 	Adjacent to Kenh Cut Canal	Next to Mau Than Bridge, adjacent to Kenh Cut canal. Area is always very crowded

Table 2.24: List of Sensitive Facilities in Cau Lau Canal

No.	Names/Photos	Distance to Works (m)	Specific Description
1	Hung An Tu pagoda 	Adjacent to Cau Lau canal	Located in 2/9 street. The area is densely populated with high traffic flow. The back is adjacent to Cau Lau canal.
2	Cau Lau Market 	Adjacent to Cau Lau canal	Cau Lau market is under Cau Lau bridge, adjacent to Cau Lau cannal with high density resident.

CHAPTER 3. ANALYSIS OF ALTERNATIVES

The young and dynamic Vinh Long is currently class III city and aims to leapfrog to class II city by 2020. This urban upgrading project will help the city to follow the right track towards its goals by aligning itself strongly with the national and regional master planning and policies, specifically:

- The National Urban Upgrading Program for the period 2009-2020 as promulgated by the Prime Minister in Decision 758/QD-TTg
- The National Urban Development Program as detailized in the Decision 1659/QD-TTg dated November 7, 2012 by the Prime Minister
- Approval of the amendment to the Orientation of the Master Planning for the development of urban system in Vietnam as in Decision 445/QD-TTg on April7, 2009
- Proposal for Climate Change adapted Urban Development Program in Vietnam, governed under Decision 2623/QD-TTg in 2013.
- The Vietnam Green Growth Strategy and Action Plan in 2014 as specified in the Decision 403/QDD-Ttg in 2014
- Vinh Long City Socio-Economic Development Plan for the period 2015-2020
- Vinh Long City's Master Planning towards 2020, including sub-plannings on spatial infrastructure, water supply and drainage, transport and flood control

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

3.1. "WITHOUT PROJECT" ALTERNATIVE

If the project is not implemented, Vinh Long City continues to face the challenges of a small city being lack of adequate urban infrastructure and vulnerable to climate change and sea level rising. The situation is worsening due also to the rapid growth of population and labor force migrating from rural to urban areas. Challenges are among:

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

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

Table 3.1: Alternatives analysis of the without project scenario

Investment Item	With Project	Without Project
Widening the alleys in LIAs	- Improve the commuting conditions for the people living in the LIAs. - Give access to local houses for evacuation, emergency and fire safety purposes - Improved sanitation and environment conditions via waste water collection and treatment - Improve significantly living conditions of residents - Reduce localized floods within the LIAs - Land value within LIAs is increased - 402 household is being affected by land acquisition, of which 4 household will be resettled	- Commuting conditions of people in LIAs remain diffucult. Issues on environmental sanitation and pollution are not addressed and will be increased over time - Living conditions of residents are not improved - Local flooding issue is remained. - Land value is not increased - No issue on land acquisition and resettlement
Road construction and upgrading.	- Improve the commuting conditions for local people, reduce traffic jam and promoting the development of the residential area - Increase land value at the area along the road sides - Issue on land acquisition, resettlement and social impacts to local people)	- Traffic pressure on existing route is remained and increased over time - Land value is not increased - No resettlement issues
Canal upgrading work	- Preventing the bank erosion - Stablize the life of local residents, the; and removing the encroachment status of canals. - Improve environmental and sanitation via wastewater collection and treatment - Better landscape and increasing green space; facilitate tourism development on river - Issues on land acquistition, resettlements and livelihood	- High risk on property loss and safety of local people living along the canal due to erosion - Ability for drainage in flooding restricted by the encroachment and pollution. - Land scape situation is not improved - No cost emerged for resettlement.

Investment Item	With Project	Without Project
	restoration to affected people during subproject implementation	

The above analysis of a theoretical "without project" case clearly demonstrates the benefits of the project.

3.2. "WITH PROJECT" ALTERNATIVES

In this scenario, the alternatives analysis addresses the options of widening the alleys in the LIAs and different technical designs of Kinh Cut and Cau Lau canal embankments. The construction of roads mostly follows the planning therefore no changes emerge from the current plan. The alternatives analysis is conducted considering a combination of technical, economic, environmental, and social criteria.

3.2.1. Alternatives for widening the alleys in the LIAs

The proposed options for upgrading the LIAs are:

(i) Upgrading with extension of all alleys within the LIA to the minimal width. The alley's centerline would stay unchanged.

(ii) Upgrade the current alleys to concrete ones without extension, A mix of option 1 and 2 in which big and heavy traffic alleys would be widened to at least 4 m widths and small alleys are upgraded and expanded to minimal width of 2 m.

The detailed analysis of alternatives is presented in table 3.2 below.

Table 3.2: Alternatives for widening alleys in LIAs

Criteria	Option 1	Option 2	Option 3 (Selected)
Technical	- Sufficient road width for installation of basic infrastructures and evacuation purposes - Construction work might be delayed due to big resettlement work arrangement.	- Easy for construction and operation - Difficult for installation of basic infrastructures (sewage)	- Main alleys with sufficient width for installing basic infrastructure - Upgraded small alleys would easily be connected to the main alleys
Social	- Living conditions and traffic safety would be significantly improved - Daily life/ livelihoods of residents would be impacted during construction and resettlement process - Involve highest scale of land acquisition Address	- Not much improve traffic and living conditions - Daily life/ livelihoods of residents would only be impacted during construction process. - No land acquisition and resettlement is required	- Improve traffic and living conditions - Daily life/ livelihoods of residents would be impacted during construction and resettlement process - Involve moderate scale of land acquisition and resettlement

Criteria	Option 1	Option 2	Option 3 (Selected)
	grievances would be needed		
Environmental	- Environmental sanitation conditions would be improved. - Prevent local flooding - Better landscape and waste management - Noise, dust, vibration and waste would be expected during construction. - Accessibility will be greatly enhanced	- Environmental sanitation conditions would be improved. - Prevent local flooding - Landscape and environmental management would not be improved much. - Less impact from noise, dust and vibration. - Accessibility would be difficult for emergency, fire safety, evacuation or waste collection purposes.	- Environmental sanitation conditions would be improved. - Prevent local flooding - Better landscape and waste management - Noise, dust, vibration and waste would be expected during construction - Evacuation or emergency could be feasible
Investment cost	- Increase value of land - Highest cost for compensation - Highest construction cost	- Value of land would not be much improved - Compensation cost would be the lowest - Cost of construction would be the lowest.	- Value of land would increase along the main alleys. - Moderate compensation cost. - High construction cost

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

3.2.2. Alternatives of embankment designs

Kenh Cut and Cau Lau canals are connected therefore technical designs of embankment are applied the same for these two canals. Four technical designs are proposed as follows:

(i) Option 1: Revetment with gravity retaining wall on pile foundation. Upper part is greened with grass and landscaping trees.

(ii) Option 2: Revetment with lower part of pre-stressed concrete sheet piles. The upper part is greened with grass and landscaping trees.

(iii) Option 3: Slope revetment with pre-fabricated concerete elements (slope 1:1.1)

(iv) Option 4: Soft and green revetment with geo-sandbags

The factors considered were: (i) technical aspects especially the restriction of flows, (ii) environmental impact, (iii) social impacts. In combining with other criteria such as construction

costs, option (iv) is selected for the Kinh Cut and Cau Lau embankments as the best solution as because of its low cost, efficiently technical functions and harmonizing with the environment. Table 3.3 provides details the alternatives analysis.

Table 3.3: Alternatives for technical embankment designs of Cau Lau and Kinh Cut canals

Criteria	Option 1	Option 2	Option 3	Option 4 (Selected)
Description	- Revetment with gravity retaining wall on pile foundation. Upper part is greened with grass and landscaping trees.	Revetment with lower part of pre-stressed concrete sheet piles. The upper part is greened with grass and landscaping trees..	Slope revetment with pre-fabricated concerete elements (slope 1:1.1)	Soft and green revetment with geo-sandbags
Technical	- Highest stability as it includes the gravity concrete wall - Difficult to construct, include high amount of construction work and long construction period.	- High stability as it includes the sheet concrete pile - Relatively difficult construction, relatively high amount of construction work and long construction period.	- Stability is moderate, prevent bank erosion. Water way transportation is low. - Easy to construction, moderate amount of construction work, short construction	- Stability is moderate, prevent bank erosion. Water way transportation is low. - Most easy to construct, least construction work and shortest construction period
Social	- High compensation & resettlement - Expected 455 affected households	Low volume of compensation, resettlement -Expected 375 affected households	- High compensation & resettlement - Expected 477 affected households	- Minimize resettlement - Expected 276 affected households
Environmental	- Aesthetic is moderately. Concrete appealing - Highest construction related impacts due to high amount of work i	- Aesthetic is moderately pleasing. Concrete appealing - Moderate construction related impacts due to moderate amount of construction work	- Stone revetment is not attractive - Low construction related impacts as most of the construction work is manual, not require the mobilisation of many machineries.	- Nice and comfort green feeling - Lowest construction related impacts as most of the construction work is manual, not require the mobilisation of many machineries.
Cost	- Medium	- High	- Low	- Medium

Conclusion: For the technical aspect, all 04 alternatives meet in terms of stability and sustainability in the project. Option 4 acquires more land compared to option 1 and 2, and as same as land acquired in option 3. Thus option 4 is selected as it would result in the lowest construction cost, the easiest construction method, the least environmental construction related impacts, and the most beautiful lanscape.

CHAPER 4. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Chapter 4 will analyze the specific environmental impacts induced by the project activities of (i) Tertiary infrastructure upgrading in Low Income Areas; (ii) Priority Primary and Secondary Infrastructures; (iii) Resettlement sites. Component 4, which is implementation support and capacity building does not involve any physical construction thus will not cause any environmental impacts.

The considered environmental impacts including both positive and negative impacts in which the latter will be given special attention in order to come up with necessary and obligatory mitigation measures to be implemented during the project's preparation, implementation and operation. Besides, the accumulation impacts and impacts to the physical cultural resources will also be assessed in this chapter.

The method used in this chapter is based on the analysis of the baseline environmental information, field survey and discussion and consultation with local authority and people and other stakeholders

4.1.ENVIRONMENTAL IMPACT ASSESSMENT

4.1.1. Positive impacts

The positive environmental impacts are of the following:

- Improve environment and sanitation in LIAs from alley upgrading, sewage and storm water collection and domestic waste collection.
- Improve the air quality and reduce dust as earth alleys to be replaced by concrete alleys.
- Reduce local flooding as the drainage would be improved and alleys' base elevation would be leveled up as same as that of the main roads.
- Address the environmental pollution in the main drainage network of the city (Cau Lau, Kinh Cut canals)
- Canal embankment would help to protect canal bank and prevent from bank erosion
- Dredging the canals would improve the environment, ensure water flow and increase drainage capacity
- Eliminate the encroachment and thus prevent the direct discharge of waste and waste water into the canals
- Tree planting along the canal banks and roads will beautify the landscape and increase the city green coverage.
- Additional economic, social, environment and aesthetic benefits from the construction of linear parks along Kinh Cut and Cau Lau i.e. open space for recreation of local people.
- Increase the connectivity by road and bridge construction, reducing the flood risks
- Improve environmental conditions in resettlement sites
- Increase climate resilience by improving drainage/ flood retention capacity, strengthening the weak soil foundation and applying the construction standards and designs adapted to climate change.

4.1.2. Negative impacts

4.1.2.1. Type and scope of impacts

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

Potential environmental impacts are classified and identified in Table 4.1 below, of which: None (N) – No impacts; Low (L): Small work, small impacts, localized, reversible, temporary; Medium (M) – Small works in sensitive/urban areas, medium-scale with medium impacts, reversible, temporary; High (H) – Major works in sensitive/urban areas, large-scaled works with significant impacts (social and/or environmental), irreversible, and compulsory compensation.

Table 4.1: Level of potential negative impacts of the project

Work items	Physical			Biological		Social				Others	
	Air, Noise, vibration	**Soil, water**	**Solid waste, degree sludge**	**Forest, Natural ecosystems**	**Fish, aquatic species**	**Land acquisition, resettlement**	**Native ethnic groups**	**Tangible cultural resources**	**Livelihood, disturbance to residential community**	**Localized flooding, traffic, safety**	**Impacts from outside subproject area**
Component 1: Upgrading tertiary infrastructure: - Expanding the main alley to 4 m; small alleys of at least 2 m width; sewage pipes D 400-600 (including manholes); installation of lighting systems; upgrading small canals in the area LIA 1; LIA 3 and LIA 4; dredging, embankment and tree landscaping for 4.1km small canals in LIA1,3,4. - Social Impacts: 402 households affected in which 398 of households affected partially, 04 household relocated. - Land acquisition: 4,158 m^2 of which residential land is at 3,322 m^2, agriculture land is 613 m^2 and 224 m^2 public land. - PCRs and sensitive receptors: 01 Long An temple; Truong To Secondary school; 01 church and Truong To secondary school in the LIA 01; Chanh toa church (70 m), Hoa Sen Kindergarten, Ngoc Thuan Monastic, Giac Hoa Pagoda in LIA 03; Vinh Long Oratory (55 m), Toa Giam Muc church (50 m), Nguyen Du Market (50 m), Tan Giai communal house, Long Hoa Pagoda, Ngo Quyen High School.											
Preparation	N	N	N	N	N	H	N	N	M	N	N
Construction	M	M	M	L	N	L	N	M	M	M	M
Operation	N	N	L	N	N	N	N	N	N	L	N
Remark	- Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2nd note below) - Pre-construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement (see 4.2) - Construction stage: (i) Local flooding; (ii) Offensive odor from sediment dredging small canal in LIA 1,3,4; (iii) Social disturbances and local traffic obstruction; (v) Impacts to PCRs and sensitives receptors: Operation stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe;										
- **Component 2: Upgrading priority primary and secondary infrastructure includes:** (i) Upgrading Bo Kenh in Ward 3 ii) upgrading P2-P9 road connecting national way No.53 and 1A; iii) construction of Vo Van Kiet street iv) Upgrading and Embankment of Kinh Cut and Cau Lau canals.											
Component 2.1: Upgrading Bo Kenh road in Ward 3 connecting to new urban area and resettlement sites in Ward 4 - Upgrade the existing 3m wide Bo Kenh earth road to the asphalt road, with the width of 14 m, and 12 m pavement (2x6m). The total upgrading length: 2.2 km. - Install sewer pipes, lighting and plant green trees along the sidewalks. - Resettlement impacts: 304 households affected, of which 290 household affected partially, 14 household displaced. The total land acquisition is 38,687m^2 of which residential area is 10,0470m^2; agriculture land is 25,063m^2 and public land is 3,576m^2.											
Preparation	L	N	N	N	N	H	N	N	N	N	N

Work items	Physical			Biological		Social				Others	
	Air, Noise, vibration	**Soil, water**	**Solid waste, degree sludge**	**Forest, Natural ecosystems**	**Fish, aquatic species**	**Land acquisition, resettlement**	**Native ethnic groups**	**Tangible cultural resources**	**Livelihood, disturbance to residential community**	**Localized flooding, traffic, safety**	**Impacts from outside subproject area**
Construction	M	M	M	L	L	L	N	L	M	L	L
Operation	L	N	N	N	N	N	N	**N**	N	L	L
Remark	- Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2nd note below) - Pre-Construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement ; (iii) Impact Due to Relocation of Graves (see 4.2) - Construction Stage: (i); Local flooding (ii) Impact on existing utilities along the road; (iii) Disruption of business activities (iv) Social disturbance and traffic concern ; (v) Impacts on agriculture land; Operation Stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe, air and noise.										
Component 2.2: Upgrading P2-P9 (Ward 2, 9) road connecting national way 53 and national way 1A - Upgrading the P2-P9 with the total length of 1.9 km, width of 10.5 m and two side pavements of 4.5 m width. - Provided with sewer pipes, lighting and green trees along the sidewalks - Resettlement: 304 household affected, of which 290 affected partially, 14 households relocated, 15 households affected severely. Land acquisition: 25,532.8 m^2 of which 2,010.4 m^2 is resident land and 8451.8 m^2 is agriculture land and public land is 15,070.6m^2). - Sensitive area: Church a distance of 150 m, Long An pagoda a distance of 80 m, Truong To Secondary School.										
Preparation	L	N	N	N	N	H	N	N	N	N	N
Construction	M	M	M	L	L	L	N	L	M	L	L
Operation	L	N	N	N	N	N	N	**N**	N	L	L
Remark	- Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2nd note below) - Pre-Construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement ; (iii) Impact Due to Relocation of Graves (see 4.2) Construction Stage: (i); Local flooding (ii) Impact on existing utilities along the road; (iii) Odor from dredging a small canal on P2-P9 Road (iv) Disruption of business activities (v) Social disturbance and traffic concern ; (vi) Impacts on agriculture land; Operation Stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe, air and noise.										
Subproject component 2.3: Construct and extend Vo Van Kiet Road, connecting to the city center in the areas of the ward 2,3,4. - Construct Vo Van Kiet asphalt road with total length of 0.62 km, width of 16 m (4 lanes) and 15m sidewalks (2x7.5m). - Installation of culverts and manholes for sewer system, lighting and green trees along the sidewalks - Resettlement: 78 households will be affected of which 56 households will be affected partly, 22 households will be displaced. The acquired land is											

Work items	Physical			Biological		Social				Others	
	Air, Noise, vibration	**Soil, water**	**Solid waste, degree sludge**	**Forest, Natural ecosystems**	**Fish, aquatic species**	**Land acquisition, resettlement**	**Native ethnic groups**	**Tangible cultural resources**	**Livelihood, disturbance to residential community**	**Localized flooding, traffic, safety**	**Impacts from outside subproject area**
26,242.64m2 in which residential land is 11,165.16 m2 and agriculture land is 6,027.8 m Sensitive receptors: Resident area in radius of 10-250 m; Vinh Long college of Technology and Economics, Vinh Long Education and Vocational Training School											
Preparation	L	N	N	N	N	H	N	N	N	N	N
Construction	M	M	M	L	L	L	N	L	M	L	L
Operation	L	N	N	N	N	N	N	**N**	N	L	L
Remark	- Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2nd note below) - Pre-Construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement ; (iii) Impact Due to Relocation of Graves (see 4.2) - Construction Stage: (i); Local flooding (ii) Impact on existing utilities along the road; (iii) Disruption of business activities (iv) Social disturbance and traffic concern ; (v) Impacts on agriculture land; (vi) Impacts on sensitive receptors - Operation Stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe, air and noise.										
Component 2.4: Upgrading and embankment of Kinh Cut canal - Reinforced concrete retaining walls (embankment) with concrete short piles. After dredged, the cross section of the river/canal is ensured to be 20 m wide minimum for drainage - A 6 m width operational road on the left bank with 3m sidewalk. On the right bank, the operational road will be the current Nguyen Du road (6 m width and canal side pavement of 3-5 m and existing household side pavement/sidewalk of 3m.) - A complete basic infrastructure of sewer system (culverts and manholes) for wastewater and storm water collection and street lighting. - Resettlement: 177 will be affected, of which 49 households will be affect partly, and 128 households will be reallocated. - Land acquisition: 17,552.3m^2 in which, residential land is 6,850.4 m^2; no agriculture land will be acquired. - Sensitive points: Vinh Long Oratory (a distance of 50 m); Diocesan (a distance of 55 m); Nguyen Du market										
Preparation	L	L	L	N	L	H	N	N	N	N	N
Construction	M	M	M	L	L	L	N	L	M	L	L
Operation	L	L	L	L	L	N	N	N	N	L	N
Remark	- Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2nd note below) - Pre-Construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement ; (iii) Impact Due to Relocation of Graves (see 4.2) - Construction Stage: (i) Ecological environment (ii) odor from dredging; (iii) Risks on soil erosion and embankment subsidence during embankment;										

Work items	Physical			Biological		Social				Others	
	Air, Noise, vibration	**Soil, water**	**Solid waste, degree sludge**	**Forest, Natural ecosystems**	**Fish, aquatic species**	**Land acquisition, resettlement**	**Native ethnic groups**	**Tangible cultural resources**	**Livelihood, disturbance to residential community**	**Localized flooding, traffic, safety**	**Impacts from outside subproject area**
	(iv)Damage impact to small bridges; (v) Social disturbance and traffic concern ; (vi) Disruption off navigation during construction of cannal; (vii)Impacts on agriculture land (viii) Impacts on PCRs - Operation Stage: (i) Risks of flooding from lack of O/M;										
Component 2.5: Upgrading and embankment of Cau Lau canal with total length of 0.76 km - Reinforced concrete retaining walls with short concrete piles. After dredged, the cross section of the river/canal is ensured to be 30 m width minimum for better drainage - 4 m width adjacent roads along 2 sides with newly planted trees. - Installation of manholes and culverts for collecting wastewater and storm water. - Resettlement: 164 households will be affected of which 140 households will be affected partly and 24 households will be reallocated. - Land acquisition: about 11,251.1m^2 will be acquired of which residential land is 5,888.7m^2 and agriculture land is about 2,703.04 m^2 - Technical infrastructure: sidewalks, sewage collection system; green trees; Electric lighting system along the road and separated line - Sensitive points: Cau Lau Market;										
Preparation	L	L	L	N	L	H	N	N	N	N	N
Construction	M	M	M	L	L	L	N	L	M	L	L
Operation	L	L	L	L	L	N	N	N	N	L	N
Remark	- Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2nd note below) - Pre-Construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement ; (iii) Impact Due to Relocation of Graves (see 4.2) - Construction Stage: (i) Ecological environment (ii) odor from dredging; (iii) Risks on soil erosion and embankment subsidence during embankment; (iv)Damage impact to small bridges; (v) Social disturbance and traffic concern ; (vi) Disruption off navigation during construction of cannal; (vii)Impacts on agriculture land (viii) Impacts on PCRs - Operation Stage: (i) Risks of flooding from lack of O/M;										
Component 3: Resettlement area - Purchase land for resettlement area in Ward 4 which has developed with complete infrastructure system such as transportation road, water supply system, public lighting system, sewage systems and treatment. Major impact will be focused in operation phase.											
Operation	L	L	L	N	N	N	N	N	N	N	N

Work items	Physical			Biological		Social				Others	
	Air, Noise, vibration	**Soil, water**	**Solid waste, degree sludge**	**Forest, Natural ecosystems**	**Fish, aquatic species**	**Land acquisition, resettlement**	**Native ethnic groups**	**Tangible cultural resources**	**Livelihood, disturbance to residential community**	**Localized flooding, traffic, safety**	**Impacts from outside subproject area**
Remark	Operation Stage: (i) Domestic wastewater; (ii) Solid domestic waste										

Note:

(1) The following criteria will be used to assess the level of impacts: No (N) -No impact; Low (L) – small works, small impact, locally, have resilience, temporary; Medium (M) - small works in the urban area / sensitivity, the average scale works to moderate the impact of which most can restore, minimize, and easy to manage, locally sets, temporary; High (H) - the average size of projects in small urban areas / sensitive, large-scale projects with significant impact (social and / or environmental) impacts which are unable to recover and claim; Both the M and H should supervise and implement mitigation measures as well as institutional capacity sufficient to ensure safety.

(2) The small and medium-scale projects, most of the impact is happened locally, temporary, and can be mitigated through the application of engineering and construction management work well together with surveillance and strictly monitoring and closely consultation with the local community

(3) Affected households (AHs) including people whose land are compulsorily acquired, leading to:

- Displacement or loss of houses;
- Loss of assets or loss of access to these assets;
- Loss of income sources or livelihood means, regardless displaced or non-displaced households; and Disturbance to daily life and habit.

4.1.3. Impact assessment of the investments on upgrading tertiary infrastructure under Component 1

4.1.3.1. Component 1 – Impacts during Preparation

Impacts during the preconstruction phase include: (i) safety risk due to UXOs, (ii) land acquisition and resettlement; (iii) graves relocation

a) Impacts from unexploded ordnances (UXOs)

The subproject construction sites have been greatly affected by human activities including extensive urban development, and UXOs have already been cleared. However, there could be UXO remnants from the war time, which may be encountered during excavation. The consequences can be serious, causing injuries, losses of human life and assets in the subproject areas. Therefore, UXO detection and clearance must be carried out before commencement of any construction work.

b) Land acquisition and resettlement

Land acquisition, relocation and resettlement will cause impacts to local households, potentially resulting in social problems and even litigation, if not undertaken successfully. People need time to settle in, adapt and integrate into new living conditions, make new relationships in the local community and even new ways of living and earning income.

The upgrading work in LIAs will affect total 402 households of which 398 households will be partially affected and 4 households will be relocated due to land acquisition. The acquired land will be 4,158 m^2, comprising of 3,322m^2 residential land, 613m^2 agriculture land and 224m^2 public land. The detailed impacts are assessed in the **section 4.2.**

c) Impact due to relocation of graves

This component will require relocation of 10 graves of households in ward 2 and 3. To the Vietnamese, grave is a religious and spiritual matter, which are highly respected. Household and individual graves are considered PCRs, and the Bank's OP/BP 4.11 applies for this subproject. However, the consultation with the households affected by grave relocation reveals that people are still willing to move the graves to another location to give land for construction if the subproject owner provides sufficient support to ensure proper grave relocation. The level of the impact caused by this activity is therefore considered to be small.

4.1.3.2. Component 1 – Impacts during Construction

Those activities in the construction phase includes upgrading tertiary infrastructure for LIA 01, 03 and 04 of the Vinh Long city include following activities:

- Expanding main alley to 4m, brach alley line to at least 2m.
- Investing to concrete pile culvert for water supply system at diameter of D400-600 (including manholes-interceptor)
- Re-building water supply systems included the connecting points
- Constructing electric lighting systems with power-saving LED bulbs.
- Renovating small canals inside the LIAs
- Operating vihicles, machinery and operation of construction of the workers.

4.1.3.2.1. Generic Environmental Impact Assessment

The investments under component 1 include activities on widening of alleys, concreting alley surfaces, installation of drainage and lighting system. Detailed assessment on the potential

adverse impacts during preparation, construction and operation of investments under component 1 are described below.

1. Impacts to Air quality

Environmental impacts related to air quality are mostly dust and gases emissions, generating from demolition of house structures, earthworks and transportation of materials. However those are discontinuous activities and happen in short period of time given the small to moderate scope and scale of the subproject. The scheduled the subproject will be implemented in 60 months from 2017 until 2021; construction period will be divided into several contracts and implemented in different times.

a)Dust emission from demolition, excavation, backfilling

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:

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

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 2.4 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 = 0.0275 kg/ton

Based on pollution coefficient E and compliance with the subproject work progress, the loads of dispersed dust generated by demoliton can be forecasted as follows (Table 4.2):

Table 4.2: Dust load from demolition, excavation, backfilling works under the component 1

Work items	Demolition volume (m^3)	Excavation volume (m^3)	Backfilling volume (m^3)	Dust load (kg/day)	Construction stage (month)
LIA 01	1,732	4,330	8,660	1.73	14
LIA 03	1,548	3,870	7,740	1.55	14
LIA 04	2,891	7,228	12,390	2.65	14

From the above pollution loads from dust by applying BOX model with a wind speed of 2.4 m/s and a distance of 10-50 m from generating sources, height 1.5-9 m, the concentration ofdust created by demolition, ecavation and backfilling can be calculated as follows:

- For LIA 1: Dust concentrations vary between 1.86-0.46 mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3).
- For LIA 3: Dust concentrations vary between 1.74 - 0.83 mg/m^3.
- For LIA 4: Dust concentrations vary between 2.70-0.57 mg/m^3.

The data indicates that at the distance of 10m from construction site, dust concentration is ranging from 6 to 8 times higher than the acceptable limits; at the distance of 50 m from

construction site, dust concentration exceeds 2 times above the limit of QCVN 05:2013/BTNMT. Within this distance, existing households along the alleys, workers at construction sites, traffic participants along the alleys will be affected. In the rain season, the dust concentration will be about 1.5 – 2 times lower compared to that in the dry season for each LIA area because higher humidity will increase the deposition of dust. In addition, construction work throughout the LIAs will be scheduled and implemented in a sequencing manner thus these impacts are localized at moderate extent and will cease upon the completion of the work. The households, PCRs, and other sensitive receptors located within a radius of 1-150 m and will be affected by dust pollution caused by the work (see Table 4.3 below).

Table 4.3: Subjects and impact scale of dust emission from excavation and backfilling and leveling activity in LIA areas.

No.	Work item	Affected subjects	Distance to construction point
1	LIA 01	Long An temple; Nguyen Truong To Secondary school Resident area in LIA 01	within construction area
		Protestant church	150 m
2	LIA 03	Ngoc Thuan- Buddhist monastery; Giac Hoa temple; Hoa Sen Kindergarten Resident area in LIA 03	within construction area
		Diocese of Vinh Long	70 m
3	LIA 04	Resident area in LIA 04 Tan Giai Pagoda; Long Hoa temple Ngo Quyen Secondary school	within construction area
		Thành Thất Vĩnh Long (worship place)	55 m
		Diocesan bishop	50 m
		Nguyen Du market	50 m

b) Dust and Gases emission emitting from transportation of excavation, backfilling and demolition activities

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_2, NO_2, and HC as follows: dust: at 1.6 g/km/vehicle; CO gas: 3.7 g/km/vehicle; SO_2: 7.43S g/km/vehicle; NO_x: 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 approximately 13 km. The total passages of trucks and the generated dust loads in the process of transportation are calculated as follows:

Table 4.4: Load of Dust and gases emission generated from transportation of demolition, excavation, backfilling, and dredging activities in LIAs

Items	Quantity of transportation vehicle (trip/day)	Transportation distance (km)	Load of SO_2 generation (mg/m.s)	Load of NO_2 generation (mg/m.s)	Load of CO generation (mg/m.s)	Load of dust generation (mg/m.s)
LIA 01	7	12	0.000226	0.000995	0.000004	0.172
LIA 03	6	12.5	0.000194	0.000853	0.000003	0.147
LIA 04	8	13.5	0.000259	0.001137	0.000005	0.196

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

- For LIA 1*:* Dust concentrations vary between 0.2- 0.26 mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3); CO contents 3.88 mg/m^3 (compared with 30 mg/m^3); SO_2 contents 0.048 mg/m^3 (compared with 0.35 mg/m^3); and NO_x contents 0.059 mg/m^3 (compared with 5 mg/m^3).
- For LIA 3*:* Dust concentrations vary between 0.17 -0.246mg/m^3; SO_2 contents 0.049 mg/m^3 (compared with 0.35 mg/m^3) and NO_x contents 0.033 mg/m^3, CO contents 5.54 mg/m^3;
- For LIA 4: Dust concentrations vary between 0.13-0.14 mg/m^3; CO contents 3.8 mg/m^3; SO_2 contents 0.048 mg/m^3; and NO_x contents 0.058 mg/m^3.

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 0.13 and 0.26 mg/m^3. According to the calculations, dust concentration would not exceed the national standards on ambient air quality (QCVN 05: 2013/BTNMT) at a distance of greater than 25 m from the source. However, it must be noted that the amount of dust generated may be significant 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 Nguyen Hue street, Dinh Tien Hoang street, highway 1A and provincial road No. 53 and some other internal transport of the city. In this route (Highway 1A), there are many sensitive locations including Ward 3's market, Nguyen Trai secondary School, Le Loi Elementary School, Kindergarten 3, Viet-My Nursery School, Pham Hung Political School, Nguyen Thong high School, Kindergarten B, Vinh Long Community College, Cuu Long university, Vocational and training College of Mekong Vinh Long, Vinh Long Vocational College, Loc Hoa secondary School, Loc Hoa kindergarten, Cau Doi market, some churches and monasteries. The results of air quality analysis in Chapter 2 shows that the air quality in these areas is currently fairly good. Therefore, the subproject impacts of dust would be visible. The receptors affected by dust would be the residents living along the routes. Dust pollution would hinder businesses and services located along the routes leading to a drop in the number of customers. However, these impacts can be fully controlled and minimized if all necessary mitigation measures would be carried out during construction. The impact level of dust during transportation is there by assessed as being medium.

Concentration of SO_2, NO_2, CO_2 that generate from process of transportation of excavated and backfilling work is within acceptable limit of QCVN 05:2013/BTNMT - National Technical Regulation on ambient air quality. This result shows that the impact of dust and gas emission from the transport vehicles is insignificant and can be assessed at LOW level.

2. Impacts on Noise and Vibration

Noises in construction phase are mostly from transportation vehicles, bulldozers, excavators, air compressors, etc. Noise levels of some types of vehicles/ machineries are shown in Table 4.5.

Table 4.5: Noise levels of some types of transportation vehicles and construction machines

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

Source: Mackernize 1985

Based on basic noise levels of different types of vehicles, machineries as mentioned in Table 4.5, regarding the number of vehicles, machineries mobilized for construction of LIA1, 3 and 4, The combined generated noise level generated by waste removal/transportation machineries and vehicles and by technical infrastructure structure demolition/displacement activities using the formula of Phạm Ngọc Đăng Air pollution - 1997 are follows:

Daytime:

- LIA 01: From construction point to 15m away, calculated noise level is 73 dBA (3 dBA more than acceptable limit).

- LIA 03: From construction point to 15m away, calculated noise level is 75 dBA (5 dBA more than acceptable limit)

- LIA 04: From construction point to 15m away, calculated noise level is 75 dBA (5 dBA more than acceptable limit)

Night time:

- LIA 01: From construction point to 60m away, calculated noise level is 58 dBA (4 dBA more than acceptable limit).

- LIA 03: From construction point to 90m away, calculated noise level is 56 dBA, 1 dBA more than acceptable limit

- LIA 04: From construction point to 90m away, calculated noise level is equal to allowable level.

So, affected subjects and scale of impact by noise mostly generate from construction vehicles/machineries to LIA 1, 3 and 4 and results presented in table 4.7.

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

1	Project item	Affected subject	Distance from construction location	Noise impact	
				Daytime	Night
1	LIA 01	Long An temple; Nguyen Truong To Secondary school Resident area in LIA 01	Within construction area	x	x
		Protestant church	150 m		
2	LIA 03	Ngoc Thuan- Buddhist monastery; Giac Hoa temple; Hoa Sen Kindergarten Resident area in LIA 03	Within construction area	x	x
		Diocese of Vinh Long	70 m		x
3	LIA 04	Tan Giai Pagoda; Long Hoa temple Ngo Quyen Secondary school Resident area in LIA 04	Within construction area	x	x
		Thành Thất Vĩnh Long -a worship place	55 m		x
		Diocesan bishop	50 m		x
		Nguyen Du market	50 m		x

However, the said noise levels are calculated for conditions in which all means are operating the same point of time. Meanwhile, the construction items are split into many packages. As construction machines and equipment will be mobilized for each separate package and the operation of these machines and equipment will not exceed 8 hours a day, generated noise will not be continuous and will not last long. The impact is therefore assessed to be moderate.

3. Impacts on water quality

Sources of impacts on water environment include: (i) personal activities of the workers, (ii) construction wastewater, (iii) rainwater runoff in the project area; iv) wastewater containing oil. Improper wastewater management may contaminate to water environment not only in the project area but also may cause spread of water-borne diseases.

As surface water quality of Cau Lau and Cau Lo river in area of LIA 1, 3 and 3 are highly polluted with high content of organic matters, both COD and BOD5 exceed acceptable limits in certain monitoring locations at 1.1; and 1.8 times, respectively. (see 2.4)

a) Pollution by workers' wastewater

Estimated total number of workers for this project is about 230 people, each LIA will have about 70, 80 and 80 workers for LIA 1, 3, and 4, respectively. Needed water volume of each worker as mentioned clearly in National Standard -QCXDVN 01:2008/BXD, as of 45 liters/person/day (for washing, cooking and drinking). Daily generated wastewater volume is taken as 100% of

daily used water volume. So, total daily generated WW volume is ranging from 3.2 – 3.6 m^3/day/work item. Regarding to contents in wastewater, there will be mostly suspended particles, oil/grease, high contents of organic matters, dissolved organic substances (such as BOD5, COD), nutrients (N, P) and micro-organisms. According to water quality standard regulated by the WHO to the developing countries, table 4.8 presents pollution load and concentration of pollutants in domestic wastewater before treated by sceptic tanks are presented as follows:

Table 4.8: Pollution load and concentration of pollutants in domestic wastewater before treatment

Pollutants	Pollution coefficient(g/person/day)	LIA1	LIA 3	LIA 4	Pollution factor (mg/l)	
		Pollution load (kg/day)	Pollution load (kg/day)	Pollution load (kg/day)	Before treatment	QCVN 14:2008 (Column B)
Number of workers		**70**	**80**	**80**		
BOD5	45 – 54	3.15 – 3.78	3.6 – 4.32	3.6 – 4.32	1,000 – 1,200	50
COD	72 – 102	5.04 – 7.14	5.76 – 8.16	5.76 – 8.16	1,600 – 2,666	-
Total suspended solids (TSS)	70 – 145	4.9 – 10.15	5.6 – 11.6	5.6 – 11.6	1,555 – 3,222	100
Oil/grease	10 – 30	0.7 – 2,1	0.8 – 2.4	0.8 – 2.4	222 - 666	20
N_{tot}	6 – 12	0.42 – 0.84	0.48 – 0.96	0.48 – 0.96	133 - 266	50
$N\text{-}NH_4$	2.4 – 4.8	0.17 – 0.34	0.19 – 0.38	0.19 – 0.38	53 - 107	10
Phosphate	0.8 – 4.0	0.06 – 0.28	0.06 – 0.32	0.06 – 0.32	17.8 – 88.9	10
Total Coliforms	106 - 109	70x103 - 70x106	80x103- 80x106	80x103- 80x106	22x106 – 22x109	5000 (MNP/100 ml)

Source: WHO, 1993

The calculated results in table above show that the untreated wastewater have concentrations of pollutants much higher than the acceptable limits set in QCVN 14: 2008/BTNMT (Column B). This moderate pollution level will affect directly to the living environment of the workers and people in the project area and affect the quality of surface water and ground water, being sources for water-born diseases. Moreover, surface water from canals in LIA 1, 3, 4 is currently subject to organic pollution-as mentioned above. Therefore, the contractor must apply proper measures to mitigate the impacts from wastewater.

b) Pollution by construction wastewater:

The wastewater generated by construction activities from cleaning materials, equipment, machineries, etc.) have high contents of TSS and organic matters. Levels of pollution are presented in table 4.9 below:

Table 4.9: Concentration of pollutants in construction wastewater

No.	Parameter	Unit	Construction wastewater	QCVN 40:2011/BTNMT
1	pH	-	6.99	5.5 - 9
2	Suspended solid	mg/l	663.0	100
3	COD	mg/l	640.9	100
4	BOD_5	mg/l	429.26	50
5	NH_4^+	mg/l	9.6	10
6	N tot	mg/l	49.27	30
7	P tot	mg/l	4.25	6
8	Fe	mg/l	0.72	5
9	Zn	mg/l	0.004	3
10	Pb	mg/l	0.055	0.5
11	As	μ mg/l	0.305	100
12	Fuel oil	mg/l	0.02	5
13	Coliform	MPN/100ml	53×10^4	5.000

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

Results in the table above show that, some wastewater quality parameters are within acceptable limits of the National technical regulation on surface water quality (QCVN 40:2011/BTNMT). However, TSS concentration is 6.6 times higher than acceptable limit, COD is at 8 times; BOD5 at 8.6 times and Coliform at 106 times higher than the acceptable limits. If mitigation measures are not properly adopted, this can be a pollution source to the environment and cause negative health impacts to workers in the project site.

c) Pollution by rainwater/stormwater runoff

Quality of rainwater depends on air cleanliness and volume of washed-away substances in the project area. However, in construction phase, quality of rainwater runoff at construction area only depends on construction's surface areas. As air environment in the project area is relatively good and having no sources of pollutants to rainwater in project areas. Therefore, rainwater in construction phase mainly contains TSS, grease/oil. Especially in this phase, ground surface of each construction item have not been completed and is easily subject to washout. To minimize rainwater runoff pollution, construction units need to collect as much as possible all waste materials and waste oil/grease of construction vehicles and machineries. So, impact will not be significant. Total volume of rainwater in the project area during construction phase will be estimated using the following formula:

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

Where: S : Total area of the project area (m^2).

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

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

166.7: is conversion factor, from water layer-wise rainfall intensity to volume-wise rainfall intensity.

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

Table 4.10: Total volume of rainwater runoff in LIA 1, 3 and 4

Work item	Rainwater drainage area (m^2)	Flow factor	Rainwater flow (l/s)
LIA 1	100,000	0.6	80,74
LIA 3	170,000	0.6	137,25
LIA 4	229,000	0.6	184,88

According to calculation results of table 4.19, rainwater runoff flow rates of LIA 1, LIA 3, LIA 4 are 80.74 l/s; 137.25 l/s, and 184.88 l/s, respectively. For concentration of pollutants in rainwater runoff, according to measurements made in 2009 by the Ho Chi Minh City Institute of Hygiene and Epidemiology, the concentration of pollutants in rainwater in urban areas with no contamination sources and with construction works is as follows (Table 4.11):

Table 4.11: Concentration of pollutants in rainwater runoff

Pollutant	Rainwater in urban areas	Storm water in urban areas with construction works	QCVN 40:2011/BTNMT (Column B)	Discharge load (kg/day)
1. COD (mg/l)	10 – 20	30 – 50	150	0.024 – 9
2. T-N (mg/l)	0.5 – 1.5	1– 1.5	40	0.01– 2.7
3. T-P (mg/l)	0.004 – 0.03	0.02 – 0.05	6	0 – 0.009
4. SS (mg/l)	10 - 20	80 – 120	100	2.4 – 21.6
5. Mineral oil & grease (mg/l)	<0.01	3– 5	10	0 – 0.9

Source: HCM City Institute of Hygiene and Epidemiology, 2009

Thus, in rainwater runoff flowing through the construction area, the content of suspended solids often exceed the permissible limits set out in national industrial wastewater standards (QCVN 40:2011/BTNMT)- Column B, while the content of mineral grease and oil, if not properly isolated, is likely to exceed the acceptable discharge limit. Moreover, high frequency of local flood in LIA areas, that rainwater runoff flow will wash away with it construction material (soil/stone waste, etc.) to causing congestion to drainage culvert lines and even contaminate environment at larger scale to locations nearby project areas.

d) Oil-containing wastewater

Construction equipment/machine maintenance water: Construction equipment/machinery

maintenance activities take place at the machinery gathering locations in construction areas, that generate about 11m^3 of oil-containing WW/day (Table 4.12). Oil contents are within acceptable limit of QCVN 40/2011/BTNMT, Column B upon discharging to canals that is not for category of water supply like Cau Lau river and Cau Lo river in the project area (Cmax oil in Cau Lau and Cau Lo canals = C x Kq x Kf = 10 x 0.6 x 1.2 = 7.2 mg/l).

Table 4.12: Volume and concentration of pollutants in wastewater generated by machinery maintenance

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

Remark: Column A is with value C of pollutants of industrial WW upon discharge in to sources that will be used for domestic water supply; Column B is with value C of pollutants in industrial WW upon discharge into source that will not be used for domestic water supply.

Thus, impact level was assessed at MEDIUM and only occurring in construction phase and can be mitigated.

4. Impacts from Solid wastes

Solid waste generated in the construction phase of component 1 includes 3 main types: (i) construction solid waste (debris); (ii) domestic solid waste. The volume of total solid waste in LIA is presented in the table 4.13:

Table 4.13: Volume of solid waste generated in each work item

Work item	Construction solid waste (m^3)		Domestic solid waste (kg/day)
	Demolition volume	Excavation volume	
Upgrading LIA 1	1,732	12,990	35
Upgrading LIA 3	1,548	11,610	40
Upgrading LIA 4	2,891	19,618	40

a) Construction solid waste

Construction solid waste includes: cement containing bags, dropped cement mortar, brick/stone chips, waste iron, steel, excavated soil, etc. According to Table 4.13**,** the excavated soil volumes to be disposed of LIA 1, 3 and 4 are about 13,000; 11,600; and 19,600 m^3, respectively. These excavation, demolition volumes contain normal solid wastes, therefore it will not cause any negative impact to environment in terms of pollution. However, storage and transportation may affect to residents in the project area, such as:

- Dust diffusion by storage, transportation activities
- Overflowing, erosion at storage locations near residential areas and existing roads affecting people and traffic convenience;

- Increase of TSS contents in case of disposal into water;

If not collected and treated properly, this will contaminate water environment of the project area.

b) Domestic solid waste

In construction phase, it is estimated that each worker working at the project area generates about **0.5 kg** of personal waste per day. At intensive construction times, number of workers work at the construction sites is approx. 70 – 80 each day. So, total volume of daily personal waste is estimated at **35-40 kg/day**. Volume of domestic waste by workers in each LIA is presented in the table 4.13 above. Content of personal solid waste generated by the workers mostly includes plastic bags, waste paper, waste food, etc. These types of waste contain about 60 – 70% of organic substances and 30 – 40% of other substances, and may contain many bacteria and germs. This waste volume, if it is not collected and treated properly, that may contaminate to surface water, groundwater sources, creating odors due to decomposition and washout of storm-water. Even though, impacts from domestic waste of workers are assessed at Medium level and occurring in short time and can be managed.

5. Hazardous solid waste

Hazardous solid waste generated by project activities include waste oil/grease, oil-stained clothes, oil/grease containers. Waste oil/grease, according to hazardous waste management regulations, oil is classified as harmful waste. Even though, waste oil/grease of transportation/construction vehicles and machineries maintenance, repairing activities is unavoidable and volume of waste oil depends on the following factors:

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

Average waste oil/grease volume discharge from transportation/construction vehicles and machineries is 7 liters/ per change time. Maximum oil change/maintenance frequency is one time of every 3 months. Thus, generated waste oil/grease volumes at construction sites of LIA 01, 3 and 4 are as follows:

Table 4.14: Generated hazardous waste

No.	Work item	Number of construction vehicles/machineries at site	Waste oil/grease volume / month
1	LIA 01	13	30
2	LIA 02	18	42
3	LIA 03	16	37

Average generated waste oil/grease volumes of LIA 1,3 and 4 are 30; 42 and 37 kg/month, respectively. These oil/grease volumes will be collected into 150-200l bins placed at the maintenance, repairing locations at the construction sites, that later on will be contracted to the specialized units to collect and recycle. Besides, the project also generates oil/grease-stained cloths and oil/grease containers – estimated of 50kg/month. Waste oil/grease can penetrate to environment by spill or washout by storm-water. Volume of spilled or washout waste oil/grease depends on storage location and management capacity factors. Because the project areas are connected to surface water in canals, that waste oil/grease can enter and contaminate surface water sources at the project areas. Thus, these waste oil/grease needs to treat properly and especially, having regulations on workers' disposal. This type of impact is assessed at moderate level .

6. Impacts from risks and incidents

Labor accidents

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

- Environmental pollution may cause fatigue, dizziness or fainting for workers during their work.
- Loading/unloading, construction and transport of materials without attentive care 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.

Healt and Safety Risk to the Community:

Risks of accidents caused to the residents by travelling/transportation using vehicles during construction must also be taken into account of by the construction contractors. Transportation activities using trucks need to have support of traffic regulator 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.

Various and 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 nests 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.

4.1.3.2.2. Site-specific Impacts during Construction

The investments under component 1 are of small scale. The resulting generic impacts can be addressed by adopting generic mitigation measures (ECOPs as specified in ESMP). There are however, certain site-specific such as (i) local flooding during construction; (ii) Odors from dredging process and management of dredged sediment (iii) social disturbance and traffic safety; (iv). Disruption of business activities and (iii) impacts to sensitive receptors are of concern and they are discussed below:

a. Local flooding

The existing alleys in the LIAs are relatively small, narrow and without drainage system. Wastewater and stormwater currently run off freely and discharge into adjacent canals. As many other part of the Mekong's low-lying areas, Vinh Long is also subjected to semi-diurnal tides. Without the improvements, people in LIAs during the wet season already experience local floods due to lack of drainage and the tidal effects combining with rain. The construction of alleys and dredging small local canals in LIA 1,3 and 4 would temporarily hinder water flow thus can worsen the local flooding problem in rainy days. This impact will cease upon the completion of the drainage system. The upgrading of alleys is carried out in consecutive manner including many small packages scattered within LIAs, and in a relative short period (07-10 days for one alley). The impact is assessed as temporary and controllable if proper mitigation measures are put into place.

b. Odors from dredging process and management of dredged soils and sediments

Upgrading of LIA1, LIA 3 and LIA 4 would generate about 7,400m^3, 4,770m^3 and 5,200m^3 dredged material respectively. The dredging is to be carried out in successive manner, at every 50-100 m canal's segment. During the dredging process, sediment will only be temporarily stored at the construction area for about 24-48 hours.

Analytical results of the sediment samples of LIA1, LIA3 and LIA4 reveal that toxic heavy metals are lower than allowable limits of QCVN 07:2009/BTNMT. However, the sediment is contaminated with high level of organic substances, which are biodegradable in anoxic conditions and can release odorous compounds. During dredging process, emission of odorous compounds such as inorganic gases, mercaptans, organic acids, phenol, and p-cresol among others, which cause nuisance smell.

The dredging, temporary storage, and transportation of the sediment cause bad odor, nuisance, leakage and unsanitary conditions to the local resident nearby and along the transportation routes. As the amount of sediment is rather small and sediment is only stored for . a short period of time at each 50-100 m canal's segment, the magnitude of odor impacts is assessed as small and temporary.

c. Social disturbances and local traffic obstruction

Although the construction activities are of small scale and do not require mobilization of heavy machineries and large work force, there is very limited space (small, narrow alley (1.5-3.5m) with relatively dense population living in the area). The daily routine of local people in all LIAs can be temporarily disrupted during the construction period in a number of ways: (i) storage of materials and construction work could cause some damage to the existing alleys and limit traffic access for people (iii) increased dust on houses and goods/foodstuff in some food stands (iv) accidents can happen (v) social conflict between the construction workers and local people. The likelihood of this occurring is high however it will be short term ceasing with the end of construction, thus the impact magnitude is moderate to local people.

e. Disruption of business activities

As identified in the inventory of loss under the resettlement survey, there will be 39 affected households who have small business and trading activities such as convenience shops, tailor's, coffee shops, hairs and nails' spa. Besides being a safety risk, noise and dust from road construction activities and equipment might temporarily disrupt business activities. The contractor should take precaution for these issues to avoid accidents and dust affecting shops.

f. Impacts on Physical Cultural Resources (PCRs)

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

Impacts on Church, Long An Pagoda (150 m from LIA 1); Chanh toa church (70 m from LIA 3), Ngoc Thuan Monastery, Giac Hoa Pagoda (5 m from LIA 3); Vinh Long Oratory (55 m from LIA 4), Toa Giam Muc church (50 m from LIA 4), Tan Giai communal house, Long Hoa Pagoda (in LIA4):

The alley upgrading and canal dredging in LIA 1, LIA 3 and LIA 4 would create potential adverse impacts on the church, monastery and pagoda due to: (i) hindrance of access of the visitors to the churches during weekends and to pagodas on the 1st and 15th day of each Lunar calendar's month for religious practices; (ii) increased dust, exhaust gases, noise, vibration, solid waste, and wastewater due to construction activities; (iii) traffic congestion and accidental risk and community safety due to construction and transportation; (iv) interference with religious events at the temples and churches due to construction activities; (v) Conflicts between workers and visitors to these religious places. The sensitivity of the local residents is high however the overall impact could be ranked as moderate. The impacts can be successfully minimized.

Vibrations impacts to PCRs

With regards to vibration impacts on PCRs, specifically Giac Hoa Pagoda, Long Hoa Pagoda and Tân Giai communal house located in the immediate vicinity of the construction site (within a radius of 30 m), further analysis is provided below:

- Giac Hoa Pagoda (5 m distant from LIA 3)**:**

Giac Hoa Pagoda is within LIA 3. The alley running in front of the pagoda will be upgraded following the existing alignment (see Figure 4.1). The alley upgrading will involve in excavating soils for the installation of a drainage system along the alley, stripping off the alley surface and resurfacing it by the concrete asphalt. The excavation process may encounter the foundation of the gate and fence of the pagoda and cause a risk on infrastructure collapse. Vibration impacts on the pagoda is of concern however, these impacts are small, temporary and short-term as the

work will be done mainly by manual methods, and small size machineries. The risk of structure collapse and vibration impact can be managed by applying the appropriate construction methods, for example using supporting pillars or steel frame to protect the fence foundation.

Figure 4.1: Location of Giac Hoa Pagoda in relation to the construction site of the alley

- **Long Hoa Pagoda and Tan Giai Communal House:**

The alley of LIA 4 by passes the fence of Long Hoa Pagoda and the fence of Tan Giao Communal House (see Figure 4.2). This alley will be upgraded to 4m wide at minimum.The alley will not be expanded in the side of Tan Giai Communal House and Long Hoa Pagoda. However, excavation process could affect the foundation of the gate and fence of the pagoda and communal house and cause a risk on infrastructure collapse. Vibration impacts on these facilities are of concern however, these impacts are small, temporary and short-term as the work will be done mainly by manual methods, and small size machineries. The risk of structure collapse and vibration impact can be reduced by applying the appropriate construction methods, for example using supporting pillars or steel frame to protect the fence foundation.

Figure 4.2: Locations of Tan Giai Communal House and Long Hoa Pagoda in relation to the alley construction site

Impacts on Nguyen Truong To Secondary School (25 m from upgrading alleys in LIA 1), Hoa Sen Kindergarten (30 m from upgarding alleys in LIA 3), Ngo Quyen High School 30 m from upgrading alleys in LIA 4):

Upgrading alleys involves some excavation of the roadbed, resurfacing the concrete asphalt and installation of drainage culverts along alley sides. Construction work will cause dust, noise and vibration impacts on sensitive receptors which are Nguyen Truong To school, Hoa Sen Kindergarten and Ngo Quyen Highschool. These schools are located in the vicinity of the alley construction work with the distances from the schools to the alley construction site vary from 25 to 30 m. However the vibration impact will not likely to create any risk of collapse to these structures because the distances from the PCRs to the sites are out of the area of collapsing influence. Moreover, upgrading alleys in LIAs deploys manual labors and the mobilized machineries are often small size, making small vibration during their operation.

Noise impacts can cause disruption to lessons of pupils and sleeping of small children. At drop off and pick up hours of kids at the kindergarten, and at walk in/dismissal hours at school there will be big flows of parents and pupils traversing the school crossings near the sites. The construction may also attract inquisitive people and students to the sites. Apart from being traffic accident risk, the following concerns should be taken into account: (i) hindrance of access to schools; (ii) traffic congestions at school crossings; (iii) increase of dust, noise, vibration and waste; (iv) disruption of school's hours and lessons; (v) safety risk to teachers and pupils . However, the work will be done in a sequential manner and in a short time, thus the impacts are temporary. As the impact sensitivity to school's teacher, students and parents is high, the overall impact extent is considered moderate.

Impacts on Nguyen Du market (50 m from LIA 4):

The upgrading of alley roads in LIA4 would have the potential to have adverse impacts on market activities due to: (i) risks of construction accidents to traders and customers and (ii) disruption of business activities; (iii) increased dust and exhaust gases, affecting market activities and goods; (iv) conflicts between workers and traders and customers; (v) traffic congestion at the market peak hours.

4.1.3.3. Component 1- Impacts during Operation

a. Risk of local flooding due to the poor operation and maintenance

The operation and maintenance of newly installed drainage systems along the alleys if not well maintained could potentially affect the drainage capacity, especially on rainy days, causing local flooding to some parts of LIAs. However, the impact can be low if proper O&M practices are adopted.

b. Risk of traffic accidents

In the first few months of new alleys operation, motorbike riders often excitedly drive faster than normal and could result in self-injuries and/or cause accidents to local people. The likelihood of occurrence could be low as it is short term and can be minimized with the adoption of road safety practices and the introduction of awareness raising communication with the local communities during the operation phase.

4.1.4. Impacts Assessment on Upgrading Priority Primary and Secondary Infrastructure-Component 2

The investments under component 2 includes: (i) Upgrading Bo Kenh Road of 14 m wide and 2.2.km long in Ward 3; (ii) Upgrading P2-P9 (Ward 2, 9) road of 1.9 km long; (iii) Construction and upgrading of Vo Van Kiet Road (16 m wide, 0.62 km long); (v) Embankment and upgrading of Cau Lau and Kinh Cut Canals.

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

4.1.4.1. Component 2 – Impacts during Preparation

a. Land acquisition and resettlement

Under component 2, there will be 713 households affected partly and 189 households relocated due to land acquisition. Total area of land to be acquired is 119, 266.16m^2 of which 36,191.07 residential land, 42,246.41 agriculture land and 40,828.68 m^2 public land.

b. Impact due to relocation of graves:

Construction of Bo Kenh, P2-P9 road and Vo Van Kiet extended road will requires relocation of 100 graves of households in ward No.2, No.3, No.4 and No.9.

Construction and embankment of Kinh Cut and Cau Lau canals will require the relocation of 58 graves of households in ward No.3 and No.4.

To the Vietnamese, a grave is a religious and spiritual matter, and is highly respected. Household and individual graves are considered PCRs, and the Bank's OP/BP 4.11 applies for this subproject. However, the consultation with the households affected by grave relocation reveals that people are still willing to move the graves to another location to give land for construction if the subproject owner supports sufficiently to ensure the grave relocation. The level of the impact caused by this activity is only small.

c. UXO safety risk

As already indicated in section 4.1.4.1, 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.

4.1.4.2. Component 2 – Potential Impacts during Construction

- Activity in construction period including: Upgrading Kinh Cut and Cau Lau canals
  - dredging and embankment of canal
  - construction of sidewalk, greenery and lighting system
  - construction of operational road
  - operation of construction machines/equipment
  - activities of construction worker
- Construction of roads: construction of embankment for Bo Kenh road; Vo Van Kiet extended road, P2-P9 road
  - construction of sidewalk and installation of lighting systems and greenery -
  - construction of asphaltic roadbed
  - construction of wastewater culvert drainage and culvert stormwater drainage

4.1.4.2.1. General Impact Assessment

1. Impacts from dust and exhaust gases

a) Dust caused by demolition, excavation, backfilling activities

According to feasible study report of Vinh Long city, volume of demolition, excavation and backfilling work in component 2, is presented in the table 4.15 below:

Table 4.15: Volume of demolition, excavation, backfilling in component 2

Work item	Demolition	Excavation	Backfilling	Total
	m^3	m^3	m^3	m^3
P2-P9 road	588	18.525	57.000	76.113
Bo Kenh	-	28.600	66.000	94.600
Vo Van Kiet road	5.600	17.600	35.200	58.400
Embankment Kinh Cụt	2.000	7.020	14.040	39.260
Embankment Cau Lau	2.500	3.800	3.800	32.900

Dust generated by demolition, excavation and backfilling activities under Component 2 is calculated in the same way as component 1. The loads of dispersed dust generated by demolition and earthworks can be forecasted as follows (Table 4.16).

Table 4.16: Dust emission from demolition, excavation, backfilling in component 2

Work item	Duration of demolition, excavation, backfilling (month)	Dust emission (kg/ngày)	Dust emission (mg/s)
P2-P9 road	24	10.45	363
Bo Kenh road	24	12.99	451
Vo Van Kiet road	24	8.02	278
Embankment Kinh Cụt	24	3.45	120
Embankment Cau Lau	24	1.51	53

From the above pollution loads from dust by applying BOX model with a wind speed of 2.4 m/s and a distance of 10-50 m from generating sources, height 1.5-9 m, the concentration of pollutants created by transportation operations can be calculated as follows:

- For P2-P9 road: Dust concentrations vary between 0.93- 5.14 mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3).
- For Bo Kenh road: Dust concentrations vary between 1.15 -6.37 mg/m^3.
- For Vo Van Kiet: Dust concentrations vary between 0.74 -4.45mg/m^3.
- For Kinh Cut cannal: Dust concentrations vary between 0.38-1.76 mg/m^3.
- For Cau Lau cannal: Dust concentrations vary between 0.23-0.84 mg/m^3.

The analyzed results in table 4.29 show that, at a distance of 10 m from dust source of construction work, concentration of dust exceed acceptable limits ranging from 2,8-21 times (According to QCVN 05:2013/BTNMT - National technical regulation on ambient air quality.). These volume of dusts are rapidly deposited into ground. While at a distance of 50m from dust source of construction of P 2-P9, Bo Kenh road, Vo Van Kiet and Kinh Cut canal, dust emission exceeds the acceptable limits at 3,8-1,3 times, for dust emission generate from embankment of Cau Lau at 50m of distance, dust concentration is within the acceptable limit. However, because 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 12-24 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. For impact scale and affected subjects, details are presented in the table 4.17.

Table 4.17: Subject and scale of impacts to dust emission from demolition, excavation, backfilling activity in component 2

No.	Work item	Affected subject	Distance to construction site
1	P-P9 road	Resident area	Close to construction area
		Nguyễn Trường Tộ Secondary School	Close to construction area
		Long An pagoda	80 m
		Protestant church	150 m
2	Vo Van Kiet extended road	Vinh Long Education and technical Training college College of Education and training Vinh Long Residence area	Close to construction area
3	Embankment for Kinh Cut	Nguyễn Du market, Residence area	Close to construction area
		Thành Thất Vĩnh Long	55 m
		Diocesan bishop	50 m
		Nguyễn Du market	50 m
4	Embankment for Cau Lau	Cầu Lầu market, Residence area	Close to construction area

b) Dust and exhaust gases from transportation of demolition, excavation, backfilling activities

Transportation means as well as machines, equipment for construction work that uses the fuel, mainly diesel oil (DO oil- with Sulphur content that smaller than 0.25%), that will generate air pollution with the product from the fuel burning process of combustion engine such as NO_x, SO_2, CO. This quantity of waste gas is the mobile source, and will directly impact on the person who takes part in the traffic on the transportation line, dispersing into the surrounding air that effects the worker and people surrounding the project area. According to the data: Type of filled-up soil and backfill soil transportation car with the load of 10 m^3 and specific consumption of fuel of 0.4 liters of oil/vehicle. (1 diesel oil liter =0.832 kg). All parameters on transportation quantity, transportation distance, the consumed fuel volume are presented in Table 4.18

Table 4.18: Load of dust and exhaust gases from transportation of excavation, backfilling, demolition materials, and dredging activities in component 2

Work item	Number of transport vehicles (trip/day)	Distance (km)	Load of dust emission (mg/m/s)	Load of SO_2 emission (mg/m.s)	Load of NO_2 emission (mg/m.s)	Load of CO emission (mg/m.s)
P2-P9 road	26	12	0.638	0.000841	0.003695	0.000015
Bo Kenh road	32	14.5	0.785	0.001035	0.004548	0.000018
Vo Van Kiet extended road	20	12.5	0.491	0.000647	0.002843	0.000012

Work item	Number of transport vehicles (trip/day)	Distance (km)	Load of dust emission (mg/m/s)	Load of SO_2 emission (mg/m.s)	Load of NO_2 emission (mg/m.s)	Load of CO emission (mg/m.s)
Embankment of Kinh Cut	15	13.5	0.368	0.000485	0.002132	0.000009
Embankment of Cau Lau	12	14	0.294	0.000388	0.001706	0.000007

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

- For P2-P9 road: Dust concentrations vary between 0.206 - 0.44mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3). CO contents 3.88 mg/m^3 (compared with 30 mg/m^3); SO_2 contents 0.048 mg/m^3 (compared with 0.35 mg/m^3); and NO_x contents 0.059 mg/m^3 (compared with 5 mg/m^3).
- For Bo Kenh road: Dust concentrations vary between 0.207 - 0.45 mg/m^3, CO contents 4.9 mg/m^3 (compared with 30 mg/m^3); SO_2 contents 0.05 mg/m^3 (compared with 0.35 mg/m^3); and NO_x contents 0.06 mg/m^3 (compared with 5 mg/m^3).
- For Vo Van Kiet: Dust concentrations vary between 0.205 -0.36 mg/m^3, CO contents 3.6 mg/m^3 (compared with 30 mg/m^3); SO_2 contents 0.04 mg/m^3 (compared with 0.35 mg/m^3); and NO_x contents 0.049 mg/m^3 (compared with 5 mg/m^3).
- For Kinh Cut cannal: Dust concentrations vary between 0.204 -0.31 mg/m^3, CO contents 3.88 mg/m^3 (compared with 30 mg/m^3); SO_2 contents 0.048 mg/m^3 (compared with 0.35 mg/m^3); and NO_x contents 0.038 mg/m^3 (compared with 5 mg/m^3).
- For Cau Lau cannal: Dust concentrations vary between 0.203- 0.29 mg/m^3, CO contents 3.6 mg/m^3 (compared with 30 mg/m^3); SO_2 contents 0.042 mg/m^3 (compared with 0.35 mg/m^3); and NO_x contents 0.032 mg/m^3 (compared with 5 mg/m^3).

Conclusion: dust concentrations generate from transportation of material and disposal (with baseline dust concentration) at a distance of 5-10m and height of 1-2 m, concentration of dust exceeds the acceptable limit at 1.1-1.5 times according to QCVN 05:2013/BTNMT- National technical regulation on ambient air quality. However, this exceedance is very small and activity of transportation material conduct in a short time, therefore, impacts are assessed at LOW level. To mitigate impact, work contractor should apply measures of ECOP report. Concentration of SO_2, NO_2, CO generation from transportation of materials and operation of vehicles in transporting excavation, backfilling and demolition work are all within acceptable limit according to QCVN 05:2013/BTNMT - *National Technical Regulation on ambient air quality*. This result shows that the impact of waste gas from the transport vehicles is insignificant and can be assessed at LOW level.

c) Dust and waste gas from concrete mixing station

Component 2 has not planned yet for concrete mixing plant. Concrete for construction can be purchased from 2 sources: i) purchase from close construction store; ii) on-site mixing source.

Environmental related issues generated from concrete mixing depends not only on location, activity and capacity of the plant. Within construction work of the project, the 30m^3/hour mixing plant is recommended to use and there will be no producing materials on site rather than mixing concrete. From practical experience, major impacts from concrete of 30m^3/hour concrete mixing plant are listed as follows:

- At a distance of 20m, dust emission exceeds the acceptable limit of the QCVN 05:2013/BTNMT
- At a distance of 45m in daytime and 90m at night, noise level is under the acceptable limit.

Scale of impact depends on sensitivity and tolerance ability of human on noise level. Due to specific characteristics of LIA with populated residence, that dust and waste gas generated from concrete mixer may affect to residential areas. Thus, work contractor need to apply proper measure to minimize impact and eliminate any potential litigation. Impacts from these activities are assessed at MEDIUM level and both dust and waste gas source in project area can be managed in construction period

2. Impacts due to noise and vibration pollution

Noises in preparation phase are mostly by operation of transportation vehicles and construction machineries. Once operation together at the same time, these vehicles and machineries will generate a combined noise impact. Besides, when the noises are transmitted in space, noise strength will decrease with the distance. Noise levels of construction vehicles/machineries, as function of distance, are calculated as shown in the following table:

Table 4.19: Distance-wise noise source level of construction vehicles/machines

Work item	Vehicles	Quantity	Distance from noise source (m)						
		Total number	1	15	30	60	90	120	150
P2-P9 road	**Combined noise level**	26	101	75	69	62	58	55	53
	Bulldozers	3	98	72	65	59	55	52	50
	Excavators	3	91	65	59	52	48	46	43
	Truck	5	95	69	62	56	52	49	47
	Concrete mixers	4	88	62	55	48	45	42	40
	Rollers	3	78	52	45	39	35	32	30
	Excavator	2	81	55	49	42	38	35	33
	Road paver	2	91	65	58	52	48	45	43
	Mobile cranes	2	85	59	52	45	42	39	37
	Generator	1	77	51	45	38	34	32	29
	Air Compressor	1	81	55	49	42	38	35	33
Bo Kenh road	**Combined noise level**	18	99	73	67	60	56	53	51
	Bulldozers	2	96	70	64	57	53	50	48
	Excavators	2	90	64	57	50	47	44	42
	Truck	3	93	67	60	54	50	47	45
	Concrete mixers	3	86	60	54	47	43	41	38
	Rollers	2	76	50	44	37	33	30	28
	Excavator	1	78	52	46	39	35	32	30
	Road paver	1	88	62	55	49	45	42	40
	Mobile cranes	2	85	59	52	45	42	39	37
	Generator	1	77	51	45	38	34	32	29
	Air Compressor	1	81	55	49	42	38	35	33
Vo Van Kiet	**Combined noise**	42	105	79	72	66	62	59	57

Work item	Vehicles	Quantity	Distance from noise source (m)						
		Total number	1	15	30	60	90	120	150
road	**level**								
	Bulldozers	5	100	74	67	61	57	54	52
	Excavators	5	93	68	61	54	50	48	46
	Truck	6	96	70	63	57	53	50	48
	Concrete mixers	6	89	63	57	50	46	44	41
	Rollers	6	81	55	48	42	38	35	33
	Excavator	4	84	58	52	45	41	38	36
	Road paver	4	94	68	61	55	51	48	46
	Mobile cranes	3	86	60	54	47	43	41	38
	Generator	1	77	51	45	38	34	32	29
	Air Compressor	1	81	55	49	42	38	35	33
Embankment Kinh Cụt	**Combined noise level**	30	104	78	71	65	61	58	56
	Bulldozers	3	98	72	65	59	55	52	50
	Excavators	3	91	65	59	52	48	46	43
	Truck	6	96	70	63	57	53	50	48
	Concrete mixers	6	89	63	57	50	46	44	41
	Rollers	3	78	52	45	39	35	32	30
	Excavator	2	81	55	49	42	38	35	33
	Road paver	2	91	65	58	52	48	45	43
	Mobile cranes	2	85	59	52	45	42	39	37
	Generator	1	77	51	45	38	34	32	29
	Pile driver	1	101	75	68	61	58	55	53
	Air Compressor	1	81	55	49	42	38	35	33
Embankment Cầu Lầu	**Combined noise level**	46	105	79	73	66	62	59	57
	Bulldozers	5	100	74	67	61	57	54	52
	Excavators	5	93	68	61	54	50	48	46
	Truck	8	97	71	65	58	54	51	49
	Concrete mixers	6	89	63	57	50	46	44	41
	Rollers	7	81	56	49	42	38	36	34
	Excavator	4	84	58	52	45	41	38	36
	Road paver	4	94	68	61	55	51	48	46
	Mobile cranes	4	88	62	55	48	45	42	40
	Generator	1	77	51	45	38	34	32	29
	Pile driver	1	101	75	68	61	58	55	53
	Air Compressor	1	81	55	49	42	38	35	33
QCVN26:2010/BTNMT (from 6h-21h) – Normal area					70 dBA				
QCVN26:2010/BTNMT (from 21h-6h) - Normal area					55 dBA				

Thus, regarding to scope and subjects of impacts in component 2, workers in construction site and residents living nearby construction points are mostly affected within a distance of 15-30 m in daytime, and 90-150m at night. Besides, some other sensitive locations may be affected from noise and vibration as presented in Table 4.20.

Daytime:

- Construction of P2-P9 road: Within a radius of 15m from construction point, calculated noise level is 75 dBA (5 dBA higher than acceptable limit).
- Construction of Bo Kenh road: Within a radius of 15m from construction point, calculated noise level is 73 dBA (3 dBA higher than acceptable limit).
- Construciton fo Vo Van Kiet road: Within a radius of 15m from construction point, calculated noise level is 72 dBA (2 dBA higher than acceptable limit).

- Embankment for Kinh Cụt river: Within a radius of 15m from construction point, calculated noise level is 71 dBA (1 dBA higher than acceptable limit)
- Embankment for Cầu Lầu river: Within a radius of 15m from construction point, calculated noise level is 73 dBA (3 dBA higher than acceptable limit)

Nighttime:

- Construction of P2-P9 road: within a radius of 120 m from construction point, calculated noise level is equal to acceptable limit
- Construciton of Bo Kenh road: within a radius of 90 m from construction point, calculated noise level is 56 dBA, (1 dBA higher than acceptable limit)
- Construction of Vo Van Kiet road: within a radius of 150 m from construction point, calculated noise level is 57 dBA, (2 dBA higher than acceptable limit)
- Embankment of Kinh Cut river: within a radius of 150 m from construction point, calculated noise level is 56 dBA, (1 dBA higher than acceptable limit)
- Embankment of Kinh Cut river: within a radius of 150 m from construction point, calculated noise level is 57 dBA, (2 dBA higher than acceptable limit)

Table 4.20: Sensitive locations may affect by dust and noise from construction vehicles/machines

No.	Work item	Sensitive location	Distance from construction work's location	Dust impact	Noise impact	
					Daytime	Nighttime
1	Construction of P2-P9 road	Nguyễn Trường Tộ Secondary school	Nearby construction location	x	x	x
		Long An pagoda	80 m	x		x
		Protestant church	150 m	x		
2	Võ Văn Kiệt road	Vinh Long University of Technology Education; Vinh Long Vocational training college	Nearby construction location	x	x	x
3	Embankment of Kinh Cụt	Nguyễn Du Market	Nearby construction location	x	x	x
		Thành Thất Vĩnh Long	55 m	x		x
		Diocesan bishop	50 m	x		x
		Nguyen Du market	50 m	x		x
4	Embankment of Cầu Lầu	Cau Lau market, Hung An Tu pagoda	Nearby construction location	x	x	x

However, the said noise levels are calculated for conditions in which all means are operating the same point of time. Meanwhile, the construction items are split into many packages. As construction machines and equipment will be mobilized for each separate package and the operation of these machines and equipment will not exceed 8 hours a day, generated noise will not be continuous and will not last long. The impact is therefore assessed to be moderate.

3. Impacts on water quality

Different sources may contaminate water environment in component 2 including: i) wastewater from personal activity of the worker (domestic wastewater); ii) construction wastewater; (iii) rainwater runoff; (iv) wastewater containing oil; (v) transportation of construction materials by barges

a) Pollution by workers' wastewater:

Wastewater volume generate from personal activities' of workers: total number of workers in this period is estimated at 90-100 people. Needed water volume of each worker as mentioned clearly in National Standard -QCXDVN 01:2008/BXD, as of 45 liters/person/day (for washing, cooking and drinking). Daily generated wastewater volume is taken as 100% of daily used water volume. So, total daily generated WW volume is ranging from 4.1 – 4.5 m^3/day/work item. Regarding to contents in wastewater, there will be mostly suspended particles, oil/grease, high contents of organic matters, dissolved organic substances (such as BOD5, COD), nutrients (N, P) and micro-organisms. According to water quality standard regulated by the WHO to the developing countries, that pollution load, concentration of pollutants in wastewater before treated by sceptic tanks are estimated at following table:

Table 4.21: Pollutant load and concentration of pollutants in domestic wastewater

Pollutants	Pollution coefficient (g/person /day)	Pollution coefficient (mg/l)	
		Before treatment	QCVN 14:2008 Column B
BOD5	45 – 54	1000 – 1200	50
COD	72 – 102	1600 – 2666	-
TSS	70 – 145	1555 – 3222	100
Oil/grease	10 – 30	222 – 666	20
N_{tot}	6 – 12	133 – 266	50
N-NH4	2,4 – 4,8	53 – 107	10
Phosphate	0,8 – 4,0	17,8 – 88,9	10
Total Coliforms	106 - 109	22x106 –22x109	5000 (MNP/100ml)

Source: WHO, 1993

The table above shows that, untreated domestic wastewater has higher concentration of pollutants than those stated in National Standard on water quality (QCVN 14: 2008/BTNMT - Column B). If there's no collection and treatment system developed, everyday there will be a considerative amount of pollutants discharge directly to environment, affecting workers and people in the project area, polluting surface and ground water source as well as posing some public health risks. Moreover, water of canals in/nearby the construction areas is currently contaminaated with organic substances such as COD, BOD (see 2.4). Therefore, the contractor should take mitigation measures to prevent further contamination.

b) Pollution by construction wastewater:

Construction wastewater generated from construction activities like cleaning material, equipment, machines. this type of wastewater has high content of TSS and organic substances,

pollution level of this wastewater is presented in the table 4.9 above (under the component 1). The table above shows that some WW quality parameters are within allowable limits of QCVN 40:2011/BTNMT. Some other parameters are higher than respective acceptable levels, such as TSS (6.6 times), COD (8 times), BOD_5(8.6 times) and Coliform (106 times). Even, volume of this wastewater is small, though, if it is not treated properly and discharged directly to environment, this source of pollution will contaminate surface water, ground water and health workers.

c) *Pollution by rainwater runoff*:

Volume of rainwater runoff in construction site depends on local climatic conditions. In principle, rainwater is water containing less pollution (clean water standard). According to WHO, concentration of parameters in rainwater are as follows:

Table 4.22: Concentration of pollutants in rainwater

No.	Parameter	Concentration (mg/L)
1	Nitrogen	0.05 – 1.5
2	Phosphate	0.004 – 0.03
3	COD	10 – 20
4	TSS	10 – 20

Source: WHO, 1993

Based on total area of the project, and water flow coefficient, rainfall intensity mentioned in the chapter 2, total volume of rainwater can be estimated in component 2.

Table 4.23: Total volume of rainwater runoff in construction site under the component 2

Work item	Rainwater drained area (m^2)	Water flow coefficient	Rainwater flow (l/s)
P2-P9 road	25,385	0.2	6.83
Bo Kenh road	39,000	0.2	10.50
Vo Van Kiet road	33,000	0.2	8.88
Embankment of Kinh Cụt	23,760	0.2	6.39
Embankment of Cau Lau	28,880	0.2	7.77

Rainwater runoff flow rates are already estimated in construction phase in each work item: P2-P9 road: 6.83 l/s ; Vo Van Kiet road: 10.50 l/s ; Bo Kenh road: 10.50 l/s ; embankment Kinh Cut: 6.39 l/s and Cầu Lầu = 7.77 l/s. Normally, rainwater quality depends on air cleanness and volume of wash-away substances in the project area. However, during construction phase, rainwater runoff quality depends on cleanness of construction's surface areas, as air environment of the project area is considered as relatively good and could not able to pollute rainwater in the area. Regarding to pollution contents in construction phase, this water contains mainly TSS, oil, grease washed-away by its flowing velocity. Especially, in condition of uncompleted ground surface of construction area, that is subject washout. To minimize rainwater runoff pollution, construction units need to collect all waste materials and waste oil/grease of construction vehicles and machineries, that may eliminate pollutants to water environment in construction site and surrounding water sources. Therefore, impact from this activity is assessed at insignificant.

d) Oil-containing wastewater

- *Construction equipment/machine maintenance water*: Similar to component 1, in component 2, construction equipment/machinery maintenance activities take place at the machinery gathering locations in construction areas, that generate about 11m^3 of oil-containing wastewater/day (Table 4.21). Oil contents in wastewater in construction site is within 0.6-1.3 (mg/L) and concentration of SS is within 81-124 (mg/L), COD is from 30-49 (mg/L).

Construction wastewater after treated well will be discharged to Cau Lau, Cau Lo, Kinh Cut and Long Ho rivers. Cmax oil of construction wastewater discharging to Cau Lo river, Kinh Cut and Cau Lau river are equal to this value in component 1, and all are within acceptable limit of QCVN 40/2011/BTNMT.

For results of Long Ho river, kq: pollution source coefficient is 0.94; kf: flow coefficient of construction waste is 1.25, Cmax6 oil in Long Ho river = Cxkqxkf=10x0,9x1,2=10.8 7.2 mg/l. Thus, the maximum acceptable limit of waste oil can be discharged into Logn Ho river is at 10.8 mg/L. This figure is to refer to oil-containing wastewater from construction in the table 4.21, the results show that, oil-containing wastewater from the project is within acceptable limit of QCVN 40:2011, therefore, impacts from this activity are assessed at Low level.

e) Wastewater from Barges

This project will use barges to transport rocks from An Giang and Dong Nai and the departure point is from Co Chien to Cau Lo river into the project areas. It is estimated that there is about 8,864m^3 of rocks transported for construction of component 2 within 6 months (estimated) with total volume approx. 70-ton barges, averagely, 1 barge will be used to transport material/day. Thus, surface water of both Co Chien and Cau Lo may be contaminated by be polluted by ballast water and barge cleaning-discharge water (barge wastewater)

Ballast water is used by taken from surface source (river, lakes), thus, this type of water may cause no effect to water environment. While barge wastewater volume is estimated at 8-10 m3/day (4 barges including 70t, 200t, 250t and 400t)- oil containing water, with solid suspended and organic matters, nutrient (Nitrogen and phosphate) as well as microorganisms. These types of wastewater will be discharged directly to river and canals and may cause negative impacts to water environment in the project areas. However, number of barges in this phase is small, thus, effect on surface water of Co Chien river, Cau Lo, Kinh Cut and Cau Lau river are assessed at insignificant level.

g) Impact on surface water quality due to dregdging

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 function of Cau Lau and Kinh Cut canal is drainage and inland waterway and there is no aquaculture activity within the radius of 5 km of the project area, thus the impact is insignificant.

h) The impact from leachate

Total amount of dredged sediment from Kinh Cut canal is 16,200 m^3. 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.

Impacts of project activity to surface water in construction phase is assessed at Medium level and occurring in a short duration. The work contractor must apply proper measures to minimize impacts to water environment and its quality. Table 4.26 summaries on susceptible areas to construction activities.

Table 4.24: Summary on susceptible areas to impacts from construction wastewater under the component 2

TT	Location	Current water quality
1	At points in Cau Lo river, Vo Van Kiet road close to LIA 3 (security fence gate group 5, ward 2)	COD, BOD5 concentration is about 1.1 times higher than acceptable limit in QCVN08:2015/BTNMT (B1 category)
2	At points between embankment canal and resident areas	COD, BOD5 concentration are about 1.5 and 1.6 times higher than acceptable limit in QCVN08:2015/BTNMT (B1 category), respectively.
3	At points between Kinh Cụt - under Cau Lo bridge	COD và BOD5 concentration are about 1.6 times higher than acceptable limit in QCVN 08:2015/BTNMT (B1 category)
4	At points in Kinh Cut river, under Mau Than bridge	COD và BOD5 concentration is about 1.5 times higher than acceptable limit in QCVN 08:2015/BTNMT (B1 category)
5	At points in Cau Lau river, under Cau Lau bridge	COD và BOD5 concentration is within acceptable limit of QCVN 08: 2015/BTNMT (B1 category)

Thus, surface water quality of Cau Lo river, river nearby embankment, Kenh Cut river and Cau Lau river is considered as organic pollution, because, these rivers and canal are currently receiving both construction wastewater and domestic waste from households near the banks. Moreover, there is no collection and waste treatment system in place in Vinh Long city, therefore, wastewater runoff and discharge to rivers and canals that will contaminate surface water source. Therefore, to mitigate and minimize pollution sources into surface water, management project activities regarding to pollution sources is necessary, appropriate, feasible approaches.

Impact level: MEDIUM

4. Impacts from solid waste

Solid waste generated in the construction phase of component 2 includes 2 main types as follows: (1) Construction solid waste (debris); (2) Domestic solid waste. The generated volume is assessed as follows:

a) Domestic solid waste by construction workers

In construction phase, domestic solid waste is generated from personal activity of workers and mostly includes plastic bags, waste paper, waste food, etc. This type of waste contains about 60

– 70% of organic content and 30 – 40% of other substances, and may contain many pathogenic microorganism and bad odors.

For volume of domestic waste is estimated at 0.5 kg/ worker/day. At intensive time of construction, there will be about 90-100 workers working in construction site/day. Thus, total solid waste volume will be 45-50 kg/day. If this source is not collected reasonably, it will cause environmental pollution (surface, ground, bad odor in project area). Moreover, persistent inorganic wastes like glass bottles, plastic bags and empty bottles in surface water may affect to local's landscape beautiful as well as degrading water quality and limit diffusing oxygen into water and affect to aquatic life.

b) Construction solid waste:

Construction solid waste includes many types such as: empty cement bags, waste cement mortar, debris, steel scrap, mostly excavated soils. Volume of demolition of existing buildings and excavated soil/rock in Component 2 is estimated from 7,600 to 94,600 m^3, averagely, about more than 50,000 m^3 of excavation volume. Besides, roads have many canal sections running parallel or crossing as well as the embankments are to be constructed at a direct connection between Kinh Cut and Cau Lau rivers. Thus, if this waste source is not collected and treated quickly, it will contaminate water environment for the case of surface water runoff.

Table 4.25: Volume of construction solid waste under the component 2

Work item	Construction solid waste (m^3)		Domestic solid waste (kg/day)
	Demolition volume	Excavation volume	
P2-P9 road	588	75,525	50
Bo Kenh road	0	94,600	50
Vo Van Kiet road	5,600	52,800	50
Embankment of Kinh Cụt	2,000	21,060	45
Embankment of Cau Lau	2,500	7,600	45

Thus, impacts from construction solid waste are assessed at MEDIUM and occurring in short duration and can be mitigated.

5. Hazardous solid waste:

Waste containing Oil/grease generated during construction process depends on following factors:

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

Averagely, waste oil/grease volume of the transportation/construction vehicles and machineries is 7 liters per change time. Maximum oil change/maintenance frequency is one time per 3 months. So, generated waste oil/grease volumes at construction sites of Component 2 are as follows:

Table 4.26: Hazardous solid wastes of component 2

No.	Work item	Number of transportation/construction vehicles at construction site	Monthly volume of solid Waste containing Oil/grease
1	P2-P9 road	26	60

No.	Work item	Number of transportation/construction vehicles at construction site	Monthly volume of solid Waste containing Oil/grease
2	Bo Kenh road	18	42
3	Vo Van Kiet road	42	98
4	Embankment of Kinh Cụt	30	70
5	Embankment of Cau Lau	46	107

The above volume of waste containing oil/grease will be stored at 150-200l drums that placed in maintenance and fixing stations and the outsourced special units will collect and treat/ or recycle. Besides, experience from other project, construction operation will also generate oil/ grease-stained cloths, estimated at 50 kg/ month. Waste oil/grease can penetrate into environment via spills or washout by rainwater runoff. Volume of spilled or washed-away waste oil/grease depend not only on storage location but also management capacity. Because the project area is close to Cau Lau canal, Kinh Cut canal, that waste oil/grease may contaminate water environment in these areas. Impact level is assessed at medium.

6. Impact on city landscape

The rehabilitation/construction activities would require excavation on 05 roads and pavements for the construction and rehabilitation, installation of the combined sewers, setting up of wall fences for the construction sites. These operations would temporarily cause changes in the local landscapes. Besides, construction materials would also be transported and gathered at construction sites. Without proper management, materials can be mixed up, especially in narrow construction sites, affecting the area landscape.

The rehabilitation / construction of 03 roads and Kinh Cut and Cau Lau 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 insignificant level.

7. Improperly finished construction sites

Good construction practices should aim to avoid residual impacts at work sites. Abandoning stockpiles of construction materials (gravel, aggregate, sand...) can pose aesthetic impacts and safety concerns at affected sites.

8. Impacts from risks and incidents:

As the mentioned under the component 1

4.1.4.2.2. Site-specific Impacts due to construction of investment under component 2

Site-specific impacts from Construction of Bo Kenh, P2-P9 road and Vo Van Kiet extended road include the following:

a. Local flooding

The current Bo Kenh, P2-P9 and Vo Van Kiet extended roads is lack a complete drainage system. There are only some open ditches and canals, which poorly serve the drainage function. The construction of road sections may temporary block these local drains, especially at the section in front of Nguyen Truong To, running towards Nguyen Van Lau Road and at the section 2 of Vo Van Kiet Road in Ward 3.

However, the likelihood of the impact is generally low as the work is short term and implemented in a successive manner. The impact can be mitigated by the application of good construction practices. Once the roads are completed, overall drainage capacity will be improved, providing sufficient drainage capacity for the area.

c. Disruption of business activities

The road will pass 37 household-businesses, which include small retail shops, clothes shops, coffee shops, beauty salons, hairdressers near the road. Besides being a safety risk, noise and dust from road construction activities and equipment might temporarily disrupt business activities. The contractor should take precautions for this matter to avoid accidents and dust contaminating shops.

d. Social disturbance and traffic concern

The construction process will cause community disturbance, especially along section at the national way 53 end (Bo Kenh road); along P2-P9 road and section 1 of Vo Van Kiet extended road (from km 0+00 to km 0+290) where local people live at high density. Daily routine and traffic convenience of local people around these areas will be affected. However, this impact can be mitigated if the contractor fully complies with measures specified in the ESMP.

Construction of Bo Kenh, P2-P9 Vo Van Kiet extended roads will contribute to an increase of 20 to 26 vehicle trips a day for transporting construction materials and waste, routing along the main roads of Nguyen Hue, Vo Van Kiet, Pham Hung and provincial road No. 53. The increase in traffic flow will pose higher risks of road accidents to local residents and might cause traffic congestion. Impact level of these activity is assessed at medium and can be minimized by implementing the traffic management plans approved by the PMU.

e. Impacts on agriculture land

Although there is about 39,541 m^2 classified as agriculture land affected, the land is scattered between houses, becoming local gardens. Moreover, due to the process of urbanization, most of the agricultural land in the central districts have been converted to urban land, so the area of agricultural land affected by the project is already being used as residential land. The impact to the land is insignificant because there are no agriculture production activities on this land.

f. Odor from dredging a small canal on P2-P9 Road

There is a small canal runs along a section of P2-P9 road next to Nguyen Truong To school towards Nguyen Van Lau street. The canal will be dredged, leveled and widened up to be a part of the P2-P9 road. The dredging materials are estimated to be approximately 1,210 m^3. Dredging duration for this section is relatively short, amount of sludge is small, thus odor impact is assessed as low, localized and temporary. The dredging sediments will be quickly transported for treatment and disposal and the odor impact can be minimized if mitigation measures are adopted.

f. Vibration impacts on Nguyen Truong To'school during the contruction of P2-P9 road

The P2-P9 Road (indicated as a red line in the map) running by Nguyen Truong To school will be upgraded to 9 m wide with 5 m wide sidewalks (blue line). The distance from the school's gate to the pavement of the P2-P9 road will be 5m. This distance is considered safe to prevent the school from the risk on infrastructure collapse due to vibration from the operation of rollers and other machineries used during the construction process. In addition, the construction will happen in a short period thus the risk on infrastructure collapse on school is considered negligible.

Figure 4.3: Locations of Nguyen Truong To School in relation to the P2-P9 road

f. Impact on sensitive receptors in Vo Van Kiet extended road

Vinh Long University of Technology Education and Vinh Long Teacher Training College are located fairly close to the Vo Van Kiet extended road, at a distance of 5 m and 25m respectively. Vo Van Kiet road will run through the left side of the schools, not hindering the main access, which is on Nguyen Hue road. However, the schools will be under some impacts from dust, noise and vibration. Safety risk and traffic congestion might be of concern at peak school hours. The likelihood of impact to schools' teachers and students is small as the construction work is short term and can be mitigated.

Specific impacts from Construction of Embankment for Cau Lau and Kinh Cut Canals

Vinh Long City will upgrade two canals under component 2 of the subproject: Cau Lau and Kinh Cut canals. At present, these two canals are polluted because waste is being disposed and discharged directly into the canals by local people living along sides of the canals. Beside, people encroachment and the fact that the canals have not been dredged regularly also contribute to the environmental pollution, bad sanitation and poor drainage capacity.

Kinh Cut and Cau Lau canals dredging activities include (i) canals dredging (ii) construction of canals embankment; (iii) construction of operational roads and the associated basic infrastructures.

a. Impact on ecological environment of Kinh Cut and Cau Lau canals

The impacts on the terrestrial and aquatic ecosystem during the construction and embankment of Kinh Cut and Cau Lau canals will be insignificant as the area is not in the protected zones and native plants and benthic species are not common with no listed species. The level of impact to the aquatic ecosystem thus is considered to be low.

The dredging process for Cau Lau and Kenh Cut canals will use wet dredging method, of which sediments will be dredged from the bed of the canals by excavator. Thus, during dredging, water quality of these canals could be impacted, through increasing water turbidity, degrading the water quality in the localised area.

The dredged sediment from Cau Lau canal will be transported directly to the disposal site by barges, while that from the Kinh Cut canal will be temporarily stored at the canal bank for about 1-2 days to reduce the water content and then transported to the disposal site by truck. From experience of similar projects, sludge leachate has a total SS content of about 800-1400 mg/l and F. Coliform content of 90-200 MPN/100ml. The direct discharge of the leachate to the water course would cause degraded water quality, and therefore needs to be well managed.

It should be noted that the canals currently receive unregulated, untreated domestic wastewater and are consequently relatively polluted, but this could be exacerbated during dredging by remobilization of sediments. In the long term, the water quality will be enhanced during operation and the impact is therefore assessed as small, temporary and reversible.

b. Odor from dredging process and management of sediments from Cau Lau and Kinh Cut process

Upgrading of Cau Lau and Kinh Cut canals would generate about 22,800 m3 and 16,200 m3 dredging materials respectively. At Cau Lau, dredging soils and sediments will be transported away by barges while dredging matrials of Kinh Cut will be transported by trucks by road. There are two bridges over the Kinh Cut canal (Kinh Cut and Mau Than bridges) that limit the access of barges into the dredging site. Dredging materials will be temporarily stored (24-48 h) on the banks of Kinh Cut before being transported by trucks.

Analytical results of the sludge samples of the two canals reveal that toxic heavy metals are lower than allowable limits of QCVN 07:2009/BTNMT. However, the sediment is contaminated with high level of organic substances and which are biodegradable in anoxic conditions and release odorous compounds. During dredging process, emission of odorous compounds causes nuisance smell.

Local residents and workers are exposed to the bad smell for a short period of dredging at each 50-100 m canal's segment. During the transportation of the dredge spoil bad odor, nuisance and leakage could occur, affecting the people living and commuting along transportation routes. As the amount of sludge is average, and the temporary storage and transportation will occur in a short period of time, the magnitude of odour impacts is assessed medium and temporary.

c. Risks on soil erosion, embankment subsidence, and house damage during embankment

During the dredging and embankment process, there are risks on erosion of the canal bank and embankment subsidence, which could be caused by various reasons: (i) construction on the weak soil structure; (ii) Gathering of heavy machines and equipment on canal banks; (iii) dredging process unexpectedly encountering groundwater; (iv) vibration during the piling process. The canal bank erosion and embankment subsidence could pose safety risks to human life and loss of assets in the subproject areas. Sensitive receptors include infrastructure, workers and local residents living surrounding the canal, especially those at the highly populated areas, especially at 2 sides of Cau Lau canal.

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

The embankment of Cau Lau and Kenh Cut canals involve concrete pile jacking work, which may impact on local house structures within the radius of 05 m. Along the two canals, there are many residential houses located within this distance. However, these houses will be relocated for the construction of embankment and the 10-14 m wide operational roads along the two sides of the embankment. Thus, the risk of house damage during the construction process is not of concern if land acquisition is completed prior to the construction.

c. Damage impact to small bridges

There are 5 bridges over the two Kinh Cut and Cau Lau canals, namely Kinh Cut, Mau Than, Lau, Hung Dao and Pham Thai Buong. These bridges are reinforced steel-concrete with bearing loads varying from 10-15 tons. Embankment of the canal might cause some damage or create risk of collapse of these structures, and thereby interrupting the house access of the local people. The likelihood of occurrence is small and avoidable by applying appropriate mitigation measures.

d. Social disturbance and traffic safety

Kinh Cut and Cau Lau rivers cross many main traffic congestion nodes of the city such as Kinh Cut bridge, Mau Than bridge, Lau bridge, Hung Dao bridge, and Pham Thai Buong bridge. An additional of traffic volume (11 trips per day over 14 months) by vehicle transportation of construction materials and waste from the construction sites will cause disturbance and traffic safety concerns to the local people along the transportation route in a number of ways: (i) storage of materials and construction work could cause some damages to the existing roads and limit traffic access of people; (ii) dust impact to local households and shops; (iv) unwanted accidents can happen ;(v) social conflict between the construction workers and local people. The impacts is likely happened but it will be short term and would stop by end of construction. The impact is assessed as temporary and at moderate level.

e. Disruption of navigation during construction of canals

Although being connected to Long Ho and Cau Lo rivers, then to Co Chien River, a tributary of Tien River, which flows to the Mekong, Kinh Cut and Cau Lau canals do not have high waterway traffic. They are considered as tertiary canals in the domestic waterway system only. The dredging and embankment of these two canals will affect small volume of boats and barges. The impact can be mitigated if the contractor and PMU communicate well with the Domestic Waterway Management Company to have a proper detour instruction and announcement made to boats' riders. The impacts therefore are considered moderate.

e. Impacts on agriculture land

Although there will be about 2,703 m2 classified as agriculture land affected however the land is actually scattered between houses, becoming local gardens. Moreover, due to the process of urbanization, most of the agricultural land in the central districts have been converted to urban land, so the area of agricultural land affected by the project is already be used as residential land. The impact to the land is insignificant because there are no agriculture production activities on this land.

f. Impact on the PCRs

Impacts on Vinh Long Oratory (55 m from Kinh Cut Canal), Toa Giam Muc church (50 m from Kinh Cut cannal) and Hung An Tu pagoda (Cau Lau canal) (0 m)

The dredging and embankment of Cau Lau and Kinh Cut canals would have potential adverse impacts on the church and pagoda due to: (i) hindrance to access to church during weekend and to pagodas,; (ii) increased dust, exhaust gases, noise, vibration, solid waste, and wastewater due to construction activities; (iii) traffic congestion and accident risk and community safety due to construction and transportation; (iv) interference with religious events at the temples and churches due to construction activities especially on the 1st and 15th day of every lunar calendar month for religious practices; (v) Conflicts between workers and visitors to these religious places. The sensitivity of the local residents is high however the overall impact could be ranked as moderate. The impacts can be minimized.

f. Vibration Impacts on PCRs

As analysis in section (c) above, upgrading of Cau Lau and Kinh Cut Canals will include pile jacking activity which might cause vibration impacts and consequently risks on collapse to those structures at an immediate vicinity within 5-8 m radius. Vinh Long Oratory and Toa Giam Muc Church are about 50m from Kinh Cut and Cau Lau embankment work thus these PCRs will be out of the area of influence. Hung An Tu Pagoda is closer to the embankment work of Cau Lau Canal. The pagoda is 15 m from the location of the pile locations (red dots as in Figure 4.4) and 9 m from the operational road (red line).

Therefore piling operation, excavation of dredging materials from the embankment work will also cause no vibration impacts and risks of collapse to Hung An Tu pagoda.

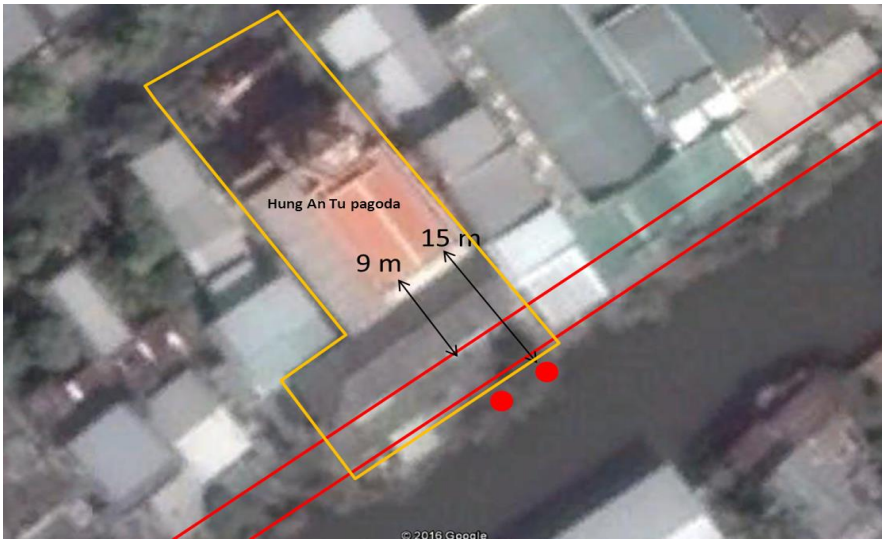


Figure 4.4: Location of Hung An Tu Pagoda in relation to the embankment site

Impacts on Nguyen Du Market and Cau Lau Market activities

The dredging and embankment of Kinh Cut and Cau Lau would cause impacts on Nguyen Du and Cau Lau market activities due to: (i) risks of construction accidents to traders and customers; (ii) disturbance of business activities; (iii) increased dust and exhaust gases, affecting market activities and goods; (iv) conflicts between workers and traders and customers; (v) traffic congestion at the market peak hours.

4.1.4.3. Component 2 – Impacts during Operation

Impacts during the operation of Bo Kenh, P2-P9 and Vo Van Kiet extened road:

a. Road Safety, Air, Noise,

Road safety is likely to be the key impact during operation of roads during the first few years as the urbanization is progressing rapidly. The risk can be managed if the knowledge of local people on road use regulations and safety practices are improved and monitoring and enforcement of traffic law implementation are strengthened.

When traffic volume increases, there will be pollution problems of dust, exhausted gases and noise however the problems can be mitigated through a long term road management and planning.

b. Local flooding due to inadequate maintenance

Roads and canals after being improved might still be subjected to local flooding due to inadequate maintenance of the associated drainage system. Disposal of domestic waste from local people can block the drain, leading to stagnation of water flow, especially in rainy days. The impact is considered low if appropriate O&M executed and behavior changes of local people on sanitation and environment established.

Impacts during the operation of the Cau Lau and Kenh Cut Canals:

a) Embankment subsidence risk during operation of Cau Lau and Kenh Cut Canals

operation phase there must be measures to cope such risks as: (i) Heavy rain, great flood, weak foundation causing embankment erosion; (ii) Embankment cracking, falling during operation phase due to natural reasons or design parameter excess; (iii) Erosion also affecting embankment quality and landscape.

Cau Lau and Kenh Cut 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 landscaple and quality of infrastructure located in the area protected by the embankment system

b) Water pollution and decreased lanscape due to direct waste disposal into the canal

During the O&M, there might be some risks of pollution and flow stagnation due to disposal of waste from households living along the canal if their behaviors are not change and there is lack of enforcement from local authority. The level of impact can be from low to moderate. The impact however can be mitigated if proper O&M practices adopted and enforcement enhanced.

Besides, behavior changes can happen as local people can be proud of new green design of the canal and want to collaborate to maintain the canal's clean and beauty.

4.1.5. Assessment of Impacts from Resettlement Areas – Component 3

The project will purchase land for resettlement area in Ward 4. This resettlement area has already been developed with complete infrastructure system such as transportation road, water supply system, public lighting system, sewage systems and treatment. Thus, in this component, major impact will be focused in operation phase.

4.1.5.1. Component 3- Impacts during Operation

The project will purchase land plots in resettlement area in Ward 4 for relocated households. This resettlement area has already been developed with complete infrastructure system such as transportation road, water supply system, public lighting system, sewage systems and treatment. Thus, in this component, major impact will be focused in operation phase.

About 259 households will be compensated for a land size of 2.5 ha, this land is equal to 18% of total resettlement area. Every household will be given a residential land plot of 80m^2. Thus, in the operation period, the project will focus on assessing impacts of resettlement to these 259 households in ward 4. Impacts generated from these households in new resettlement areas would relate to domestic wastewater and domestic solid wastes.

1. Domestic wastewater

With 259 relocated households and a family of four, daily domestic water usage is 45 liters/person/day according to QCXDVN 01:2008/BXD. Generated domestic water volume is taken as **100%** of daily used water volume. So, total generated domestic WW volume is about **46.62 m^3/day**.

Pollutants in the WW include suspended sediment, oil, grease, dissolved organic substances (BOD, COD), nutrients (N, P) and micro-organisms. The untreated wastewater has pollutant contents much higher than the allowable standard (QCVN 14: 2008/BTNMT (Column B). If there's no collection and treatment system developed, everyday there will be an amount of pollutant emitted to the environment. This is a considerable pollution source directly affecting living environment of and people in the project area, causing water-related diseases and directly affecting surface water and groundwater environments. However, for resettlement area in ward 4, the sewage will be collected at receptors of the ADB-funded project, which will be in operation after its construction phase. Thus, impact level from this activity is considered insignificant.

2. Solid domestic waste

It is assume that 1 person generates about 0.5 kg of domestic waste a day, total volume of waste will increase about 518 kg/day at the resettlement site. This volume of waste if is not well collected and treated, will cause negative impacts to surface water, soil and bad odors to the area. In addition, inorganic persistent pollutant like bottles, plastic bags in water may effect on aesthetic setting of the city. However, solid domestic waste will be collected daily by the URENCO Vinh Long, therefore impacts from this activity is assessed as low and manageable.

4.2. SOCIAL IMPACT ASSESSMENT

The project is expected to have significant positive social impacts in Vinh Long 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 5 wards of Vinh Long city and will bring benefits to 141,136 people.

Upgrading tertiary infrastructure will bring many benefits to residents in LIAs like: improving environmental condition, living condition, bringing access to social service and raising land value. Beneficiaries from the upgrading of tertiary infrastructure are 1,983 households living in the LIAs of the project, especially poor and social policy households.

Besides positive impact, the project also bring negavite impacts like: land acquisition, resettlement, loss of livelihood, social illness…

4.2.2. Positive impacts

Upgrading infrastructure will bring many benefits for people in the province in general and people in low-income areas in particular, in table 4.27:

Table 4.27: Positive Social Impacts in the Project Area

Component	Description of Impacts	Beneficiaries	Measures to maximize project benefits
General Impacts for all Components			
All components	Employment opportunities during the construction phase for unskilled workers	For all unskilled workers in project area	- Agreement with local authorities (ward level) to ensure benefits for job opportunities during the project period for unskilled workers in the project area (i.e. prepare list of workers to give to contractors). - Opportunity to be employed for both men and women.
	Improving infrastructure and urban landscape.	For all citizen	- Consult for people's ideas in the preparation phase to improve facilities and efficiency of the works.
Specific impacts for each Component			
Component 1 Upgrading tertiary infrastructure in LIAs 1, 3,4	- Infrastructure upgrading in LIAs will improve living conditions for all HH in LIAs. Especially: (1) wastewater will be collected, (2) improving environmental condition.	1983 Households (9.917 persons) including 114 poor HH	- Design and implementation of the subproject with participation of the whole community; proposed changes integrated into implementation plan. - Civil works in component 1 shall prioritize job opportunities for poor people in LIAs to increase their income.
	Alleys and lanes are expanded and equipped with lightning system; transport conditions are improved (so that ambulances and fire trucks can access to residential areas). Security of persons and assets are enhanced. Mobility will also be	1983 Households (9.917 persons) including 114 poor HH	- Raising people's awareness on the danger of encroaching on public land and streets through development of awareness programs

Component	Description of Impacts	Beneficiaries	Measures to maximize project benefits
	enhanced		
	By improving infrastructure and access in the LIAs, value of land and house will increase accordingly.	People living in LIAs, particularly people living along street/lane front houses.	- Regularize HH without LURC after the civil works.
Component 2:			
Road	- 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.	For all citizen	Consult for people's ideas in the preparation phase to improve facilities and efficiency of the works.
	- Value of land and house will increase accordingly.	People living along street/lane front houses.	Regularize HH without LURC after the civil works.
	- Construction of sewage system helps to improve drainage capacity for the city, improve environmental sanitation.	For all citizen	Design and implementation of the subproject with participation of the whole community; proposed changes integrated into implementation plan.
Canal	- Construction Kinh Cut river and Cau Lau embankment, dredging the canal systems help to improve emvìoment sanitation, improve urban landscape.	For all citizen	Consult for people's ideas in the preparation phase to improve facilities and efficiency of the works.

4.2.3.Negative impacts

4.2.3.1. Land acquisition

The area of land to be acquired to serve the project, including two types: (i) temporary land acquisition for constructing anxiliary 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, eventhough 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 of land acquisition on individual land and public land in 5 project wards. The total area of the land recovered components: 123424.86m^2, in which: residential land is 39514.03m^2, agricultural land is 42,859.75 m^2. Based on the Inventory of Losses (IOL) conducted in October 2016, 1,304 households in Ward 1, Ward 2, Ward 3, Ward 4, Ward 8 are affected by land acquisition. Of 1,304 HH, 1,111 households are partially affected and 193 households have to be relocated. In the relocated HHs, 24 household are vulnerable.

4.2.3.2. 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...). 152 households are business and trading establishments. Component 1 has 39 households being affected, Component 2 has 113 households being affected. In which 116 business establishment to be relocated. Most of HHs don't have registered busines.

4.2.3.3. Gender Issues

The project brings many risks, specialy 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.

4.2.2.4. Risks of social ills

High concentration of workers in the construction site with high percentage of male workers and temporary residents, business and entertainment activities can generate complicated social ills like prostitute, heroine addiction. Some social diseases like HIV/AIDS, HBV, HAV…can happen and spread.

4.2.2.5. Impacts in Traffic System

During the construction process, a large amount of soil, rock, sand, construction materials and equipment will be transported to the area planned for construction. This will increase a huge amount of vehicles on the roads, affecting traffic capacity on the roads, causing traffic jam in peak hours and potential risks of traffic accidents.

4.2.2.6. Conflicts on benefits and impacts on local economy

- For the economy: The construction of the project items will concentrate about 150 workers during peak periods, increasing the demand for foods in the locality, contributing to the promotion of services .
- For the management system of local government: The construction of the project will attract free migrants to the project area, this will be the cause of social evils. This impact will be controlled by the contractor.

- For people: illegal immigrants and construction workers can bring strange diseases and spread to local people and vice versa. At the same time, their activities can pollute water and air, facilitating the development of diseases, especially common diseases such as malaria, diarrhea, yellow fever ... affecting the health of construction workers and the people. This impact can be controlled by the contractor.

4.3. CUMULTIVE IMPACT ASSESSMENT

Cumulative impacts are the environmental and social effects of a project in combination with the effects of other existing projects and/or projects that are being carried out, or are reasonably foreseeable, in respect of specific components of the environment and social conditions. The assessment focuses on the effects of concurrent construction and operation of the subproject with other spatially and temporally proximate projects to ensure that the cumulative impacts are identified and evaluated in an integrated manner in the area of Vinh Long City. As such, this cumulative analysis relies on a list of related projects that have the potential to contribute to cumulative impacts in the subproject area of influence.

Geographic Scope

Cumulative impacts are assessed for related projects within a similar geographic area. This geographic area may vary, depending upon the issue area discussed and the geographic extent of the potential impact. For the purposes of this analysis, review of the projects in and around the subproject area has found no reasonably foreseeable, on-going, and future projects within the subproject area.

Project Timing

In addition to the geographic scope, cumulative impacts also take into consideration the timing of related projects relative to the proposed subproject. For this analysis, other past, present, and reasonably-foreseeable future construction projects in the area have been reviewed and found that there were no recent past projects, projects being implemented, or projects to be executed in the City in foreseeable future.

Therefore, it can be concluded that there would be no cumulative impacts from other projects in combination with the proposed subproject.

4.4. INDUCED IMPACT ASSESSMENT

Induced development can be a positive as well as negative cumulative impact. If not planned to conform to local physical plans, it can lead to urban sprawl along the new roads and improved canals. However, this impact can be manageable if proper planning adopted. The positive induced impacts however will outweigh the negative ones. It is foreseeable that the land value will increase along the new road and improved areas therefore land-use will significantly changed in the surrounding areas. Specifically, current agriculture land along Bo Kenh, P2-P9 road, and Vo Van Kiet extended road as well as area along operational road of Kinh Cut and Cau Lau canal will be subjected to residential land as according to the City Master Plan. Undoubtedly, the local government and the community will be benefited from the land value capture financing. This is one among many other benefits that the urban upgrading project will bring.

CHAPTER 5. ENVIRONMENTAL AND SOCIAL MITIGATION MEASURES

5.1.ENVIRONMENTAL IMPACT MITIGATION MEASURES

5.1.1. General principles

In order to minimize adverse environmental impacts, many measures haven 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 techinical 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 3 LIAs

Expansion of the alleys will be carried out only for the major alleys and with consent of the local communities.

The alleys with no possibility for expansion will be upgraded within their existing boundaries to limit site clearance and disturbances within the local communities.

- Consistent investments are to be made in all the alleys (drainage and lighting systems) to synchronize them with the secondary technical infrastructure of connecting lines.

Component 2: Upgrading primary and secondary infrastructure priorities

(i) Upgrading/Constructing Bo Kenh, P2-P9 and Vo Van Kiet extended road (Subcomponet 2.1, 2.2 and 2.3)

- 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 desgned not to raise it elevation to avoid possible water run off to the households along the two sides of the roads.
- The wastewater drainage system should be designed as a closed sewage system with connection points to be later connected directly to HHs' drainage systems (generally, one standby connection point for 5 HHs).
- The electrical boxes, mainholes, green cells should be designed to be located between each two households.
- Positions of placing public waste bins along the streets are to be included in the design.

(ii) Rehabilitating Kinh Cut and Cau Lau canal (Subcomponent 2.4, 2.5)

- The design of the embankment has been calculated on the basis of surveys on hydrologic regimes (flood levels, flow regimes, etc.), topography and geology of the area to ensure the safety and effective operation of the embankment.
- The sewer system would be proposed to be designed with box culverts, CSO and anti-odor manholes where it comes across residential areas.
- The technical design must include the position for temporary gathering of sludge. This position must be well distant from residential areas and to the tail end of the wind.
- Positions of placing public waste bins along the embankments are to be included in the design so that residents could dispose of garbage properly.
- Trees would be planted along Kinh Cut and Cau Lau canal to improve the landscape.

5.1.3. Measures to Mitigate Impacts during Pre-Construction

During the project preparation, the resettlement consultant, technical consultant and PMU have worked together to analyze the alternative options and select the most suitable design based on the principle of (i) minimizing the resettlement due to land acquisition and (ii) mitigating impacts of land acquisition and resettlement.

On the basis, there are 04 relocated households in Component 1; 189 relocated households in component 2 and none in component 3. These households each will have a land plot in the resettlement area in ward 4 of Vinh Long City. These numbers of affected and relocated households are resulted from the collective efforts of all stakeholders in minimizing and mitigating the impacts from land acquisition and resettlement to the possible extent.

As presented in Chapter 4, there are 1,304 partially affected households (PAH) and 11 affected organizations in 05 wards of Vinh Long city. The total land acquired is 123,424.86 m2 of which residential land is 39514.03m^2, agricultural land is 42,859.75 m^2 and public land is 40,828.68 m^2. There are 522 PAHs whose house being affected, of which 193 households are being totally affected; 36 PAHs with business activities are temporarily affected. There are 24 vulnerable households of which 12 single women headed households because of their single and or widow or their husbands are disabled) and 12 PAHs are poor HH.

The estimated cost for the Resettlement Action Plan of the subproject is approximately 383.234.034.912 VND (equivalent to 17.216.263,92 USD at the exchange rate of 22,260 VND = 1 USD). Of which:

No.	Component	Total	
		VND	USD
1	Component 1	19,938,693,390.75	895,718.48
2	Component 2	360,067,341,521.25	16,175,531.96
3	Component 3	0	0
	Total for subject	383,234,034,912	17,216,263.92

(Source: RP report, Dec 2016)

The estimated cost for land clearance and resettlement is calculated based on provisions set by People Committee of Vinh Long province and the policies determined by the World Bank. The Detailed mitigation measures for land acquisition are provided in the RP of the subproject.

Relocation of graves

There are 168 household graves, which will need to be relocated under Component 1,2 of the subproject.

- Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation, 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. According to Resettlement Plan, the price of compensation for the grave/tomb: including cost for displacing, transporting, re-burying, re-constructing and other related costs is stipulated in Clause 1 of Article 15 of Decision 18/2014/QD-UBND of People's Committee of Vinh Long province as follows:

- The amount of compensation for soil tomb: 4,000,000 VND/tomb

- The amount of compensation for non- corpse stone tomb (which is pre-dug to bury dead person): 6,000,000 VND/tomb

- The amount of compensation for brick/stone tomb: 8,000,000 VND/tomb.

- 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 Vinh Long Provincial Military Base for UXO detection and clearance at the construction sites. UXO clearance will be executed right after the completion of site compensation and before the implementation of demolition and ground leveling. The estimated cost is approximately 50 million VND/ha. No construction activity will be allowed until the UXO clearance is completed.

5.1.4. Measures to Mitigate Impacts during Construction

5.1.4.1. Generic Impact Mitigation Measures

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. Scope and content of the ECOPs is as follows:

Scope: Construction activities for small works governed by these ECOPs are those whose impacts are of limited extent, temporary and reversible, and readily managed with good construction practices.

The typical general impacts which are minimized by the mitigation measures defined in ECOPs include: (1) Dust, exhaust gases emission, impacts of the noise and vibration; (2) wastewater management; (3) Solid waste control; (4) Hazardous waste; (5) Water pollution control; (6) Methods for controlling the impacts on aquatic species and biological creatures; (7) Controlling effects on the urban landscape and aesthetics; (8) Controlling methods of sediments, erosion and floods; (9) Land subsidence and land slide control; (10) Traffic safety control; (11) Controlling the influence to the existing infrastructures and services; (12) Controlling the social impacts; (13) Controlling the impacts on cultural and religious structures; (14) Safeguard measures for the public health; (15) Safeguard measures for the workers' health.

ECOPs are presented in deails in **Section 6.2.1.**

5.1.4.2. Specific Impact Mitigation Measures

Component 2 includes upgrading Cau Lau and Kinh Cut canals; upgrading/constructing Bo Kenh, P2-P9 and Vo Van Kiet extended roads; The impact assessments on the construction of bridge and roads, and embankment rehabilitation are shown in Chapter 4, Section 4.1, which indicated the medium level of the almost environmental impacts. The Contractors have to take mitigation measures under ECOPs to control these impacts. In order to mitigate the site - specific impacts arising from the dredging and embankment construction as well as those generated from construction of roads and bridges, the Contractors shall take the following measures:

Table 5.1: Site-specific mitigation measures during construction phase

No	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
1	**Component 1: Tertiary Infrastructure Upgrading in LIAs**	
a	Local flooding - Residents within LIAs 1,3 an 4 in Ward No.2, 3	- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction - 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 - The contractors must set up temporary drainage system at the construction site and ensure that it is cleared of mud and other obstructions - Have a standby pumps for rapid drainage in case of heavy rain or extreme weather events
b	-Odor and management of 17,000 m^3 sediments generated from small canals dredging in LIA 1,3 and 4. - Residents in Ward No.2,3 - People commuting along transportation route	*To control impacts from dredged soils and sediments* - The Dredged Materials Management Plan (DMMPs) for the dredging works of small canals has been prepared. Overall, dredged sediment will be disposed at Hoa Phu landfill or being used for agricultural or tree planting purpose based on actual need of the local people. The DMMP is described in details in chapter 6 – Environmental and Social Management Plan and Annex 1. - Ensure that detailed design scope for the canal dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor's dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts - 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. - Manage to ensure sediment will be disposed appropriately according to the approved DMMP. *To control impacts by odors from dredging process:* - Sediments are collected along the work sites and covered by the technical fabric to limit the slurry water leaking into the soil. The dredged materials are to be transported for disposal within the day. The management plan on dredged materials will be prepared to instruct the contractors to manage the waste source. - Uncontrolled disposal of the dredged sludge is prohibited. The waste source must be managed properly under the supervision of PMU. - In order to limit the impacts of odor of the dredging materials, the workers shall be equipped with masks, boots and gloves when working in/exposing to these waste sources. - Spraying EM (Effective Microorganisms) every day. The deodorants can eliminate malodors from H2S, CH4, etc. - Dredged materials will be collected, transported and treated under a contract at Hoa Phu Solid Waste Treatment Plant (landfill site). Transportation of the excavated sediments must meet the environmental protection requirements and avoid leakage; the waste materials carrying trunks must be covered closely and not overloaded as permitted.
c.	Social disturbances and local traffic obstruction - Local people in LIA 1,3 and 4 in ward No.2,3.	- Ensure that the contract requires the contractor, before commencing work, to provides a construction plan with a detailed heath, safety, environment and traffic management plan - Inform local residents in advanced (at least 07 days) about construction and work schedules, interruption of services, traffic routes. - 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. - Construction is carried out in a sequencing manner, section by section in a short period of time. Avoid the simultaneous construction and delay all over the LIAs. - Contractors should provide lighting at a construction site at night; security guard staff at

		construction sites to regulate vehicles go out and in the construction site; - Put the road construction warning signs at the site all the time. - Avoiding the waste/material transportation during rush hours; - Construction by night time is not allowed - Limit the construction area; the construction activities are only taken in the site boundary - Assign staff to guide the traffic during transportation, unloading, and loading.
d.	- Disruption of business activities	- 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. - Set up construction and traffic warning signs at the construction site. - Provide safe and easy acces to the household businesses putting clean and strong thick wood panels or steel plates over the open ditches. - Do not gather materials and wastes within 20m from household businesses and shops. - Do not use machines generating loud noise and high vibration levels near the businesses. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Deploy staff to guide the traffic during construction, transportation, loading and unloading of construction materials and wastes, and to guard high risk operations. - Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session. - Cleaning up construction areas at the end of the day, especially construction areas in front of business shops. - Providing night lighting system with luminously painted fence and night lamp. - Manage the worker force to any avoid the conflict with the local people and traders. - Compensate goods, products damaged by construction activities of the subproject. - Immediately address any issue/problem caused by the construction activities and raised by the local household traders.

e.	**Impact on Physical Cultural Resources (PCRs)** Church, Long An Pagoda (150 m from LIA 1); Chanh toa Church (70 m from LIA 3), Ngoc Thuan Monastic, Giac Hoa Pagoda (5 m from LIA 3); Vinh Long Oratory (55 m from LIA 4), Toa Giam Muc church (50 m from LIA 4), Tan Giai communal house, Long Hoa Pagoda (in LIA4) **Impact on sensitive receptors** Nguyen Truong To Secondary School (5 m from LIA 1) Hoa Sen Kindergarten (5 m from LIA 3) Ngo Quyen High School (5 m from LIA 4) Nguyen Du market (50 m from LIA 4)	***Impac on pagodas/churches:*** - Inform pagodas/churches 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 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. - Prohibit gathering of construction materials within 100m in front of the pagoda/church and monastic. - Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagoda. - 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. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas. - Truck drivers shall restrict horning in areas close to the pagoda area - Immediately address any issue/problem caused by the construction activities and raised by the pagoda/ church and monastic. ***Impact on schools:*** - Inform the school management 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 - Construction area to be fenced and marked with warning signs to prevent pupils and unauthorized people from entering. - Teachers to be informed of construction operations to keep pupils off the site during their break time. - Prohibit use of construction methods that cause noise during school learning hours. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Immediately collect any domestic wastes and construction spoils around the school and dispose

		in a designated site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes when children go to and leave the school. - Do not load construction materials within 20m from school and tidy construction materials and stockpiles every working session. - Cover the incomplete trenches under construction at end of the working day. - The construction method shall include the measures to protect the foundation of the fence/gate, main building of the Nguyen Truong To school, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage. - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with Nguyen Truong To school. - Immediately address any issue/problem caused by the construction activities and raised by the schools ***Impact on Nguyen Du market*** - 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. - Spray sufficient water to suppress dust during dry and windy days at least two times a day at road along the market area. - 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.
	Vibration impacts on PCRs (Giac Hoa Pagoda, Tan Giai Communal House) and Risk of collapse to fence and gate of the PCRs	- The contractors should provide evidences showing all equipment and machineries used in the project have been tested and complied with the Vietnamese Regulations on Vibration from construction activities, as specified in the QCVN27:2010/BTNMT; - The construction method shall include the measures to protect the foundation of the fence/gate, main building of the pagodas, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage. - The contractor should take photos at the initial sate of the construction site, especially the alley section that passes by Giac Hoa Pagoda and Tan Giai Communal House. In case damages happen, the contractor should take full responsibility in compensating or reconstructing the

		broken facilities as agreed with the pagoda.
2	**Component 2: Priority Primary and Secondary Infrastructures**	
	Construction of Bo Kenh (subcomponent 2.1), P2-P9 road (2.2) and Vo Van Kiet extended road (2.3)	
b	Local flooding - Residents living along the road	- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction - The Contractors must apply the specific construction methods, and flood prevention and control alternatives during construction period or the flow diverson alternatives to ensure the drainage in the location. - Set up a temporary sewers to ensure drainage at the construction site. - Arranging the standby pumps for rapid drainage in case of heavy rain or extreme weather incidents.
c	Disruption of business activities	As mentioned in component 1
d	Social disturbance and traffic concern Residences near the road alignment and along the transportation route	*To control impacts on social disturbance and traffic concern* - Ensure that the contract requires the contractor, before commencing work, to provides a construction plan with a detailed heath, safety, environment and traffic management plan - Inform local residents in advanced (at least 07 days) about construction and work schedules, interruption of services, traffic routes. - Inform the community of the planned night construction at least 2 days in advance. Limit the construction activities that cause great noise and vibration by nigh time. - 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. - Contractors should provide lighting at a construction site at night; security guard staff at construction sites to moderate vehicles go out and in the construction site; - Put the road construction warning signs at the site all the time.

		- Avoiding the waste/material transportation during rush hours; - Inform the community of the planned night construction at least 2 days in advance. - The construction activities are only conducted in the designated boundary - Assign staff to guide the traffic during transportation, unloading, and loading.
e.	Impacts on agriculture land - on ward No.2,No.3, No.4, No8	- Informing the community of the construction schedule at least one week before the construction. - Arrange drainage around the construction sites to ensure no soil erosion and sedimentation to the rice fields and irrigation canals. - Provide alternative water diversion from canals to the locations the local people requested, if they are affected. - Regularly check the affected on-field irrigation canals to ensure construction spoils and wastes do not block them. - 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. - Closely consult with the local community to ensure that suitable solutions to problems are taken and communities concerns related to construction activities are addressed.
g	Odor from dredging a small canal on P2-P9 Road - People living along canal on P2-P9 road in Ward No.2, No.8	*To control impacts from 1,200 m3 dredged materials:* Dredged soils and sediments will be collected, transported by covered truck of 1,210 m^3 and treated under a contract at Hoa Phu landfill *To control impacts by odors from dredging process:* The mitigation measures as similar to those applied for small canals within the LIAs as prestented above
h	Impact on sensitive receptors in Vo Van Kiet extended road (Vinh Long University of Technology Education and Vinh Long Teacher Training College)	- Inform the school management 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 - Construction area to be fenced and marked with warning signs to prevent pupils and unauthorized people from entering. - Teachers to be informed of construction operations to keep pupils off the site during their break time. - Prohibit use of construction methods that cause noise during school learning hours.

		- Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Immediately collect any domestic wastes and construction spoils around the school and dispose in a designated site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes when children go to and leave the school. - Do not load construction materials within 20m from school and tidy construction materials and stockpiles every working session. - Cover the incomplete trenches under construction at end of the working day. - Immediately address any issue/problem caused by the construction activities and raised by the schools
	Vibration impacts and risk on infrastructure collapse to Nguyen Truong To School	- The contractor should provide evidences proving all equipment and machineries used in the project have been tested and complied with the current Vietnamese Regulations on Vibration from construction activities as specified in the QCVN27:2010/BTNMT; - The construction method shall include the measures to protect the foundation of the fence/gate, main building of the Nguyen Truong To school, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage. - The contractor should take photos at the initial sate of the construction site, especially the alley section that passes by the school. In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the school.
2.4 2.5	***Dredging and embankment of Cau Lau Canal (subcomponent 2.4) and Kinh Cut Canals (subcomponents 2.5)***	
a	Impact on ecological environment of Cau Lau and Kenh Cut canals during wet dredging process	- The dredging operation is conducted only during the dry season; - Create sedimentation traps and maintain them periodically to ensure that most solids in surface runoff are retained in the traps before entering the existing drains or water sources surrounding the sites; - Leachate from sediments must be first deposited in sedimentation hole/trap before entering the canals. - Strictly prohibit contractors to discharge waste into canals - Upon forecasted stormy weather, suspend all the construction activities, tidy up the sites, brace and protect the materials and construction machines.

		- Do not gather construction materials as well as machinery and equipment near the stream. Gathering small quantities of materials, fit with the schedule. Materials must be covered with tarpaulin, avoiding the upwind location, near the canal. - Strictly prevent hazardous waste, waste oils or particularly greasy rags from entering the flow.
b	Odors from dredging process, and nuisance and leakage during the transportation of sediments, i.e. 22,000 m^3 from Cau Lau Canal; 16,200 m^3 from Kinh Cut Canal - People living along Cau Lau and Kinh Cut canals -and at the transfer site along Kinh Cut in ward No. 4 and along the transportation routes (Mau Than-National Highway No.53- Dinh Tien Hoang road-Hoa Phu landfill)	***Management of sediments generated during dredging process: 22,000 m^3 sediments from Cau Lau Canal; and 16,200 m^3 from Kinh Cut Canal*** - The Dredged Materials Management Plan (DMMPs) for the dredging Kinh Cut and Cau Lau canal has been prepared. Overall, excavated materials will be disposed at Hoa Phu landfill landfill or being used for agricultural or tree planting purpose based on actual needs of the local people. The DMMP is described in details in chapter 6 – Environmental and Social Management Plan and and Annex 1. - Ensure that detailed design of canal dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor's dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts - Prior to construction, the contractors shall have 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. - Manage to ensure sediments will be disposed appropriately according to the approved DMMP. ***To control impacts by odors from dredging process:*** - Sediments materials will be collected along the work sites and covered by the technical fabric to limit slurry leaking into the soil, and transported for disposal within the day. The management plan on dredged materials will be prepared to instruct the contractors to manage the waste source. - Uncontrolled disposal of the dredged sludge is prohibited. The waste source must be managed properly under the supervision of PMU. - In order to limit the impacts of odor of the dredged sludges, the workers shall be equipped with the masks, boots and gloves when working in/exposing to these waste sources. - Spraying EM (Effective Microorganisms) every day. The deodorants can eliminate malodors

		from H_2S, CH_4, etc. - Dredged materials will be collected, transported and treated by contracts in the Hoa Phu Solid Waste Treatment Plant (landfill site). Transportation of the dredged sludge must meet the environmental protection requirements and avoid slurry leakage; the sludge carrying trunks must be covered closely and not overloaded as permitted.
c	**Risks on soil erosion, embankment subsidence, house cracking during embankment**	- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure sustainability and stability of the embankment; - Ensure that the detailed design and contractor's construction method take into account the risk on local house cracking - Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to the authorities concerned for approval by the construction contractors. - Ensure that land acquisition and house relocation at the site boundary is completed piror to commencing construction workUse construction method to reduce vibration for construction activities of embankment i.e. pipe jacking instead of pile driving; closely monitoring the vibration level; - Construction of side slope is made in accordance with the design - Do not carry out dredging 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.
d	Damage risks to 05 small bridges across Cau Lau and Kenh Cut canals - Kinh Cut, Mau Than, Lau, Hung Dao, Pham Thai Buong bridges - Local residents in ward 3,4 using the bridge for transportation	- Inform the local people of the construction activities and their potential impacts such as waste, dust, and noise, traffic, especially vibration, risk of cracking on overpass and construction schedule at least 02 weeks before start of the construction. - To use construction method that cause less vibration for construction activities of embankment; - Stabilize and reinforce the canal banks in the vicinity of small bridges over Cau Lau and Kinh Cut prior to the dredging and embankment. - Do not utilize heavy machineries while dredging near the small overpassing bridges. - Place safety signs and provide proper detour instructions on each of the dredging segment that crosses the small bridge - If damage to the bridges happens, a temporary access shall be provided for the local residents. The damage bridges shall be repaired or adequate compensations shall be made upon agreement

		with affected households and local community.
e	Traffic safety - Especially at the traffic congestion nodes near Kinh Cut, Mau Than, Lau, Hung Dao, Pham Thai Buong - The commuting people along Mau Than road - National Highway No.53 - Dinh Tien Hoang road	- Ensure that the contract requires the contractor, before commencing work, to provide a construction plan with a detailed health, safety, environment and traffic management plan. This plan has to be consulted with the local authorities and approved by CSC - Using solid fence to isolate construction site area at the traffic congestion nodes, i.e. at Kenh cut bridge, Mau Than Bridge, Lau Bridge, Hung Dao Bridge, Pham Thai Buong Bridge - Coordinate with the local authority to regulate transportation during rush hour, especially at the traffic congestion nodes as indicated above. - Do not carry out loading, unloading materials at the rush hour.
g	Disruption off navigation during construction of canal - Local people using waterway traffic in Kinh Cut and Cau Lau canals	- Coordinate with the local authority to inform local people on the construction plan prior to construction; - Coordinate with the Department of Inland Waterway to flag the signal system on the inland waterway the transport travel through; - Provide the workers with and request them to use life jackets in construction operations on the water surface. Observing staff must be present during entire shifts for timely rescue in case of incidents. - Place warning boards along the construction route, both on land and water surface (arrange the road and waterway traffic guide).
h	Impacts on agriculture land in Ward No.3 and No.4	- Informing the community of the construction schedule at least one week before the construction. - Arrange drainage around the construction sites to ensure no soil erosion and sedimentation to the rice fields and irrigation canals. - Provide alternative water diversion from canals to the locations the local people requested, if they are affected. - Regularly check the affected on-field irrigation canals to ensure construction spoils and wastes do not block them. - Closely consult with the local community to ensure that suitable solutions to problems are taken and communities concerns related to construction activities are addressed.
i	Impacts on PCRs Vinh Long Oratory (55 m from Kinh Cut Canal), Toa Giam Muc church (50 m from Kinh Cut canal)	- Inform the pagodas/churches 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

	and Hung An Tu pagoda (Cau Lau canal).	construction. - 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. - Prohibit gathering of construction materials within 100m in front of the pagodas. - Pile driving activities will not be carried out before 7 am or after 6 pm, or at days and hours advised by the local management. - Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagodas. - 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. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas. - Truck drivers shall restrict horning in areas close to the pagoda area - Immediately address any issue/problem caused by the construction activities and raised by the pagodas.
k	Impact on sensitive receptors Impacts on Nguyen Du market 'activities (Kinh Cut canal) and Cau Lau (Cau Lau canal):	- Limiting to transportation of materials/wastes (for constructing the items of Kinh Cut and Cau Lau canal) to avoid disruption of Nguyen Du and Cau Lau Market's activities at peak hours (morning: 5-9h; noon: 11-12h; afternoon and evening: 16 - 19h). - Spray sufficient water to suppress dust during dry and windy days at least two times a day at road along the market area. - 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.
	Vibration impacts and risk on structure collapse to Hưng An Tu Pagoda	- The contractors should provide evidences showing all equipment and machineries used in the project have been tested and complied with the Vietnamese Regulations on Vibration from construction activities, as specified in the QCVN27:2010/BTNMT. - 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.

		- The contractor should take photos at the initial sate of the construction site, especially the alley section that passes by Hung An Tu Pagoda. If damage happens to the pagoda's fence, the contractor should be responsible for reconstructing the fence to return it to its initial state.

Mitigation measures for impacts on traffic and traffic safety due to transportation of construction materials and wastes:

During construction, under component 1,2, a number of sreets and roads will be affected by transportatin of construction materials and waste as indicated in Table 5.2 below.

Table 5.2. Material and waste transport routes

Construction site	Expected length (km)	Roads for spoil transportation
LIA 1	12.5	Pham Hung road → Nguyen Hue road → Hoang Hoa Tham road → National Highway No.1A
LIA 3	11.8	Vo Van Kiet road → Nguyen Hue road → Hoang Hoa Tham road → National Highway No.1A
LIA 4	13.5	Mau Than road → National Highway No.53 → Dinh Tien Hoang road
Border road Ward 2 - Ward 9 (Route 1)	12.5	Pham Hung road →Nguyen Hue road → Dinh Tien Hoang road
Border road Ward 2 - Ward 9 (Route 1)	12	Vo Van Kiet road → Nguyen Hue road → Dinh Tien Hoang road → National Highway No.1A
Border road Ward 2 - Ward 9 (Route 3)	10.8	National Highway No.53 → Dinh Tien Hoang road
Bo Kenh road	14.3	National Highway No.53 → Dinh Tien Hoang road → National Highway No.1A
Vo Van Kiet road (Route 1)	11.8	Vo Van Kiet road → Nguyen Hue road → Dinh Tien Hoang road → National Highway No.1A
Vo Van Kiet road (Route 1)	13.5	Mau Than road → National Highway No.53 → Dinh Tien Hoang

Construction site	Expected length (km)	Roads for spoil transportation
Kenh Cut embankments	13.5	Mau Than road → National Highway No.53 → Dinh Tien Hoang road

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. Measures to Mitigate Impacts during Operation

❖ **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:

Mitigation Measures for f local flooding on the alley due to the indadequate maintenance and blockage of drains

- Cooperating with the local authorities 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.

Measures for traffic safety

- Ensure that traffic safety provisions, including signs, lights, and signals regulating speeds, allowed vehicles load that were installed during construction are permanently and effectively maintained, and renewed as necessary
- Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road.
- Cooperating with the local government to appoint the staff for traffic regulation at peak hours;
- Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the alleys in its as-completed condition;

❖ **Component 2**

For Bo Kenh road (subcomponent 2.1); P2-P9 road (subcomponent 2.2) and Vo Van Kiet extended road (subcomponent 2.3):

Road safety

After construction is completed, there will be operations of various vehicles on the new road. Key short-term impacts would include an increase in traffic and pedestrian accidents, due to higher standard road allowing more and faster traffic; premature failure of pavements, drainage structures due to inadequate maintenance. Other impacts would be possibly localized flooding related.

To mitigate these impacts the following measures will be carried out by the city road maintenance agency:

- Ensure that traffic safety provisions, including signs, lights, and pavement markings that were installed during construction are permanently and effectively maintained, and renewed as necessary.

- Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the road in its as-completed condition.
- Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road.
- Ensure effective road inspection for any signs of damages, soil erosion and landslide for immediate repairing actions.
- Cooperating with the local government to appoint the staff for traffic regulation at peak hours;

Mitigation measures for blockage of drainage system due to inadequate maintenance

To minimize impacts by the status of blockage of drainage system due to inadequate maintenance during operation phase of Bo Kenh, P2-P9 and Vo Van Kiet extended roads; the O&M units will be implemented mitigation measures follow:

- The management of storm water drainage along the roads should be focused and examined regularly to detect the congested drainage sewer sections and carry out dredging.
- Conduct periodic planning decentralization and dredging sewer sections and manholes in order to minimize the flow congestion (every 6 months).
- Control disposal of sludge: Similar to the construction phase, those who manage the water drainage systems would have contracts with relevant authorities of sludge dredging from the sewer sections and manholes and then transport to the landfill by specialized tank trucks to avoid odor emission and spillage during transportation.

For Cau Lau and Kenh Cut Canals (subcomponents 2.4 and 2.5)

Measures to prevent embankment subsidence risk:

- 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.
- Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the embankment periodically
- Closely monitor the construction of other infrastructures within the area that potentially affect the embankment structures

Measures for the status of direct waste disposal into the Kinh Cut and Cau Lau canals

During the O&M, to control risks of pollution and flow stagnation due to disposal of waste from households living along the canals, the O&M unit will be implemented mitigation measures follow:

- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the canals; PMU and DONRE should be in collaboration to impose much more serious penalty to polluter
- Properly arranging the waste baskets along the canal and launching programs of increasing awareness of the community toward environmental protection;
- Carrying out periodical dredging and clearing works of the canals at least 6 months/time especially before the wet season;

- Signing contracts with the responsible agencies on collecting, transporting and treating dredged sludge.

❖ **Component 3:**

Concerning about the impacts from domestic wastewater and solid waste generated from the resettlement sites, the operation management agency has to take the following mitigation measures:

- Households in the resettlement sites have to build latrines with septic tank in accordance with regulations of the Government, the wastes from the latrines must be primarily treated in the septic tanks of each household before discharging into the public drainage system. The wastewater will be then connected to the wastewater collection and treatment system of Vinh Long city (funded by ADB).
- The volume of the solid waste is very few and will be collected and managed by Vinh Long URENCO.

In general, the resettlement areas where there are current drainage system and waste collection areas, these impacts are very minor and under control.

5.2. SOCIAL MITIGATION MEASURES

5.2.1. Measure to minize impact on land acquisition

Screening of adverse impacts on involuntary resettlement indicated tha land acquisition as a result of the project is inevitable. Significant resettlement impacts are expected due to the proposed investments, particularly under Component 2.

During detailed design, design consultant should consult the local community to find mitigation measure for land acquisition and other adverse effecs on people. On the other hand, a resettlement policy framework, and a resettlement plan for each sub-project have been prepared to ensure that any loss and damages caused by the project are adequately compensated.

Measures have been taken to reduce land acquisition during the preparation stage. Specifically, in each LIA a Community Upgrading Plan (CUP) was developed based on extensive community consultations and social surveys to identify priority investments and to agree on thep proposed design (i.e. width of the alley expansion, location of drainage/sanitation etc.). Resettlement areas which have infrastructe should be built near the works.

During RP implementation. Detailed Measurement Suvey (DMS) which constitute the basis for compensation will be conducted with the full participation of affected persons.

5.2.2. Measure to minize impact on livelihood

- Assistance for relocation close to former location;
- Short distance (2 to 5 km) from the resettlement sites to their former business location should not affect their income.
- In case of impacts on livelihood, an income restoration program has been prepared for AHHs.
- Civil works should prioritize job opportunities for local people, especially the affected HH and the poor, to increase their income.

- The RP includes specific meaures to support non-registered businesses.

5.2.3. Measure to minize gender issues

A gender action plan is needed to facilitate the maximum participation of women in the construction phase of the project, providing new opportunities for women to increase their income, but not increasing the burden for their life, to enhance benefits for women and contributing to increase the role and position of women in the family in the project area.

5.2.4. Measure to minize rick of social ills

Well controlling 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.

5.2.5. Measure to minize impact in traffic system

-Construction contractor to select reasonable time for construction and select warning boards and site safety measures.

-Local authority and construction contractors to share the working plan with people to proactively respond.

5.2.6. 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.

5.2.7. Preparation of resettlement plan (RP)

The Project resettlement framework (RPF) and according to the Government of Vietnam and the World Bank OP 4.12 was prepared to guide the preparation of the resettlement plans defined during project preparation and for those that will be identified during project implementation. In order to minimize impacts caused by land acquisition, the project design proposed alternatives to select the optimal option to meet the following criteria (i) causing the smallest possible impacts on land acquisition; (ii) including consultations' inputs provided by the local authorities and communities in the subproject area.

The RP addresses the relocation and livelihood impact of the Project on directly impacted communities and households. The Vinh Long PPC and authorized PMU ensured that any involuntary resettlement will be carried out in accordance with the agreed RPF/RP.

The Resettlement Plan for Vinh Long City includes a special attention to gender and vulnerable group issues in accordance with the WB policy on Involuntary Resettlement. In this respect, the RP addresses the vulnerable group, gender and poverty issues particularly among the directly

impacted households. The measures in the RP include provision of opportunities for increased women's participation in decision making and in livelihood training, and ensuring that compensation will be given to both men and women.

Vinh Long PPC has provided resettlement area in Ward 4 to arrange for the beneficiaries of resettlement. These resettlement area include land plots with infrastructure systems: leveling, roads, drainage systems, power supply, urban lighting, and trees.

Location for constructing the resettlement areas are compliance with planning of the PPC of Vinh long city and the construction of resettlement areas is an activity to help the city renovate residential areas for more beautiful landscape in the future.

Information about the resettlement area in Ward 4:

Resettlement area in Ward 4:

- Area: 9,4 ha.
- Status: Completed infrastruture.
- Investor: Division for urban management – Vinh Long city.
- Number of plots: 385 plots; Remained plots: 128 plots.
- Plot area: 90 – 125 m^2.

5.2.8. 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. People will get information and update on project implementation to have proactive plan for production and daily activities. Information for the development: increasing accessibility to the information for people's lives, contributing into the improvement of life quality, enhancing involvement of community.

5.2.9. Information publication, social accountability and monitoring responsibility

To ensure the participation of affected communities, families, local governments and related organizations in sharing information on project, advice on the choice of technical solutions, expectation of impacts on land, income and on-land property... 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.

5.2.10. Hiring social experts

Hiring social experienced experts by PMU to implement the resettlement plan, income restoration program and the Gender Action Plan and the Public Health Management Plan.

5.3.MEASURES TO MITIGATE CUMULATIVE IMPACTS

The assessment indicates that the cumulative impacts of the Subpjoject and the associated projects are mostly positive. The negatives cumulative impacts are minor to moderate and can be addressed individually at the project level.

CHAPTER 6. ENVIRONMENTALAND SOCIAL MANAGEMENT PLAN

Based on the assessments of the potential adverse environmental impacts and mitigation measures proposed in Chapter 4 and chapter 5 of this report, this Chapter presents an Environmental and Social Management Plan (ESMP) for Vinh Long project. EMP identifies the measures to be carried out for the project, including environmental monitoring program and implementation arrangements, taken into account the needs to comply with the government's EIA regulations and WB's environmental safeguard policies, including Environmental, Health, and Safety (EHS) Guidelines of the WB.

6.1. BASIC PRINCIPLES

In order to ensure that all pollution sources arising from the subproject activities during the preparation stage and the construction stage as well as in the operation period will not cause any negative impacts on the environment and public health, it is compulsory that the management, monitoring and supervision of environmental quality are executed in a scientific, systematic and regular manner. Below is a summary of environmental impacts, mitigation measures and responsibilities of stakeholders.

ESMP's mitigation measures are divided into 3 basic parts: (1) ECOP, (2) Specific mitigation measures for the specific types of works, and (3) Site-specific mitigation measures for each sensitive location to be affected by the subproject's work items.

(1) All of the potential negative impacts on physical, biological, and social environment could be mitigated through a set of general measures that are typically applied to most of construction projects to minimize impacts such as noise, dust, vibration, waste generation, traffic hindrance, public safety, etc. In this context, an ECOP has been prepared to describe the specific requirements to be carried out by contractor to mitigate the subproject potential impacts which are considered as the general ones (Section 6.2.1). The contractors will also be required to mitigate site-specific impacts which will be identified in order to address specific issues of the subproject.

(2) In addition to adopting the ECOPs, the specific mitigation measures have been identified (Section 6.2.2) for addressing the impacts associated with the specific types of structures under the subproject. These measures will be included in the contracts for corresponding packages.

(3) All the specific impacts on each sensitive place of which mitigation measures could not be addressed through implementation of the ECOPs, shall be solved by the site-specific mitigation measures. (Section 6.2.4). Measures to mitigate impacts from land acquisition and resettlement are mentioned separately in the Resettlement Action Plan (RAP) and those measures will be carried out and supervised separately.

6.2. KEY IMPACT MITIGATION MEASURES

6.2.1. ECOPs

Typical common impacts which will be minimized by mitigation measures defined in ECOP include: (1) Dust, exhaust gases, noise and vibration; (2) wastewater management; (3) Solid waste management; (4) 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: Environmental Codes of Practices for addressing general construction impacts (ECOPs)

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
1. Generated dust, noise, vibration and exhaust gas	• 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. • 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 • Carry out watering for dust control at least 3 times a day: in the morning, at noon, and in the afternoon during dry weather with temperatures of over 25^{o}C, or in windy weather. Avoid overwatering as this may make the surrounding muddy. • Exposed soil and materials shall be protected against wind erosion and the location of materials shall take into consideration the prevailing wind directions and locations of sensitive receptors. • Dust masks should be used by workers where dust levels are excessive • There should be no burning of waste or construction materials on site. • Cement processing plants should be far from residential areas. • Only use transportation vehicles with valid registry. • 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. • 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. • Put temporarily gathered materials and waste heaps with a volume of about	• QCVN 05: 2013/MONRE:National technical regulation on ambient air quality • QCVN 26:2010/BTNMT: National technical regulation on noise • QCVN 27:2010/BTNMT: National technical regulation on vibration • TCVN 6438-2005: Road vehicles. Maximum permitted emission limits of exhaust gas • Decision No. 35/2005/QD-BGTVT on inspection of quality, technical safety and	Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	20m^{3}within barriers or covered so as to avoid dust dispersion. • Transport wastes out of construction sites to the designated locations for reuse or to the disposal sites in the soonest possible time. • Do not put vehicles and machines to run idle in more than 5 minutes. • Avoid preparations of construction materials such as mixing concrete near local people's houses or other sensitive works like pagodas, school gates, or offices. • Locate vehicle washing stations at the exit/entrance of big construction sites such as the areas for Vo Van Kiet road, P2-P9, Bo Kenh Street. • Periodically wash the trucks used for transporting materials and construction wastes. • 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. • Perform the method of successive construction for each sewer section in construction sites of long sewer lines. • Observe and secure construction progress correctly. • Set up 2.5m-high fences of corrugated iron around the construction sites such as the areas for the LIAs, Vo Van Kiet road, P2-P9, Bo Kenh street, Cau Lau, Kinh Cut embankment. • 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 • Avoiding or minimizing transportation through community areas and avoiding as well as material processing areas (such as cement mixing)	environmental protection;		
2. Wastewater	• The Contractor must be responsible for compliance with Vietnamese legislation relevant to wastewater discharges into watercourses.	• QCVN 14:2008/BTNMT:	Contractor	PMU, CSC,

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
management	• Employ local workers to limit the amount of generated domestic wastes and wastewater. • Provide septic tanks for toilets for treating wastewater before it can be discharged into the environment. On-site mobile toilets with 3-compartment septic tanks can be used in areas for major work items as LiAs,Vo Van Kiet road, P2-P9 road, Bo Kenh street, Kinh Cut and Cau Lau embankment. Wastewater from toilets as well as kitchens, showers, sinks, etc. shall be discharged into a conservancy tank for removal from the site or discharged into municipal sewerage systems; there should be no direct discharges to any waterbody • 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**.** • Clear ditches around the workers' camps every week. • Build sedimentation ponds and ditches to receive stormwater runoff at the construction sites such as the areas for LIAs; Vo Van Kiet road, P2-P9 and Bo Kenh street and Cau Lau and Kinh Cut cannal. • Make appropriate arrangements for collecting, diverting or intercepting wastewater from households to ensure minimal discharge or local clogging and flooding. • Before construction, all necessary wastewater disposal permits/licenses and/or wastewater disposal contracts have been obtained. • At completion of construction works, wastewater collection tanks and septic tanks shall be safely disposed or effectively sealed off.	National technical regulation on domestic wastewater; • QCVN 40: 2011/ BTNMT: National technical regulationon industrial wastewater		IEMC
3. Solid waste management	• 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. • Before construction, all necessary waste disposal permits or licenses must be	• Decision No, 59/2007/NĐ-CP on garbage management;	Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	obtained. • Solid waste may be temporarily stored on site in a designated area approved by the Construction Supervision Consultant and relevant local authorities prior to collection and disposal through a licensed waste collector. • Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof. • No burning, on-site burying or dumping of solid waste shall occur. • If not removed off site, solid waste or construction debris shall be disposed of only at sites identified and approved by the Construction Supervision Consultant 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. • Limit waste pollution from litter and drop of materials. Place dustbins at the workers' camps. • Temporarily collect and separate domestic wastes. Provide watertight dustbins for domestic waste and tightly cover them to avoid giving rise to bad odors and leachate leakage, attracting flies, mice and other pathogenic species. Periodically collect and transport the waste to the dispose at Hoa Phu landfill. • Perform concrete mixing on impermeable ground. Collect waste and wastewater containing cement through drainage ditches with sedimentation pits in construction sites before being discharged into receiving waters. • Separate the components and parts which can be reused or recycled in the construction wastes before transporting the waste to Hoa Phu landfill in accordance with design documents acceptable to the supervision engineer. • 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. • Collect waste and tidy up construction sites at the end of a working day/shift	• Decision No,38/2015/NĐ-CP dated 24/04/2015 on waste and scrap management		

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	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. • The Contractor will sign a contract with Vinh Long Urban Environment Company to collect solid waste, conforming to Decree No. 59/2007/ND-CP dated 09 April 2007 on solid waste management and Decree No. 38/2015/ND-CP dated 24 April 2015 on management of waste and waste materials.			
4. Hazardous waste management	• 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. • Collect and temporarily store used oil and grease separately in specialized containers and place in safe and fire-free areas with impermeable floors roofs, at a safe distance from fire sources. Sign contracts with for oil and grease to be delivered to suppliers/ manufacturers. • 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. • The removal of asbestos-containing materials or other toxic substances shall be performed and disposed of by specially trained and certified workers. • Used oil and grease shall be removed from site and sold to an approved used oil recycling company. • 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. • Used oil or oil-contaminated materials that could potentially contain PCBs	• Circular No. 36/2015/TT-BTNMT on hazardous waste management; • Decision No.38/2015/NĐ-CP dated 24/04/2015 on waste and scrap management	Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	shall be securely stored to avoid any leakage or affecting workers. • Unused or rejected tar or bituminous products shall be returned to the supplier's production plant. • Relevant agencies shall be promptly informed of any accidental spill or incident • Store chemicals appropriately and with appropriate labeling • Appropriate communication and training programs should be put in place to prepare workers to recognize and respond to workplace chemical hazards • 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			
5. Water pollution	• 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 – *National Technical Regulation on surface water quality* and QCVN 14:2008/BTNMT – *National Technical Regulation on domestic wastewater quality*. • Provide preliminary sedimentation ponds and ditches of stormwater runoff at the construction sites such as the areas for LIAs, Kinh Cut and Cau Lau cannals. • Provide construction workers on site with mobile toilets. • Avoid excavation and backfilling during rains. • 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. • Do not allow temporary gathering of bulk materials and mixing of concrete within 50m from ponds, lakes, rivers, streams, or other water sources. Maintain maximum distances possible between the gathering points to water	• QCVN 09-MT:2015/BTNMT: National technical regulation on underground water; • QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater; • QCVN 40: 2011/ BTNMT: National technical	Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	sources in the construction of LIAs, Kinh Cut and Cau Lau cannals. • Store used and unused oil and petrol in closed containers on impermeable ground covered with roofs and contained within surrounding banks for easy control and collection in case of leakage. Do not locate oil and petrol storages within 25m from ponds, lakes, rivers, and streams. • Collect and transport excavated soils from the construction of sewers and ditches out of the construction site within 24 hours. • 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	regulationon industrial wastewater; • TCVN 7222: 2002: General requirements for concentrated wastewater treatment plants		
6. Impacts on plants and aquatic species	• The Contractor shall prepare a Clearance, Revegetation and Restoration Management • 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. • Limit disturbances to areas with construction operations, especially in locations covered with green trees or vegetation. Do not use chemicals to clear vegetation. • Do not gather materials and wastes at places covered with vegetation or with green trees, but on vacant land instead. • Use sheet pile driving method using Larsen piles to limit impacts on the water quality. • 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. • The contractor shall remove topsoil from all areas where topsoil will be	• Law on environmental protection No. 55/2014/QH13	Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	impacted by construction activities, including temporary activities such as storage and stockpiling, etc; the stripped topsoil shall be stockpiled in areas agreed to by the Construction Supervision Consultant for later use in re-vegetation and shall be adequately protected. • Trees cannot be cut down unless explicitly authorized in the vegetation clearing plan. • When needed, temporary protective fencing will be erected to efficiently protect the preserved trees before commencement of any works within the site. • 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. • The Contractor shall ensure that no hunting, trapping, shooting, poisoning of fauna takes place.			
7. Impacts on urban landscape and beauty	• Carefully cover transport vehicles for materials and waste and periodically wash and clean the vehicles. • 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. • Do not temporarily gather construction materials and wastes within 20m from the gate of schools, offices temples, pagodas, etc. • The Contractor will have to work out construction plans in such a way as to avoid the 1st and 15th days of each lunar month if construction is to be carried out near historical and cultural works such as pagodas, churches, temples, etc. • Regularly collect materials and wastes and tidy up the construction site**.**	• Law on environmental protection No. 55/2014/QH13 • TCVN 4447:1987: Construction regulation • Circular No. 22/2010/TT-BXD on requirements on safety	Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
8. Sedimentation, erosion, flooding, subsidence and slides	• Avoid disturbances and damage to the existing vegetation and green trees. • Periodically and thoroughly remove soils, stones and wastes from drainage sewers and ditches inside and around the construction site. • Neatly gather materials and wastes so as to limit them being swept away by stormwater. • Carry out ground leveling and rolling after discarding materials at disposal sites.	• TCVN 4447:1987: Construction regulation • Circular No. 22/2010/TT-BXD: Regulation on construction safety • QCVN 08:2008/BTNMT – National technical regulation on surface water quality	Contractor	PMU, CSC, IEMC
9. Traffic management	• Before construction, carry out consultations with local government and community and with traffic police. • Set up traffic and maintain instruction signs and warnings to secure safety for people and means of transport during construction. • 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. • Put speed limit signs at a distance of 200m from the construction site. • 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. • Do not park vehicles in the roads longer than necessary. Do not allow	• Law on communication and transport No. 23/2008/QH12; • Law on construction No. 50/2014/QH13; • Law No. 38/2009/QH12 dated 19/6/2009 amending and supplementing some articles of the Law relating to capital construction	Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	construction vehicles and materials to encroach upon the pavements. • 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. • Install night lighting of all construction sites. • Significant increases in number of vehicle trips must be covered in a construction plan previously approved. Routing, especially of heavy vehicles, needs to take into account sensitive sites such as schools, hospitals, and markets. • Installation of lighting at night must be done, if necessary, to ensure safe traffic circulation. • Employ safe traffic control measures, including road/rivers/canal signs and flag persons to warn of dangerous conditions. • Avoid material transportation for construction during rush hours. • 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	investment • Circular No. 22/2010/TT-BXD on regulation on construction safety		
10. Influence to existing infrastructure and services	• Provide information to affected households on working schedules as well as planned disruptions (at least 2 days in advance). • The Contractor must only use vehicles of sizes and loads within permissible limits for the roads along such vehicles' route. • 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. • Stop construction when existing works are damaged. Identify causes of related incidents and work out solutions. In case the damages are due to the	• Decree No. 73/2010/ND-CP on administrative penalization of violations related to security and social affairs	Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	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. • Reinstall the road surface and sidewalks at construction sites after the construction of sewer lines has been completed. • The contractor should ensure alternative water supply to affected residents in the event of disruptions lasting more than one day. • Any damages to existing cable utility systems shall be reported to the authorities and repaired as soon as possible.			
11. Social mitigation measures through worker management	• 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. • 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. • 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. • 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. • The subproject will cooperate with the local health agency in developing and implementing plans for control of diseases among workers. • Workers temporarily residing at the camps and rented houses must be registered with the local authorities for temporary residence. • Train workers on issues related to social security, social evils, diseases and	• Decree No. 73/2010/ND-CP on administrative penalization of violations against security and social affairs • Circular No. 22/2010/TT-BXD regulation on construction safety • Directive No. 02/2008/CT-BXD on safety and sanitation issues in construction units • TCVN 5308-91:	Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	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. • Prohibit workers from: + Consuming alcoholic drinks during working time + Quarreling and fighting + Gambling and indulging in social evils such as drug use and prostitution + Disposing of garbage indiscriminately.	Technical regulation on construction safety • Decision No. 96/2008/QD-TTg on clearance of UXOs		
12. Control of impacts on cultural works	• Do not gather materials and wastes within 20m from cultural, historical, and religious works such as temples, pagodas, churches, monuments, historic relics, etc. Water spray the construction sites next to such works. • Do not use machines generating loud noise and high vibration levels near cultural, historical, and religious works. • In case of archeological objects being unearthed during the implementation of earthwork, all parties will conform to the following procedures: + In case of archeological objects being unearthed during the implementation of earthwork, all parties will conform to the following procedures: + Suspend construction operations at the place of discovery; + Preliminarily describe the area where the archaeological objects are to be unearthed; + 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; + Inform the Supervision Engineer of the event and who in turn will	• Law on cultural heritage No. 28/2001/QH10; • Amended and supplemented Law on cultural heritage No. 32/2009/QH12; • Amended and supplemented Decree No. 98/2010/ND-CP	Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	immediately inform the subproject owner, the local authorities in charge of the case and the Institute of Archaeology (within 24 hours or less); + 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; + 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); + 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 + Only resume construction activities at the site after being permitted by the local competent agencies and the PMU in relation to safeguarding such relics			
13. Management of warehouses and borrow pits	• 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. • Retaining walls are to set uparound disposal areas if necessary. • The use of new sites for stockpiling, gathering or exploiting materials necessary for construction operations must obtain prior approval from the		Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	Construction Engineer. • 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. • If access roads are needed for these new sites, they must be considered in the environmental assessment report.			
14. Communication to local community	• 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). • 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. • Project information will be disseminated to affected parties (e.g. local authorities, enterprises and affected households, etc.) through community meetings before construction commencement. • A contact address will be provided to the community. • 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. • Community concerns and requested information are to be monitored as the project progresses. • Inquiries must be responded by telephone and written correspondence in a timely and accurate manner. • Local residents must be informed about construction and work schedules, interruption of services, traffic detour routes and provisional bus routes,	• Decree No. 73/2010/ND-CP on administrative penalization of violations related to security and social affairs	Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	blasting and demolition operations, as appropriate. • 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. • 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.			
15. Mitigation measures for limitation of access to street household businesses	• 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. • Set up construction and traffic warning signs at the construction site. • Provide safe and easy acces to the household businesses putting clean and strong thick wood panels or steel plates over the open ditches. • Do not gather materials and wastes within 20m from household businesses and shops. • Do not use machines generating loud noise and high vibration levels near the businesses. • Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. • Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes, and to guard high risk operations. • Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session. • Cleaning up construction areas at the end of the day, especially construction areas in front of business shops.	• Decree No. 73/2010/ND-CP on administrative penalization of violations against security and social affairs	Contractor	PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	• Providing night lighting system with luminously painted fence and night lamp. • Manage the worker force to any avoid the conflict with the local people and traders. • Compensate goods, products damaged by construction activities of the subproject. • Immediately address any issue/problem caused by the construction activities and raised by the local household traders.			

The details on the DMMP (Embankment for small canals in LIA1,3,4, Kinh Cut and Cau Lau):

- The contractors are requested to prepare a specific dredging material management plan (DMMP) and submit the same to the Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary gathering of dredged materials, control of polluting material during temporary gathering and transportation, pollution control, and risks at disposal sites. The detailed guidelines on DMMP are provided in Annex 1.

6.2.2. Site-specific EMP

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

Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
Component 1: Tertiary Infrastructure Upgrading in LIAs				
Preparation phase				
UXO clearance	-The subproject owner (the subproject PMU) will sign a contract with the military civil engineering agency or Vinh Long Provincial Military Base for UXO detection and clearance at the construction sites. UXO clearance will be executed right after the completion of site compensation and before the implementation of demolition and ground leveling. The estimated cost is approximately 50 million VND/ha. No construction activity will be allowed until the UXO clearance is completed.	The military civil engineering agency or Vinh Long Provincial Military	PMU	City Fund
Lan acquisition and resettlement,	-The resettlement consultant, technical consultant and PMU have worked together to analyze the alternative options and select the most suitable design based on the principle of (i) minimizing the resettlement due to land acquisition and (ii) mitigating impacts of land acquisition and resettlement.	Detailed Design Consultant	PMU	City Fund
	Land acquisition and resettlement will be compliance with the approved Resettlement Policy Framework (RPF), which was prepared in order to establish the resettlement principles, eligibility requirements for compensation, valuation methods, describe the legal and institutional framework, organizational arrangements, funding mechanisms, and community consultation and participation, and grievance redress mechanism to be applied to the project during the project implementation. Resettlement Action Plan (RAP) will be prepared in compliance with the approval RPF and submitted to the World Bank for approval before construction activities will be started. The RPF has been prepared in compliance with the World Bank's Operational Policy on Involuntary Resettlement (OP 4,12) and the Vietnam's laws and regulations. The RPF will be applied to all components of the CTUDR Project that result in involuntary resettlement, regardless of the finance source.	Center of Municipal Land Fund Management and Development	PMU, Ward People's Committee, Vinh Long'PC	City Fund

Grave relocation	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.According to Resettlement Plan, the price of compensation for the grave/tomb: including cost for displacing, transporting, re-burying, re-constructing and other related costs is stipulated in Clause 1 of Article 15 of Decision 18/2014/QD-UBND of People's Committee of Vinh Long province as follows: - The amount of compensation for soil tomb: 4,000,000 VND/tomb - The amount of compensation for non- corpse stone tomb (which is pre-dug to bury dead person): 6,000,000 VND/tomb - The amount of compensation for brick/stone tomb: 8,000,000 VND/tomb. - 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	Center of Municipal Land Fund Management and Development	PMU, Ward People's Committee	City Fund
Construction phase				
Local flooding - Residents within LIAs 1,3 an 4 in Ward No.2, 3	- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction	Detailed Design Consultant (DDC)	PMU	IM: Construction contract conditions - Fund: IDA &IBRD
	- 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 - The contractors must set up temporary drainage system at the construction site and ensure that it is cleared of mud and other obstructions. - Have a standby pumps for rapid drainage in case of heavy rain or extreme	Contractor	PMU	IM: Construction contract conditions - Fund: IDA &IBRD

	weather events			
-Odor and management of 17,000 m^3 sediments generated from small canals dredging in LIA 1,3 and 4. - Residents in Ward No.2,3 - People commuting along transportation route	*To control impacts from dredged soils and sediments* - The Dredged Materials Management Plan (DMMPs) for the dredging works of small canals has been prepared. Overall, dredged sediment will be disposed at Hoa Phu landfill or being used for agricultural or tree planting purpose based on actual need of the local people. The DMMP is described in details in chapter 6 – Environmental and Social Management Plan and Annex 1.	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
	Ensure that detailed design scope for the canal dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor's dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
	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. Manage to ensure sediment will be disposed appropriately according to the approved DMMP	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
		- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
	To control impacts by odors from dredging process: - Sediments are collected along the work sites and covered by the technical fabric to limit the slurry water leaking into the soil. The dredged materials are to be transported for disposal within the day. The management plan on dredged materials will be prepared to instruct the contractors to manage the waste source. - Uncontrolled disposal of the dredged sludge is prohibited. The waste source must be managed properly under the supervision of PMU. - In order to limit the impacts of odor of the dredging materials, the workers shall be equipped with masks, boots and gloves when working in/exposing to these	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD

	waste sources. - Spraying EM (Effective Microorganisms) every day. The deodorants can eliminate malodors from H2S, CH4, etc. - Dredged materials will be collected, transported and treated under a contract at Hoa Phu Solid Waste Treatment Plant (landfill site). Transportation of the excavated sediments must meet the environmental protection requirements and avoid leakage; the waste materials carrying trunks must be covered closely and not overloaded as permitted.			
Social disturbances and local traffic obstruction - Local people in LIA 1,3 and 4 in ward No.2,3.	- Ensure that the contract requires the contractor, before commencing work, to provides a construction plan with a detailed heath, safety, environment and traffic management plan - Inform local residents in advanced (at least 07 days) about construction and work schedules, interruption of services, traffic routes. - 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. - Construction is carried out in a sequencing manner, section by section in a short period of time. Avoid the simultaneous construction and delay all over the LIAs. - Contractors should provide lighting at a construction site at night; security guard staff at construction sites to regulate vehicles go out and in the construction site; - Put the road construction warning signs at the site all the time. - Avoiding the waste/material transportation during rush hours; - Construction by night time is not allowed - Limit the construction area; the construction activities are only taken in the site boundary - Assign staff to guide the traffic during transportation, unloading, and loading.	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD

- Disruption of business activities	- 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. - Set up construction and traffic warning signs at the construction site. - Provide safe and easy acces to the household businesses putting clean and strong thick wood panels or steel plates over the open ditches. - Do not gather materials and wastes within 20m from household businesses and shops. - Do not use machines generating loud noise and high vibration levels near the businesses. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Deploy staff to guide the traffic during construction, transportation, loading and unloading of construction materials and wastes, and to guard high risk operations. - Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session. - Cleaning up construction areas at the end of the day, especially construction areas in front of business shops. - Providing night lighting system with luminously painted fence and night lamp. - Manage the worker force to any avoid the conflict with the local people and traders. - Compensate goods, products damaged by construction activities of the subproject. - Immediately address any issue/problem caused by the construction activities and raised by the local household traders.	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
Impact on Physical Cultural Resources (PCRs) - Church, Long	***Impac on pagodas/churches:*** - Inform pagodas/churches of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD

An Pagoda (150 m from LIA 1); - Chanh toa Church (70 m from LIA 3), Ngoc Thuan Monastic, Giac Hoa Pagoda (5 m from LIA 3); - Vinh Long Oratory (55 m from LIA 4), Toa Giam Muc church (50 m from LIA 4), - Tan Giai communal house, Long Hoa Pagoda (in LIA4) Impact on sensitive receptors - Nguyen Truong To Secondary School (5 m from LIA 1) - Hoa Sen Kindergarten (5 m from LIA 3) - Ngo Quyen High School (5	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 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. - Prohibit gathering of construction materials within 100m in front of the pagoda/church and monastic. - Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagoda. - 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. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas. - Truck drivers shall restrict horning in areas close to the pagoda area - Immediately address any issue/problem caused by the construction activities and raised by the pagoda/ church and monastic. ***For Giac Hoa Pagoda and Tan Giai Communal House*** - The construction method shall include the measures to protect the foundation of the fence/gate, main building of the pagodas, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage. - The contractor should take photos at the initial sate of the construction site, especially the alley section that passes by Giac Hoa Pagoda and Tan Giai Communal House. In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the pagoda. ***Impact on schools:*** - Inform the school management 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			

m from LIA 4) - Nguyen Du market (50 m from LIA 4)	- Construction area to be fenced and marked with warning signs to prevent pupils and unauthorized people from entering. - Teachers to be informed of construction operations to keep pupils off the site during their break time. - Prohibit use of construction methods that cause noise during school learning hours. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Immediately collect any domestic wastes and construction spoils around the school and dispose in a designated site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes when children go to and leave the school. - Do not load construction materials within 20m from school and tidy construction materials and stockpiles every working session. - Cover the incomplete trenches under construction at end of the working day. - Immediately address any issue/problem caused by the construction activities and raised by the schools - The construction method shall include the measures to protect the foundation of the fence/gate, main building of the Nguyen Truong To school, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage. - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with Nguyen Truong To school. ***<u>Impact on Nguyen Du market</u>*** - 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.			

	- Spray sufficient water to suppress dust during dry and windy days at least two times a day at road along the market area. - 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.			
Opearation				
Local flooding on the alley due to the indadequate maintenance and blockage of drains	- Cooperating with the local authorities 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.	Vinh Long URENCO	Vinh Long'PPC	City operations and maintenance plan, City Fund
Traffic safety	- Ensure that traffic safety provisions, including signs, lights, and signals regulating speeds, allowed vehicles load that were installed during construction are permanently and effectively maintained, and renewed as necessary - Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road. - Cooperating with the local government to appoint the staff for traffic regulation at peak hours; - Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the alleys in its as-completed condition;	Vinh Long DOT	Vinh Long'PPC	City operations and maintenance plan, City Fund
Component 2: Priority Primary and Secondary Infrastructures				
Construction of Bo Kenh (subcomponent 2.1), P2-P9 road (2.2) and Vo Van Kiet extended road (2.3)				
Preperation phase				
UXO clearance	- As mentioned in Component 1	The military civil engineering	PMU	City Fund

		agency or Vinh Long Provincial Military		
Lan acquisition and resettlement,	- As mentioned in Component 1	Center of Municipal Land Fund Management and Development	PMU, Ward People's Committee	City Fund
Grave relocation	- - - As mentioned in Component 1	Center of Municipal Land Fund Management and Development	PMU, Ward People's Committee	City Fund
Construction phase				
Local flooding - Residents living along the road	- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
	- The Contractors must apply the specific construction methods, and flood prevention and control alternatives during construction period or the flow diverson alternatives to ensure the drainage in the location. - Set up a temporary sewers to ensure drainage at the construction site. - Arranging the standby pumps for rapid drainage in case of heavy rain or extreme weather incidents.	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
Disruption of	As mentioned in component 1	- Contractor	- PMU, CSC,	Fund: IDA

business activities			IEMC	&IBRD
Social disturbance and traffic concern Residences near the road alignment and along the transportation route	*To control impacts on social disturbance and traffic concern* - Ensure that the contract requires the contractor, before commencing work, to provides a construction plan with a detailed heath, safety, environment and traffic management plan - Inform local residents in advanced (at least 07 days) about construction and work schedules, interruption of services, traffic routes. - Inform the community of the planned night construction at least 2 days in advance. Limit the construction activities that cause great noise and vibration by nigh time. - 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. - Contractors should provide lighting at a construction site at night; security guard staff at construction sites to moderate vehicles go out and in the construction site; - Put the road construction warning signs at the site all the time. - Avoiding the waste/material transportation during rush hours; - Inform the community of the planned night construction at least 2 days in advance. - The construction activities are only conducted in the designated boundary - Assign staff to guide the traffic during transportation, unloading, and loading.	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
Impacts on agriculture land - on ward No.2,No.3, No.4, No8	- Informing the community of the construction schedule at least one week before the construction. - Arrange drainage around the construction sites to ensure no soil erosion and sedimentation to fields - Provide alternative water diversion from canals to the locations the local people requested, if they are affected.	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD

	- Regularly check the affected on-field irrigation canals to ensure construction spoils and wastes do not block them. - 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. - Closely consult with the local community to ensure that suitable solutions to problems are taken and communities concerns related to construction activities are addressed.			
Odor from dredging a small canal on P2-P9 Road - People living along canal on P2-P9 road in Ward No.2, No.8	*To control impacts from 1,200 m3 dredged materials:* Dredged soils and sediments will be collected, transported by covered truck of 1,210 m^3 and treated under a contract at Hoa Phu Solid Waste Treatment Plant (landfill site). *To control impacts by odors from dredging process:* The mitigation measures as similar to those applied for small canals within the LIAs as prestented above	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
Impact on sensitive receptors in Vo Van Kiet extended road (Vinh Long University of Technology Education and Vinh Long Teacher Training College)	- Inform the school management 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 - Construction area to be fenced and marked with warning signs to prevent pupils and unauthorized people from entering. - Teachers to be informed of construction operations to keep pupils off the site during their break time. - Prohibit use of construction methods that cause noise during school learning hours. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Immediately collect any domestic wastes and construction spoils around the school and dispose in a designated site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes when children go to	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD

	and leave the school. - Do not load construction materials within 20m from school and tidy construction materials and stockpiles every working session. - Cover the incomplete trenches under construction at end of the working day. - Immediately address any issue/problem caused by the construction activities and raised by the schools			
Risk on infrastructure collapse to Nguyen Truong To School's fence due to vibration	- The contractor should provide evidences proving all equipment and machineries used in the project have been tested and complied with the current Vietnamese Regulations on Vibration from construction activities as specified in the QCVN27:2010/BTNMT; - The construction method shall include the measures to protect the foundation of the fence/gate, main building of Nguyen Truong To school, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage. - The contractor should take photos at the initial sate of the construction site, especially the alley section that passes by the school. In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the school.	-	-	
Operation phase				
Road safety	After construction is completed, there will be operations of various vehicles on the new road. Key short-term impacts would include an increase in traffic and pedestrian accidents, due to higher standard road allowing more and faster traffic; premature failure of pavements, drainage structures due to inadequate maintenance. Other impacts would be possibly localized flooding related. To mitigate these impacts the following measures will be carried out by the city road maintenance agency: - Ensure that traffic safety provisions, including signs, lights, and pavement markings that were installed during construction are permanently and effectively maintained, and renewed as necessary. - Ensure the city's operations and maintenance plan, and related budget,	Vinh Long DOT	Vinh Long'PPC	City operations and maintenance plan, City Fund

	includes the work and resources required to maintain the road in its as-completed condition. - Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road. - Ensure effective road inspection for any signs of damages, soil erosion and landslide for immediate repairing actions. - Cooperating with the local government to appoint the staff for traffic regulation at peak hours;			
Mitigation measures for blockage of drainage system due to inadequate maintenance	To minimize impacts by the status of blockage of drainage system due to inadequate maintenance during operation phase of Bo Kenh, P2-P9 and Vo Van Kiet extended roads; the O&M units will be implemented mitigation measures follow: - The management of storm water drainage along the roads should be focused and examined regularly to detect the congested drainage sewer sections and carry out dredging. - Conduct periodic planning decentralization and dredging sewer sections and manholes in order to minimize the flow congestion (every 6 months). - Control disposal of sludge: Similar to the construction phase, those who manage the water drainage systems would have contracts with relevant authorities of sludge dredging from the sewer sections and manholes and then transport to the landfill by specialized tank trucks to avoid odor emission and spillage during transportation.	Vinh Long URENCO	Vinh Long'PPC	City operations and maintenance plan, City Fund
Dredging and embankment of Cau Lau Canal (subcomponent 2.4) and Kinh Cut Canals (subcomponents 2.5)				
Preparation phase				
UXO clearance	- As mentioned in Component 1	The military civil engineering agency or Vinh Long Provincial Military	PMU	City Fund

Lan acquisition and resettlement,	- As mentioned in Component 1	Center of Municipal Land Fund Management and Development	PMU, Ward People's Committee	City Fund
Grave relocation	- As mentioned in Component 1	Center of Municipal Land Fund Management and Development	PMU, Ward People's Committee	City Fund
Construction phase				
Impact on ecological environment of Cau Lau and Kenh Cut canals during wet dredging process	- The dredging operation is conducted only during the dry season; - Create sedimentation traps and maintain them periodically to ensure that most solids in surface runoff are retained in the traps before entering the existing drains or water sources surrounding the sites; - Leachate from sediments must be first deposited in sedimentation hole/trap before entering the canals. - Strictly prohibit contractors to discharge waste into canals - Upon forecasted stormy weather, suspend all the construction activities, tidy up the sites, brace and protect the materials and construction machines. - Do not gather construction materials as well as machinery and equipment near the stream. Gathering small quantities of materials, fit with the schedule. Materials must be covered with tarpaulin, avoiding the upwind location, near the canal. - Strictly prevent hazardous waste, waste oils or particularly greasy rags from entering the flow.	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
Odors from dredging process,	***Management of sediments generated during dredging process: 22,000 m^3 sediments from Cau Lau Canal; and 16,200 m^3 from Kinh Cut Canal***	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD

and nuisance and leakage during the transportation of sediments, i.e. 22,000 m^3 from Cau Lau Canal; 16,200 m^3 from Kinh Cut Canal - People living along Cau Lau and Kinh Cut canals -and at the transfer site along Kinh Cut in ward No. 4 and along the transportation routes (Mau Than-National Highway No.53- Dinh Tien Hoang road- Hoa Phu landfill)	- The Dredged Materials Management Plan (DMMPs) for the dredging Kinh Cut and Cau Lau canal has been prepared. Overall, excavated materials will be disposed at Hoa Phu landfill landfill or being used for agricultural or tree planting purpose based on actual needs of the local people. The DMMP is described in details in chapter 6 – Environmental and Social Management Plan and and Annex 1. - Ensure that detailed design of canal dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor's dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts - Prior to construction, the contractors shall have 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. - Manage to ensure sediments will be disposed appropriately according to the approved DMMP. ***To control impacts by odors from dredging process:*** - Sediments materials will be collected along the work sites and covered by the technical fabric to limit slurry leaking into the soil, and transported for disposal within the day. The management plan on dredged materials will be prepared to instruct the contractors to manage the waste source. - Uncontrolled disposal of the dredged sludge is prohibited. The waste source must be managed properly under the supervision of PMU. - In order to limit the impacts of odor of the dredged sludges, the workers shall be equipped with the masks, boots and gloves when working in/exposing to these waste sources. - Spraying EM (Effective Microorganisms) every day. The deodorants can eliminate malodors from H_2S, CH_4, etc.			

	- Dredged materials will be collected, transported and treated by contracts in the Hoa Phu Solid Waste Treatment Plant (landfill site). Transportation of the dredged sludge must meet the environmental protection requirements and avoid slurry leakage; the sludge carrying trunks must be covered closely and not overloaded as permitted.			
Risks on soil erosion, embankment subsidence, house cracking during embankment	- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure sustainability and stability of the embankment; - Ensure that the detailed design construction method take into account the risk on local house cracking	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
	- Ensure that contractor's construction method take into account the risk on local house cracking - Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to the authorities concerned for approval by the construction contractors. - Ensure that land acquisition and house relocation at the site boundary is completed piror to commencing construction workUse construction method to reduce vibration for construction activities of embankment i.e. pipe jacking instead of pile driving; closely monitoring the vibration level; - Construction of side slope is made in accordance with the design - Do not carry out dredging 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.	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
Damage risks to 05 small bridges across Cau Lau and Kenh Cut canals - Kinh Cut, Mau	- Inform the local people of the construction activities and their potential impacts such as waste, dust, and noise, traffic, especially vibration, risk of cracking on overpass and construction schedule at least 02 weeks before start of the construction. - To use construction method that cause less vibration for construction activities of embankment; - Stabilize and reinforce the canal banks in the vicinity of small bridges over Cau	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD

Than, Lau, Hung Dao, Pham Thai Buong bridges - Local residents in ward 3,4 using the bridge for transportation	Lau and Kinh Cut prior to the dredging and embankment. - Do not utilize heavy machineries while dredging near the small overpassing bridges. - Place safety signs and provide proper detour instructions on each of the dredging segment that crosses the small bridge - If damage to the bridges happens, a temporary access shall be provided for the local residents. The damage bridges shall be repaired or adequate compensations shall be made upon agreement with affected households and local community.			
Traffic safety - Especially at the traffic congestion nodes near Kinh Cut, Mau Than, Lau, Hung Dao, Pham Thai Buong - The commuting people along the road Mau Than, Hung Dao	- Ensure that the contract requires the contractor, before commencing work, to provide a construction plan with a detailed health, safety, environment and traffic management plan. This plan has to be consulted with the local authorities and approved by CSC - Using solid fence to isolate construction site area at the traffic congestion nodes, i.e. at Kenh cut bridge, Mau Than Bridge, Lau Bridge, Hung Dao Bridge, Pham Thai Buong Bridge - Coordinate with the local authority to regulate transportation during rush hour, especially at the traffic congestion nodes as indicated above. - Do not carry out loading, unloading materials at the rush hour.	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
Disruption off navigation during construction of canal - Local people using waterway traffic in Kinh Cut and Cau Lau canals	- Coordinate with the local authority to inform local people on the construction plan prior to construction; - Coordinate with the Department of Inland Waterway to flag the signal system on the inland waterway the transport travel through; - Provide the workers with and request them to use life jackets in construction operations on the water surface. Observing staff must be present during entire shifts for timely rescue in case of incidents. - Place warning boards along the construction route, both on land and water surface (arrange the road and waterway traffic guide).	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD

Impacts on agriculture land in Ward No.3 and No.4	- Informing the community of the construction schedule at least one week before the construction. - Arrange drainage around the construction sites to ensure no soil erosion and sedimentation to the rice fields and irrigation canals. - Provide alternative water diversion from canals to the locations the local people requested, if they are affected. - Regularly check the affected on-field irrigation canals to ensure construction spoils and wastes do not block them. - Closely consult with the local community to ensure that suitable solutions to problems are taken and communities concerns related to construction activities are addressed.	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
Impacts on PCRs Vinh Long Oratory (55 m from Kinh Cut Canal), Toa Giam Muc church (50 m from Kinh Cut canal) and Hung An Tu pagoda (Cau Lau canal).	- Inform the pagodas/churches 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 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. - Prohibit gathering of construction materials within 100m in front of the pagodas. - Pile jacking activities will not be carried out before 7 am or after 6 pm, or at days and hours advised by the local management. - Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagodas. - 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. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas.	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD

	- Truck drivers shall restrict horning in areas close to the pagoda area - Immediately address any issue/problem caused by the construction activities and raised by the pagodas. - The construction method shall include the measures to protect the foundation of the fence/gate, main building of the Hung An Tu Pagoda, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage. - The contractor should take photos at the initial sate of the construction site, especially the alley section that passes by these PCRs. In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the PCRs/facilities.			
Impact on sensitive receptors Impacts on Nguyen Du market 'activities (Kinh Cut canal) and Cau Lau (Cau Lau canal):	- Limiting to transportation of materials/wastes (for constructing the items of Kinh Cut and Cau Lau canal) to avoid disruption of Nguyen Du and Cau Lau Market's activities at peak hours (morning: 5-9h; noon: 11-12h; afternoon and evening: 16 - 19h). - Spray sufficient water to suppress dust during dry and windy days at least two times a day at road along the market area. - 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.	- Contractor	- PMU, CSC, IEMC	Fund: IDA &IBRD
Operation phase				
- Embankment subsidence risk	- To avoid risk on embankment cracking and subsidence, in detailed design should be implemented hydrology and geological surveys to ensure sustainable and stable designs	DDC	PMU	Fund: IDA &IBRD
	- City shall provide O &M Plan as well as budget source should be approved and arranged by the City. - Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the embankment periodically - Closely monitor the construction of other infrastructures within the area that	Vinh Long DOT	Vinh Long'PPC	City operations and maintenance plan, City Fund

	potentially affect the embankment structures			
- Measures for the status of direct waste disposal into the Kinh Cut and Cau Lau canals	- During the O&M, to control risks of pollution and flow stagnation due to disposal of waste from households living along the canals, the O&M unit will be implemented mitigation measures follow: - Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the canals; PMU and DONRE should be in collaboration to impose much more serious penalty to polluter - Properly arranging the waste baskets along the canal and launching programs of increasing awareness of the community toward environmental protection; - Carrying out periodical dredging and clearing works of the canals at least 6 months/time especially before the wet season; - Signing contracts with the responsible agencies on collecting, transporting and treating dredged sludge.	Vinh Long URENCO	Vinh Long'PPC	City operations and maintenance plan, City Fund
Component 3: Resettlement area				
Domestic wastewater and solid waste	- The generated wastewater from resettlement site is about 46.62 m3/d. Households in the resettlement sites have to build latrines with septic tank in accordance with regulations of the Government, the wastes from the latrines must be primarily treated in the septic tanks of each household before discharging into the public drainage system. The wastewater will be then connected to the wastewater collection and treatment system of Vinh Long city (funded by ADB). - The volume of the solid waste (518 kg/day) is very few and will be collected and managed by Vinh Long URENCO.	Vinh Long URENCO	Vinh Long'PPC	City operations and maintenance plan, City Fund

6.2.3. Management of Impacts on Physical Cultural Resources

Based on the ESIA study and the preparation of the RAP, non sensitive works, temples, historical sites, and natural conservation areas are affected by land acquisition.

If in the construction phase, specific procedures are to be applied in case of archeological artifact finds. The Figure 6.1 below identifies steps to be taken. The PMU will be responsible for the overall coordination and reporting. The chance find procedures will be included in all construction contracts and key staff and contractors will be trained on how to implement them.

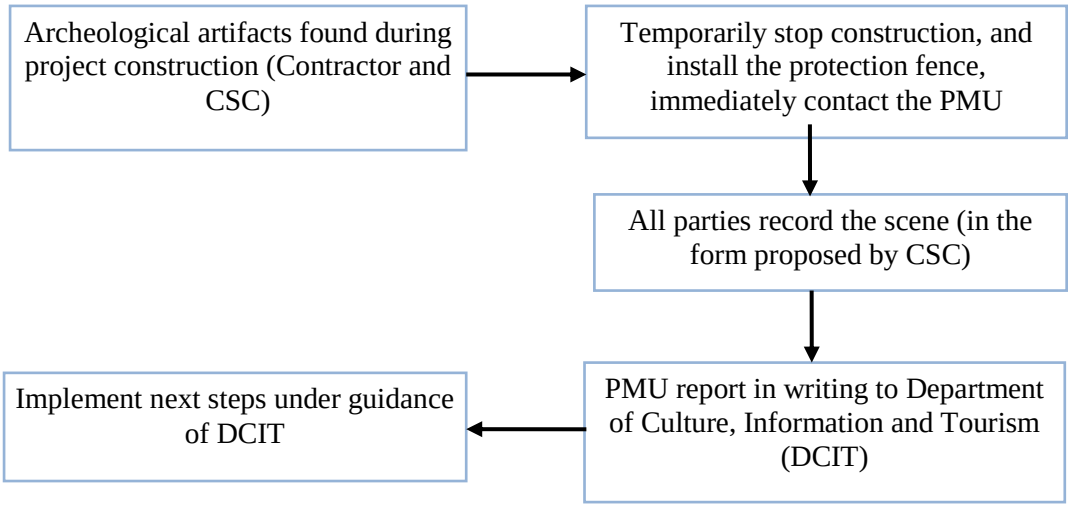


Figure 6.1: Chance-finding procedure in case of archeological artifacts found during the project construction

6.2.4.Emergency Procedures

During construction period, if there are environmental emergency or labor accidents, the Contractors 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:

6.2.4.1.Vehicle Accidents

Vehicle accidents may include, but are not limited to:

- Vehicle roll-over; and
- Vehicle crash with another vehicle, structure or with a person (worker or person from the local community).

Procedure:

- Stop work immediately;
- Turn off the vehicle, if possible;
- Help passengers of the vehicle(s) exit the vehicle and move to a safe place, if possible;
- If there is an injury, follow the procedure for medical emergencies (see below); and
- If there is a fuel/chemical spill, follow the procedure for spill emergency (see below).

6.2.4.2. Electrical faults/accidents

It is not safe to carry out the works within a 10m radius area of electrical cables, electrical accidents may happen as the result of:

- Collision with power cables and poles;
- Collapse of cable poles; and
- Hitting underground cables.

Procedure:

When an electrical 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.

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.

Chemical/Fuel Spill

A spill of chemical/fuel has the potential to cause soil and underground water contamination, if not controlled and cleaned up timely and properly. Chemical/fuel spills include, but are not limited to, the following:

- Fuel spill during refueling;
- Fuel/oil/grease leaks during vehicle parking or operating; and
- Breaking of fuel tanks on vehicles.

Spill response facilities: A spill kit shall be provided on each heavy equipment (bulldozers and excavators), in the HW and hazardous materials storage areas, and in any designated fueling locations. A spill kit includes a drip tray, absorbent materials, and impermeable bags to collect

contaminated soil and used absorbent materials, and a small spade used for collecting contaminated soil.

Procedure:

- When there is a spill, immediately use the absorbent materials to absorb the spilled materials and locate the drip tray to collect the spilled flow (if the spill continues);
- Collect used absorbent materials into an impermeable bag;
- Use the spade to collect the contaminated soil into the impermeable bag; note that there should be no contaminated soil left (stained soil must be collected to the full horizontal and vertical depth of the impact);
- Transfer the filled impermeable bag to the HW Storage Area for storage;
- If the spill is larger than one spill kit or person can handle, request another worker to support (e.g. to bring more spill kits);
- Use work gloves, safety glasses, long sleeved tops and trousers during the above response process and minimize direct contact with the spilled fuel/oil; and
- At and around the location of release, samples shall be taken to confirm whether any contaminated soil/underground water remains. The number of samples will depend on the scale of the release and the estimated impacted area. The parameters to be analyzed will depend on the substance released. Depths where samples are taken should be at the ground surface and immediately above the underground water table. These should be identified in a sampling plan prepared by the HSE Management and Monitoring Office in consultation with appropriately qualified technical staff. Response to any remaining contamination should be defined accordingly.

Medical Emergency

A medical emergency is a situation in which, due to an acute illness or injury, there is an immediate risk to a person's life or long-term health. Medical emergencies include, but are not limited to, the following:

- Injuries from vehicle accidents;
- Wildlife attacks, e.g. snake bites or bees attack;
- Heat stress;
- 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.

Adverse Weather

Potential adverse weather events include, but are not limited to: Heavy rain; Strong wind; or Typhoon. The potential for an earthquake, tsunami and heavy flood happening at the site is considered unlikely.

Procedure:

The Contractor General Manager will check the national and local weather forecast each morning prior to work commencing. Should adverse weather be predicted, depending on the severity and timing of the weather expected. If adverse weather is expected to be serious, lengthy and soon (e.g. in the case of a typhoon), the Contractor General Manager shall contact all workers not to come to work. If the weather is less serious and is not expected to last long, the Contractor Supervisor - Workers will cover this situation during the daily toolbox talk, continue to monitor the weather situation throughout the day and issue instructions as necessary to stop work, do their work sites safe, and find a safe sheltering location (either back at the site office, if sufficient time to return, or locally to the active works (in the case of the latter, the worker shall call the Contractor Supervisor – Workers to inform them where and when they are in the sheltering location). If the Contractor Supervisor – Workers do not hear from a worker(s) within 15 minutes of instruction to shelter, the Contractor Supervisor – Workers shall mobilize to the location by car to ensure the safety of the worker(s).

Broken water pipes

The existing water supply pipes on the routes may be broken due to the following reasons:

- During earthwork process for constructing foundation holes, inappropriate identification of the location or the wrong operating actions by the workers, non-compliance with the technical design drawings may cause the collision between the construction equipment and the water supply pipes;
- The affecting force of the construction equipment focuses on one place, while the foundation of the construction area is weak, which creates the break of the water supply pipes;
- Such incidents if occur will create a loss of the huge water volume and an impact on the domestic water demand of the residents who access to this water supply source.

Procedure:

- Immediately turn off the valve/use the availabe 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;
- Advice the residents in vicinity the water reserve alternative during repair, incident recovery time.

Sanitary Effluent Spill

- A spill of sanitary effluent has the potential to cause surface water, soil and underground water contamination and nuisance/health hazard to nearby households, if not controlled and cleaned up timely and properly. Sanitary effluent spills can occur during emptying and transportation of effluent from septic tanks being demolished on site.
- Spill response facilities: A spill kit shall be provided on each septic tank collection truck. A spill kit includes impermeable bags to collect contaminated soil and a small spade used for collecting contaminated soil.

Procedure:

- When there is a spill, immediately stop the flow;
- Use the spade to collect the contaminated soil into the impermeable bag; note that there should be no contaminated soil left (contaminated soil must be collected to the full horizontal and vertical depth of the impact);
- Transfer the filled impermeable bag to the Waste Storage Area for storage;
- If the spill is larger than one spill kit or person can handle, request another worker to support (e.g. to bring more spill kits);
- Use work gloves, safety glasses, long sleeved tops and trousers during the above response process and minimize direct contact with the spilled effluent.

6.3. SOCIAL ACTION PLAN

6.3.1.Occupational training foundation

Establishment of the occupational training foundations for the households, the members of which are unemployed is the critical demand in order to ensure that the people stay in the project areas and able to find out the appropriate job. 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.

6.3.5.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. ENVIRONMENT MONITORING PROGRAM

6.4.1. Objective and Approach

Main objective of the Environment Monitoring program is to ensure that (a) the potential negative impacts of the project are minimized; (b) the ESMP is effectively implemented; and (c) the ESMP is adequate to mitigate the potential negative impacts. Given that monitoring the

implementation of the RP will be conducted separately, the environmental monitoring program will comprise (a) monitoring the safeguard performance of the contractor during site clearance and construction, (b) environmental quality monitoring, (c) monitoring effectiveness of the ESMP.

6.4.2. Monitoring of Contractor's Safeguard Performance

Three levels of safeguard monitoring will be implemented: routine monitoring, periodic monitoring, and community monitoring as follows:

Routine monitoring: The routine monitoring will be made by the Construction Supervision Consultant (CSC) as assigned by PMU. The CSC will include the monitoring results in the project progress reports.

Periodical monitoring (every six months): As part of the overall monitoring of the ESMP, the ESU assisted by the Independent Environmental Monitoring Consultant (IEMC) will also monitor the contractors' performance every 6 months and the results will be reported to the PMU and the WB.

Community monitoring: Monitoring by local communities will be conducted following the Government practices with the technical and management support from the PMU.

6.4.3. Environmental Quality Monitoring

To ensure an acceptable level of environmental quality, monitoring of dust, noise, vibration, air quality, and water quality will be made at project specific locations that are likely to be significantly affected by the construction activities, or requested by local authorities and communities for specific purposes. ESU/IEMC will be responsible for the monitoring of the program.

Below is a list of the key issues and scope of monitoring that will be considered in the implementation of the monitoring program:

Implementation of the Dredge Material Management Plan (DMMP) for all sludge and similar material excavated from the project work sites: Amount, level of heavy metals, locations and performance at disposal sites, and impacts on 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 paod and impact on local residents;

Others: As agreed with local agencies and communities during the preparation of the monitoring program.

Table 6.4 provide general guidance on the monitoring program considering that the activities will be carried out before construction (project baseline environment), during construction (assumed 4 years), and during the first year of operation. Detailed monitoring programs will be prepared during the detailed design stage. An estimated cost for monitoring is incorporated into the ESMP cost (Section 6.4.5). Many of these measurements are required by Vietnamese regulations and would need to be done even if not directly related to expected project impacts.

Table 6.4: Location, parameters and frequency of monitoring

No	Monitored items	Preparation and construction phase
I	**Monitoring of air quality**	
1.1	Monitoring parameters	noise, TSP, CO, NO_2, SO_2, HC, H_2S, microclimate
	Monitoring frequency	Preparation phase: oneobtained for determining base conditions Construction phase: measurements taken every three-months
	Applied Regulation	QCVN 05 :2013/BTNMT, QCVN 06:2009/BTNMT
1.2	Monitoring positions	KK1: Amid residential area in LIA1 KK2: Gate of Nguyen Truong To Junior High School KK3: Intersection of Ngo Quyen street and Le Thai To street KK4: Intersection of Ngo Quyen street and Le Thi Hong Gam street KK5: The area near Long Ha Pagoda KK6: Intersection of Binh Lu bridge end and the project road P2-P9 KK7: The location between residential area and the project road P2-P9 KK8: End of the project road P2-P9 at Tan Huu bridge - National highway No.53 - Engine machinery manufacturing factory KK9: Intersection of Vo Van Kiet street and Nguyen Hue street (In front of Vinh Long Education College and Vinh Long University Of Technology Education) KK10: In Vinh Long University Of Technology Education, bordering Vinh Long Education College and the project road Vo Van Kiet KK11: Amid the project road Vo Van Kiet, bordering LIA3 (Security fence gate of Cluster 5, P2), Hoang Hoa Tham street and Cau Lo river KK12: Amid the project road Vo Van Kiet, bordering LIA4 and Mau Than street KK13: Intersection of Bo Kenh road - National Highway No.53 KK14: In Bo Kenh road and residential area KK15: Intersection of Bo Kenh - Bach Dang roads KK16: At Mau Than bridge Kk17: At Kinh Cut bridge KK18: At Lau bridge KK19: At Hung Dao Vuong bridge KK20: At Pham Thai Buong bridge
II	**Surface Water Quality Monitoring**	
2.1	Monitoring parameters	pH, temperatures, salinity, TSS, BOD5, NH4+, Cl-, T-N, T-P, Fe, As, Mn, total oil, coliform
2.2	Monitoring frequency	Preparation phase: oneobtained for determining base conditions Construction phase: measurements taken every three - months
2.3	Applied Regulation	QCVN 08-MT:2015/BTNMT

No	Monitored items	Preparation and construction phase
2.4	Monitoring positions	NM1: At Cau Lo bridge, near intersection of Ngo Quyen - Le Thi Hong Gam streets NM2: At Kinh Cut river, at the location adjacent to LIA4 (near Long Hoa pagoda) NM3: In Cau Lo river, the section near Long Hoa pagoda NM4: In the river section under Binh Lu bridge (near intersection of Binh Lu road and the project road P2-P9) NM5: In the river section under Tan Huu bridge (near intersection of Tan Huu bridge - National highway No.53 - Engine machinery manufacturing factory NM6: In Cau Lo river, Vo Van Kiet section bordering LIA3 (Security fence gate of Cluster 5, P2) NM7: In river between Bo Kenh road and residential area; NM8: In Kinh Cut river under Lo bridge. NM9: Kinh Cut river under Mau Than bridge NM10: In Cau Lau river, under Lau bridge NM11: In Cau Lau river, under Hung Dao Vuong bridge Nm12: In Cau Lau river, under Pham Thai Buong bridge
III	**Soil**	
3.1	Monitoring parameters	As, Hg,Cd, Cr, Cu, Pb, Zn
3.2	Monitoring frequency	Preparation phase: oneobtained for determining base conditions Construction phase: measurements taken every 6 months
3.3	Applied Regulation	QCVN 03-MT :2015/BTNMT
3.4	Monitoring positions	D1: Soil in the project area, Nguyen Truong To Junior High School gate D2: Soil in residential area in the project area LIA3 D3: Soil in residential area in the project area LIA4 D4: Soil in residential area in the project area LIA4 near Long Hoa pagoda D5: Soil at intersection of Binh Lu bridge end and the project road P2-P9 D6: Soil at intersection of Binh Lu bridge end and the project road P2-P9 D7: Soil at lhe location between residential area and the project road P2-P9 D8: Soil in the project area, Vo Van Kiet section bordering LIA3 (Security fence gate of Cluster 5, P2) D9: Soil in residential area near the project road (Bo Kenh road area) D10: Soil in residential area between Nguyen Du street and Kinh Cut canal D11: Soil in residential area along Cau Lau river, 2/9 road. D12: Soil in residential area along Cau Lau river, 2/9 road.
IV	**Sediment quality**	
4.1	Monitoring parameters	As, Hg,Cd, Cr, Cu, Pb, Zn

No	Monitored items	Preparation and construction phase
4.2	Monitoring frequency	Preparation phase: oneobtained for determining base conditions Construction phase: measurements taken every 6 months
4.3	Applied Regulation	QCVN 03-MT :2015/BTNMT
4.4	Monitoring positions	TT1: At Cau Lo bridge, near intersection of Ngo Quyen - Le Thi Hong Gam streets TT2: In Kinh Cut river, the section adjacent to LIA4 TT3: In Cau Lo river, the section near Long Hoa pagoda TT4: In the river section under Binh Lu bridge TT5: In the river section under Tan Huu bridge TT6: In Cau Lo river, Vo Van Kiet section bordering LIA3 (Security fence gate of Cluster 5, P2) TT7: In Kinh Cut river under Lo bridge. TT8: In Kinh Cut river under Mau Than bridge. TT9: In Kinh Cut river under Kinh Cut bridge. TT10: In Cau Lau river, under Lau bridge TT11: In Cau Lau river, under Hung Dao Vuong bridge TT12: In Cau Lau river, under Pham Thai Buong bridge
V	**Monitoring of erosion**	**During embankment construction**
VI	**Monitoring of solid waste**	**Monitoring volume of waste generated and sludge dredged**
VII	**Monitoring of hazardous waste**	**Monitoring volume at storage location**

6.4.5. Estimated Costs for Environmental Monitoring Program

Table 6.5: Monitoring costs

No.	Parameters	Units	Locations	Number of sampling	Price	Total	
					(VNĐ)	(VNĐ)	(USD)
1	**Noise**					**19,188,000**	872
-	L_{Aeq}	Sample	20	120	159,900	19,188,000	872
2	**Vibiration**	Sample	20	120	159,900	19,188,000	872
					81,400	**180,060,000**	8,185
	TSP	Sample	20	120	139,600	16,752,000	761
-	CO	Sample	20	120	666,100	79,932,000	3,633
-	NO_2	Sample	20	120	335,600	40,272,000	1,831
=	SO_2	Sample	20	120	359,200	43,104,000	1,959
3	**Surface water**				81,400	**184,428,000**	8,383
-	pH	Sample	12	72	339,800	24,465,600	1,112
-	DO	Sample	12	72	299,900	21,592,800	981
-	COD, BOD_5	Sample	12	72	230,200	16,574,400	753
-	TSS	Sample	12	72	387,700	27,914,400	1,269
-	NH_4+, NO_2-, NO_3-, PO_4^3-, Cl-, Fe	Sample	12	72	307,500	22,140,000	1,006

-	**Surface active agent**	Sample	12	72	338,100	24,343,200	1,107
-	E. Coli	Sample	12	72	324,900	23,392,800	1,063
-	**Coliform**	Sample	12	72	333,400	24,004,800	1,091
4	Soil (As, Hg,Cd, Cr, Cu, Pb, Zn)	Sample	12	72	2,503,600	180,259,200	8,083
5	Sediment quality As, Hg,Cd, Cr, Cu, Pb, Zn	Sample	12	12	2,898,100	34,777,200	1,559
6	**Other**					**38,367,600**	**1,744**
IEMC total cost						**637,080,000**	**28,568**

In order to ensure the objective, scienctific and real reflection of the positive and negative impacts during project implemenation, the monitoring programs have to be ajdusted at an appropriate time in relevance to the actual site work progress and project schedule. The monitoring stations will be set up based on the monitoring location map which has been made in ESIA report. When the project construction period lasts within 2 years (from the approval time on EIA report), the monitoring data may be used as the primary data.

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 Vinh Long city subproject

NO.	Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
1	Land acquisition and resettlement works	- The affected households are able to receive compensation according to WB policy and their income will be recovered; - HHs which have no land will receive one slot in resettlement area.	- Setting up Resettlement policy framework in accordance with the GoV regulations harmonized with WB's policy - Establishing Resettlement Action Plan for land acquisition, compensation, support and implementation of resettlement works - Implementing land acquisition and resettlement works	- Resettlement policy frameworks and plans are established. - Number of the affected HHs, quantity/level of grassroots affection - Number of affected HHs on illegal land assets is clearly identified. - Number of HHs participating in livelihood recovery, occupational training, occupational change.	- PMU - Center of Municipal Land Fund Management and Development - Local authorities - Consultants
2	Monitoring livelihood and income recovery: primary financial supports as per policies; expediting Occupational training programs	HHs participating in livelihood/income are well assisted.	- Assistances are made following Resettlement Plan Framework - Loan programs - Occupational training	- Number of HHs are assisted as per Resettlement policy framework - Number of HHs has access to loan programs - Number of people/HHs have the occupational trainings	

NO.	Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
3	Supervising the implementation of impacts mitigation program on community health and safety	Minimizing risks during construction period, social evils and traffic disturbance.	- Developing action plans on risks and emergency response during construction - Developing social evils mitigation plans during construction - Developing action plans on reducing traffic disturbance during construction	- Number of site shelters/camps fully equipped by first aid services - Number of training courses on occupational safety regulations delivered to the workers - Number of provided labor protective equipment/ total number of laborers - Number of entry restriction sign boards installed in the fences, 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	As the above
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

NO.	Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
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 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 included in construction bid packages;
- CSC will be responsible for monitoring the day-to-day implementation of mitigation measures. Related costsare included in the CSC service contract;
- IEMC will be responsible for overall environmental monitoring which includes support to the PMU in implementing environmentalsupervision and monitoring, and responsible for reporting on the implementation through monitoring reports.

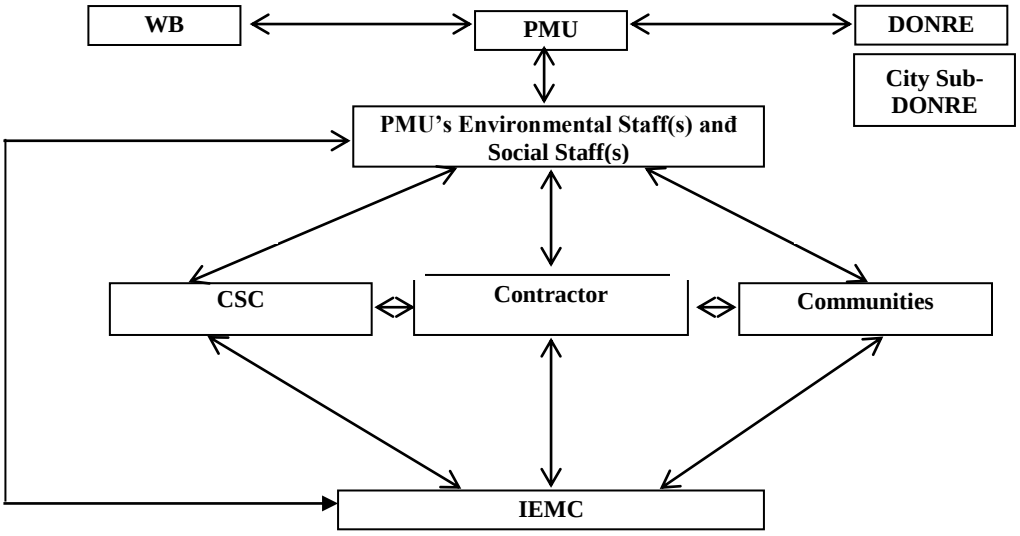


Figure 6.2: Organization chart for ESMP Implementation

Table 6.7: Roles and responsibilities of key parties

Community/ Agencies	Responsibilities
PMU (Vinh long Development Project Management Unit)	- 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. - Specifically the PMU will: (i) closely coordinate with local authorities in the participation of the community during subproject preparation and implementation; (ii) Ensure that the detailed design include all environment provisions as indicated in the ESMP; (iii) monitor and supervise ESMP implementation including incorporation of ESMP into the detailed technical designs and bidding and contractual documents; (iv) ensure that an environmental management system is set up and functions properly; (v) be in charge of reporting on ESMP implementation to the DONRE and the World Bank. - 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.
PMU Environmental and Social Staff(s) (ES)	- The ES is responsible for monitoring the implementation of the World Bank's environmental and social safeguard policies in all phases and process of the Project. Specifically, ES will be responsible for: (i) helping PMU incorporate ESMP into the detailed technical designs and civil works bidding and contractual documents; (ii) helping PMU incorporate responsibilities for ESMP and RAP monitoring and supervision into the TORs, bidding and contractual documents for the Construction Supervision Consultant (CSC) and other safeguard consultant (IEMC) as needed; iii) providing relevant inputs to the consultant selection process; (iv) reviewing reports submitted by the CSC and safeguard consultants; (v) conducting periodic site checks; (vi) helping the PMU on solutions to handle social and resettlement issues of the subproject; and vii) preparing environmental and social performance section on the progress and review reports to be submitted to the DONRE and the World Bank.
Construction Supervision Consultant (CSC)	- The CSC will assgin Environmental and Social Staff(s) and will be responsible for routine supervising and monitoring all construction activities and for ensuring that Contractors comply with the requirements of the contracts and the ECOP. The CSC will engage sufficient number of qualified staff (e.g. Environmental Engineers) with adequate knowledge on environmental protection and construction project management to perform the required duties and to supervise the Contractor's performance. - The CSC will also assist the PMU in reporting and maintaining close coordination with the local community.
Contractor	- The contractor will assign Enviromental and Social Staff(s) to carry out Enviromental and Social mitigation measures proposed in ESIA/ESMP. - Based on the approved environmental specifications (ECOP) in the bidding and contractual documents, the Contractor is responsible for establishing a contractor site-specific ESMP and Dredging Material Management Plan (DMMP) (if any) for each construction site area, submit the plan to PMU and CSC for review and approval before commencement of construction. - 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. - The Contractor is required to appoint a competent individual as the contractor's

Community/ Agencies	Responsibilities
	on-site *Safety and Environment Officer (SEO)* who will be responsible for monitoring the contractor's compliance with health and safety requirements, the site-speific ESMP requirements, and the environmental specifications (ECOP). - Take actions to mitigate all potential negative impacts in line with the objective described in the site-specific ESMP. - Actively communicate with local residents and take actions to prevent disturbance during construction. - Ensure that all staff and workers understand the procedure and their tasks in the environmental management program. - Report to the PMU and CSC on any difficulties and their solutions. - Report to local authority and PMU and CSC if environmental accidents occur and coordinate with agencies and keys stakeholders to resolve these issues.
Independent Envionmental Monitoring Consultants (IEMC)	- 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-speific ESMP implementation in both construction and operation phases. IEMC will also be responsible to support PMU to prepare monitoring reports on site-speific ESMP implementation. - 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. - Carry out the periodical environmental quality monitoring during construction 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'sexisting capabilities

Regarding project implementation experience

So far, Vinh Long 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 managementas well as data analyses and consolidation, suiting the accounting standards of both the Vietnamese system and the Donor's system, so that a most suitable and optimal accounting system could be set up to handle finance-accounting management tasks.

6.6.2. Environmental Compliance Framework

(i) Environmental Duties of the Contractor

The contractor firstly shall adhere to minimize the impact that may be result of the project construction activities and secondly, apply the mitigation measures under ESMP to prevent harm and nuisances on local communities and environment caused by the impacts in construction and operation phases.

Prior to construction, the contractor will be required to prepare and submit a contractor's site-specific Environmental Management Plan (Contractor's SEMP) to the CSC and PMU based on the ESMP of the project and requirement in the Specification of Bidding Document. The contractor's site-specific SEMP shall demonstrate compliance with Vietnamese environmental technical regulations/ standards, the mitigation measures set down in the specifications and the World Bank Safeguard Policies. The content of the site-specific SEMP shall be in line with the subproject specific ESMP and shall be enhanced by the Contractor's works practices, implementation procedures and program. The site-specific SEMP shall be certified by the CSC with subsequent submission to the PMU for approval. No construction activity should be implemented before approval of the contractor's site-specific SEMP.

Remedial actions that cannot be effectively carried out during construction should be carried out on completion of the works (and before issuance of the acceptance of completion of works)

The duties of the Contractor include but not limiting to:

- Compliance with relevant legislative requirements governing the environment, public health and safety;
- Work within the scope of contractual requirements and other tender conditions;
- Organize representatives of the construction team to participate in the joint site inspections undertaken by the Environmental Staff of the CSC;
- Carry out any corrective actions instructed by the Environmental Staff of the PMU and CSC;
- In case of non-compliances/discrepancies, carry out investigation and submit proposals on mitigation measures, and implement remedial measures to reduce environmental impact;

- Stop construction activities, which generate adverse impacts upon receiving instructions from the Environmental Staffof PMU and CSC. Propose and carry out corrective actions and implement alternative construction method, if required, in order to minimize the environmental impacts; Non-compliance by the Contractor will be cause for suspension of works and other penalties until the non-compliance has been resolved to the satisfaction of the ES of PMU and CSC.

(ii) Contractor's Safety, Social and Environmental Officer (SEO)

The contractor shall be required to appoint competent staff(s)as the Contractor's on-site safety, social and environment officer (SEO). The SEO must be appropriately trained in environmental management and must possess the skills necessary to transfer environmental management knowledge to all personnel involved in the contract. The SEO will be responsible for monitoring the contractor's compliance with the ESMP requirements and the environmental specifications. The duties of the SEO shall include but not be limited to the following:

- Carry out environmental site inspections to assess and audit the contractors' site practice, equipment and work methodologies with respect to pollution control and adequacy of environmental mitigation measures implemented;
- Monitor compliance with environmental protection measures, pollution prevention and control measures and contractual requirements;
- Monitor the implementation of environmental mitigation measures;
- Prepare audit reports for the site environmental conditions;
- Investigate complaints and recommend any required corrective measures;
- Advise the contractor on environment improvement, awareness and proactive pollution prevention measures;
- Recommend suitable mitigation measures to the contractor in the case of non-compliance. Carry out additional monitoring of noncompliance instructed by the ES of PMU and CSC
- Inform the contractor and ES (of PMU and CSC) of environmental issues, submit contractor's ESMP Implementation Plan to the ES of PMU and CSC, and relevant authorities, if required;
- Keep detailed records of all site activities that may relate to the environment.

(iii) Independent Environmental Monitoring Consultant (IEMC)

In order to minimize the environmental impacts during construction phase of the Project, the Project owner shall ensure that environmental quality monitoring requirements are established for the project. An IEMC appointed by PMU shall carry out the monitoring.

- IEMC will be responsible for carrying out environmental sampling, monitoring and marking report during subproject implementation. Environmental monitoring will be report periodically to PMU and World Bank (respectively every 03 months for PMU and every 6 months for WB in construction phase).
- IEMC will also supply specialized assistance to PMU and ES in environmental matters.

(iv) Environmental Supervision during Construction (CSC)

During construction phase, a qualified CSC reporting to the PMU shall carry out the environmental supervision. The CSC will assign environmental and social staff(s), will be responsible for inspecting, and supervising all construction activities to ensure that mitigation measures adopted in the ESMP are properly implemented, and that the negative environmental

impacts of the subproject are minimized. The CSC shall engage sufficient number of Environmental Supervision Engineers with adequate knowledge on environmental protection and construction project management to perform the required duties and to supervise the Contractor's performance. Specifically ES of CSC will:

- Review and assess on behalf of the PMU whether the construction design meets the requirements of the mitigation and management measures of the ESMP,
- Supervise site environmental management system of contractors including their performance, experience and handling of site environmental issues, and provide corrective instructions;
- Review the ESMP implementation by the contractors, verify and confirm environmental supervision procedures, parameters, monitoring locations, equipment and results;
- Report ESMP implementation status to PMU and prepare the environmental supervision statement during the construction phase; and

(v) Compliance with Legal and Contractual Requirements

The constructions activities shall comply not only with contractual environmental protection and pollution control requirements but also with environmental protection and pollution control laws of the Socialist Republic of Viet Nam.

All the works method statements submitted by the Contractor to the CSC and PMU for approval to see whether sufficient environmental protection and pollution control measures have been included.

The CSC and PMU shall also review the progress and program of the works to check that relevant environmental laws have not been violated, and that any potential for violating the laws can be prevented.

The Contractor shall copy relevant documents to the SEO and the ES of CSC and PMU. The document shall at least include the updated work progress report, the updated work measure, and the application letters for different license/permits under the environmental protection laws, and all the valid license/permit. The SEO and the ES shall also have access, upon request, to the Site Log-Book.

After reviewing the documents, the SEO or the ES shall advise the PMU and the contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the SEO or the ES concludes that the status on license/permit application and any environmental protection and pollution control preparation works may not comply with the work measure or may result in potential violation of environmental protection and pollution control requirements, they shall advise the Contractor and the PMU accordingly.

(vi) Environmental Claims and Penalty System

In the compliance framework, if non-compliance with environmental regulations are discovered by CSC/ES/IEMC/PMU during the site supervision, 2% values of interim payment of the contractor of this month will be held back.The Contractor will be given a grace period (determined by CSC/PMU) to repair the violation.If the Contractor performs the repairs within the grace period (confirmed by CSC/PMU), no penalty is incurred and keeping money will be pay. However, if the Contractor fails to successfully make the necessary repairs within the grace period, the Contractor will pay the cost for a third party to repair the damages (deduction from keeping money).

In case of IEMC/CSC/PMU not detected of non-compliance with environmental regulations of

the contractor, they will be responsibility payment to repair the violation.

(vii) Reporting Arrangements

ESMP monitoring and reporting requirements are summarized in table 6.7.

Table 6.8: 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
	IEMC	PMU	Every three-month
5	PMU	DONRE	Every six-month
6	PMU	WB	Every six-month

6.6.3. Estimated Costs for Each Work of Environmental Protection Measures

Table Error! No text of specified style in document.**.9: Costs for environmental protection items**

NO.	Works	Costs (estimated)
1	Renting areas for dumping mud/dredged soil	VND 150 million
2	Construction site fencing	VND 200 million
3	Prevention and control of fire and explosion(fire extinguishers, fire hoses, emergency lights)	VND 200 million
4	Watering and sprinkling	5 million/month
5	Trash bins on site	VND 50 million
6	Portable toilet	VND 60 million
7	Standby pump	VND 150 million
8	Planting trees at the treatment plant	VND 300 million
9	Wastewater treatment plants, sewer lines, drainage lines	VND 34.156.897 million

6.7. CAPACITY BUIDLING

The table 6.10 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 6.10: Advanced training program on environmental monitoring management capacity

I. Subjects	**PROJECT MANAGEMENT UNIT**
Training course	Environmental monitoring and reporting
Participants	Staff in charge of environmental issues;environmental managers
Training frequency	Immediately after the project becomes valid, but at least one month prior to the first bid package. The next training will be planned on demand.
Duration	Four days
Content	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; Environmental monitoring for the Subproject includes: - Requirements of environmental monitoring; - Monitoring and implementation of mitigation measures; - Community involvement in environmental assessment; - Guiding and monitoring contractors, CSC and community representatives in the implementation of environmental monitoring; - Forms used in environmental monitoring processes; - Reaction and risk control; - Manner of receiving and submit forms; - Other issues to be determined.
Responsibility	With the help of the Technical Assistance Team, the Independent environmental Monitoring Consultant (IEMC) and PMUimplement safety policies.
II. Subjects	**CSC, CONTRACTORS, REPRESENTATIVESOF LOCAL AUTHORITIES (WARDS/COMMUNES), COMMUNITIES**
Training course	Implementation of mitigation measures
Participants	CSC;construction engineers, site construction field manager. staff in charge of environment issues, the contractor; representatives of local authorities; representatives of urban groups
Training frequency	Shortly after awarding contracts to the contractors with updates on demand
Duration	Three-day training for CSC and contractors, and two-day training for others
Content	- Overview of the overall environmental monitoring; - Requirements of environmental monitoring; - The roles and responsibility of the contractors and CSC; - The content and method of environmental monitoring; - Reaction and risk control; - Introducing monitoring forms and instructing on filling out forms and reporting incidents; - Other issues to be determined - Preparing and submitting reports
Responsibility	With the help of technical assistance teams, PMU, the independent environmental monitoring consultant (IEMC) implement safety policies.
III. Subjects	**COMMUNITIES / WORKERS**
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	- Brief presentation on safety issues and overview on the environment; - 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.); - Management of safety and environmental sanitation on site and at workers' camps; - Mitigation measures applied on site and camps; - Safety measures for electricity, mechanical engineering, transportation, air pollution; - Methods of dealing with emergency situations; - The rights and responsibilities of environmental monitoring - Environmental monitoring, environmental monitoring form - Measures to mitigate the social impact and monitoring implementationOther issues to be determined
Responsibility	Contractors, PMU with the assistance of IEMC

6.8. TOTAL COSTESTIMATES

The following table provides a cost estimate for the implementation of environmental management plan (ESMP). The cost of ESMP7 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 communityparticipation, 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 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

7Excluding costs for RP implementation and independent monitoring the performance of RP/EMP

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 Error! No text of specified style in document.**6.11: Estimated costs of EMP implementation (USD million)**

Content	Items of Vinh Long 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 environmentalsafety policies	As part of the costs for the PMU	Counterpart funds
(d) Environmental quality monitoring	0.029	WB
(e) Independent environmental monitoring consulting(IEMC)	0.035	WB
(f) Capacity building programs on safeguard policies	0.01	WB

Table 6.12: Estimated costs of IEMC (Exchange rate: 1 USD = 22,230 VND)

No.	Content	Unit	Quantity	Price (VND)	Total (VND)	Total (USD)
1	Specialist salary (I)	person-month	60	40,000,000	2,400,000,000	102,128
2	Specialist salary (II)	person-month	60	30,000,000	1,800,000,000	76,596
3	Specialist salary (III)	person-month	60	15,000,000	900,000,000	38,298
4	Local stays and allowance	person-day	1.800	520,000	936,000,000	39,830
5	Traveling expenses	Trip/ person	270	3,000,000	810,000,000	34,468
6	Training course	class	20	10,000,000	200,000,000	8,511
7	Office supply	monitoring session			300,000,000	12,766
8	Office and communication	month	60	5,000,000	300,000,000	12,766
	Total				**7,646,000,000**	**325,363**

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. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

CHAPTER 7. PUBLIC CONSULTATION AND INFORMATION DISLCOSURE

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. The Chapter also summarizes responses and commitments of the subproject owner in complying with the environmental and social mitigation measures and information disclosure.

7.1. PUBLIC CONSULTATION PROCESS

Public consultation is specifically required by the World Bank's environmental and social safeguard policies. The public consultation in preparation of the subproject ESIA also must comply with the requirements in the Government's Decree No. 18/2015/ND-CP dated 14 February 2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan, and Circular No. 27/2015/TT-BTNMT dated 29 May 2015 of the Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment and environmental protection plan. The objectives of public consultation for this ESIA are:

- To share all information on the items and tentative activities of the Subproject with local community and stakeholders;

- To gather opinions/comments and concerns from local authorities and the community on local particularities and environmentally sensitive matters in the subproject area, especially matters that the environmental assessment impact group has not been aware of. On such basis, the concerns of the local community may be proposed for proper settlement during the selection of subproject design options;

- To collect opinions/comments from the local community on the Subproject's tasks in the preparation of the ESIA as well as comments on the draft ESIA to adequately and precisely assess environmental impacts and propose the most effective and feasible mitigation measures for negative environmental impacts.

The public consultations were conducted during the subproject preparation to ensure that affected households and key stakeholders to participate and express their opinions about environmental and social issues. Key topics covered in the public consultations are:

i. Disseminate key information related to policies of the World Bank, the Government and the subprojects.

ii. Provide locals with subproject on resettlement, environment, gender as well as ethnic minority issues through village loudspeaker system and subproject information brochures/leaflets;

iii. Collect opinions and feedback of the local communities regarding the subproject implementation;

iv. In the community consultation, needs to introduce and public all information of subproject and WB's safeguard policies, collect opinions and comments of the residents on design and resettlement options as well as their aspirations and expectations are recorded;

v. Respond questions to local communities concerning the subproject and safeguard policies;

vi. CPCs and PMU provided answers to questions to local residents related to subproject and local policies;

vii. Local communities, representatives of the CPC's and other stakeholders' contributions

This is a Category A subproject, thus according to WB's requirements, consultation is implemented into two times during environmental and social impact assessment process.

The public consultation was carried out with local communities and authorities at project area including 5 wards (1,2,3,4 and 9). The first consultation was conducted from 25 July to 27 July 2016 and second consultation was conducted from 19 December to 21 December 2016. The first public consultation discussed about the subproject scope, investment and ESIA preparation process. The second public consultation followed up on the first consultation inputs and substance of the draft ESIA. The public consultation meetings were held at the Ward/Commune PC.

About 7 days prior to public consultation, the consultant informed the local authority about the proposed investment and cooperated with the local authority to invite the affected people and representatives of the affected HHs to attend public consultation meeting. Attending the meeting were representatives of the People's Committee, the Veterans Association, the Vietnam Fatherland Front, Women's Union, Youth Union, administration officials, head of residential areas and affected households by the subproject. The number of participants in the first and second consultations was 125 and 120 respectively. The results of the two public consultation meetings are described in the following Tables 7.1 and 7.2.

7.2. PUBLIC CONSULTATION RESULTS

7.2.1. The first public consultation

The first pubic consultation was conducted from July 25 to 27, 2016 in the subproject wards. Place, time, participants and conetent of the first public consultation are presented in Table 7.1:

Table 7.1: The results of the first consultation in Vinh Long City

Location and Time	Participants	Participants' opinions	PMU and Consultant's responses
Ward No. 1 (25/07/2016)	- Project Management Unit: 02 - Environmental Consultants: 02 - Design consultants: 02 - Representatives People's Committee, the Veterans Association, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 06 people	○ The people were disseminated on subproject information. ○ Solid waste and domestic wastewater is directly discharged into Kinh Cut and Cau Lau Cannal. By Kinh Cut and Cau Lau cannal' embankment will be Improved environment and sanitation ○ Have job-placement assistance. ○ Need to implement the adequate compensation policies for the affected households. ○ During the implementation of subproject, the environmental protection measures need implementing strictly to avoid affecting people health, and environmental pollution	o The options/issues will be addressed in the ESIA report and included in the bidding documents of construction packages. The options/issues will be considered and addressed in the RP.

Location and Time	Participants	Participants' opinions	PMU and Consultant's responses
		○ Ensure sustainabuility and avoid damage to local infrastructures during the subproject implementation when implementing subproject.	
○ Ward No. 2 (25/07/2016)	- Project Management Unit: 02 - Environmental Consultants: 02 - Design consultants: 02 - Representatives People's Committee, the Veterans Association, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 03 people: 6 people - Affectec households: 26	○ People agreed with subproject implementation ○ Ward 2 has a canal next to Nguyen Truong To School which is usually flooding whenever there is heavy rain. Some households usually discharge waste into the canal next to Nguyen Truong To School, making flow stuck and dirty, black water in the canal and foul smell. Project should be Fill up the canal next to Nguyen Truong To School. ○ Ensure traffic situation in the area. ○ In the subproject construction, Contractor must ensure good drainage system to avoid flood when raining. ○ When getting environmental problems, it need to be solved immediately. ○ Constructtion supervision need to implemented by households.	○ The project will be construction drainage system with concrete pipes D600 and wastewater UPVC sewer pipes D220 along 2 sides of the road ○ These issue will be addressed in the ESIA process and included in the bidding documents of construction packages
○ Ward No. 3 (26/07/2016)	- Project Management Unit: 02 - Environmental Consultants: 02 - Design consultants: 02 -Representatives People's Committee, the Veterans Association, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 03 people: 6 people	○ People agreed with subproject implementation ○ Waste collection system just meets 60% of demand, many households who live in small alleys which is unaccessible for waste collection vehicles do not access waste collection service. ○ Ensure traffic situation in the area. ○ In the subproject construction, Contractor must ensure good drainage system to avoid flood when raining. ○ When getting environmental problems, it need to be solved immediately. ○ Constructtion supervision	○ The project wil widen the existing main alleys with concrete/asphalt structure from 2.5m width to 4.0 to 5.5 m with ○ The project will provide water supply pipes and street lighting, waste bins and garbage trolleys ○ These issue will be addressed in the ESIA process and included in the bidding documents of construction packages

Location and Time	Participants	Participants' opinions	PMU and Consultant's responses
	- Affectec households: 26	need to implemented by households.	
○ Ward No. 4 (26/07/2016)	- Project Management Unit: 02 - Environmental Consultants: 02 - Design consultants: 02 -Representatives People's Committee, the Veterans Association, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 03 people: 6 people - Affectec households: 26	People agreed with subproject implementation ○ Ensure traffic situation in the area. ○ In the subproject construction, Contractor must ensure good drainage system to avoid flood when raining. ○ When getting environmental problems, it need to be solved immediately. ○ Constructtion supervision need to implemented by households.	○ These issue will be addressed in the ESIA process and included in the bidding documents of construction packages
○ Ward No. 8 (27/07/2016)	- Project Management Unit: 02 - Environmental Consultants: 02 - Design consultants: 02 -Representatives People's Committee, the Veterans Association, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 03 people: 6 people	○ People agreed with subproject implementation ○ Ensure traffic situation in the area. ○ In the subproject construction, Contractor must ensure good drainage system to avoid flood when raining. ○ When getting environmental problems, it need to be solved immediately. ○ Constructtion supervision need to implemented by households.	○ These issue will be addressed in the ESIA process and included in the bidding documents of construction packages

Minutes of the consultation meetings and samples of the interview questionnaires are provided in Appendix 5.

7.2.2. The results from the second public consultation

The second public consultation was conducted from 19 December to 21 December 2016. The second consultation was conducted with local authorities and representatives of households,

enterprises in the wards/communes. Place, time, participants and outcomes of the second public consultation are presented in See Table 7.2.

Table 7.2: Results of the second environmental consultation in the project area

Location, Time	Participants	Community's opinions	PMU and Consultant's responses
Ward No. 1 (19/12/2016)	- Project Management Unit: 02 - Environmental Consultants: 02 - Design consultants: 02 - Representatives People's Committee, the Veterans Association, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 06 people Affectec households: 10	+ Agree with environmental impacts and the proposed mitigation measures mentioned in the report + Client needs to fully ensure labor safety; ensure traffic safety during transportation of construction materials to construction sites; practice fire prevention and fighting and maintenance of order and security at construction sites. + Client needs to pay attention to environmental impacts during construction time: personnal waste of the workers, harmful waste of construction activities, and handling of generated dust and noises, etc. + Client needs to fully implement commitments about environmental impact prevention, mitigation measures. + Ensure sustainability and avoid damage to local infrastructures.	+ The opinions/issues will be addressed in the ESIA report and included in the bidding documents of construction packages.
○ Ward No. 2 (19/12/2016)	- Project Management Unit: 02 - Environmental Consultants: 02 - Design consultants: 02 - Representatives People's Committee, the Veterans Association, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 03 people: 6 people - Affectec households: 26	+ Agree with environmental impacts and mitigation measures mentioned in the report. The mitigation measures should be presented more clearly and in more detail. + Client needs to pay attention to environmental impacts during construction time: personnal waste of the workers, harmful waste of construction activities, and handling of generated dust and noises, etc. + Client needs to fully implement commitments about environmental impact prevention, mitigation measures.	+ These issues will be addressed in the ESIA process and included in the bidding documents of construction packages
Ward No. 3	- Project	+ Agree with environmental impact	+ These issues will be

Location, Time	Participants	Community's opinions	PMU and Consultant's responses
(20/12/2016)	Management Unit: 02 - Environmental Consultants: 02 - Design consultants: 02 - Representatives People's Committee, the Veterans Association, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 03 people: 6 people - Affectec households: 26	mitigation measures mentioned in the summary report. + Client needs to pay attention to upgrading, expansion of small alley roads as well as development of uniform drainage sewer, waste collection systems. + Client needs to fully implement commitments about environmental impact prevention, mitigation measures.	addressed in the ESIA process and included in the bidding documents of construction packages
○ Ward No. 4 (21/12/2016)	- Project Management Unit: 02 - Environmental Consultants: 02 - Design consultants: 02 - Representatives People's Committee, the Veterans Association, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 03 people: 6 people - Affectec households: 26	+ Agrees with negative impacts on natural environment and socio-economic development as mentioned in the report. + Uniform investment should be made on waste collection system, storm-water/domestic WW drainage system to avoid flooding. + Client needs to pay attention to environmental impacts during construction time: personnal waste of the workers, harmful waste of construction activities, and handling of generated dust and noises, etc.	+ These issues will be addressed in the ESIA process and included in the bidding documents of construction packages
○ Ward No. 8 (21/12/2016)	- Project Management Unit: 02 - Environmental Consultants: 02 - Design consultants: 02	+ During project implementation period, there will be impacts on natural environment, socio-economic development and community health. These impacts will interrupt natural environment and daily life of people in the	+ These issues will be addressed in the ESIA process and included in the bidding documents of construction packages

Location, Time	Participants	Community's opinions	PMU and Consultant's responses
	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 03 people: 6 people	project area. However, these impacts are merely local and in a short period of time. + Agree with the proposed mitigation measures on natural environment, socio-economic development and community health. However, impacts on people's daily life and health needs to be paid with special attention. + During construction course, Client and construction contractors need to apply necessary measures to minimize impacts of noises and dust on the environment and daily life of people in the area. + Client needs to fully implement commitments about environmental impact prevention, mitigation measures.	

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 report was publically disclosed at the offices of Vinh Long City People's Committee and the People's Committees of subproject wards and communes on January 5, 2016. The draft ESIA report allows local people to further access the subproject information and contribute their opinions/comments on environmental and social concerns to the subproject owner. The draft ESIA was also disclosed in the World Bank's Operations Portal on January 10, 2016

CHAPTER 8. CONCLUSIONS, RECOMMENDATIONS AND COMMITTMENTS

8.1.CONCLUSIONS

The "***Vietnam Scaling Up Urban Upgrading Project (SUUP) – Vinh Long City Sub-Project"*** is an urban upgrading project of which the main work includes rehabilitation of existing infrastructures, especially those of the city's low income areas and new development of secondary and primary infrastructures. Vinh Long project will help to improve the city's drainage conditions, local flooding and environmental conditions, contributing to the sustainable growth of the city.

The contents of ESIA report comply with the current requirements for environmental impact assessment stipulated by the Vietnamese Government and WB's policies. The report will be one of the key documents to be submitted to State management agencies in charge of the environment to determine the location and scope of the work as a basis for applying for an investment license. In addition, this is also an important document helping the project appraisal and in the negotiation and signing of the loan agreement between the Government of Vietnam and the World Bank.

Environmental impacts:

The environmental impacts were theoretically and empirically assessed with support from the baseline and statistical data as well as experiences from similar WB projects. The impacts are relatively quantified as best as they can be for all three stages of project's preparation, construction and operation and will be further assessed and adjusted during the project implementation in order to mitigate the negative impacts and enhance the positive ones.

The positive impacts of the project include improvement of water supply and drainage and other basic infrastructures in LIAs, mitigation of local flooding, better connectivity within and out of the city and enhancement of climate resilience. The embankment of Cau Lau and Kinh Cut canals will help to address the drainage, environmental pollution and local encroachment and will create more green spaces for the city.

Most of the impacts during the pre-construction and construction stages are temporary and short-term, taking place in areas around construction sites or on transport routes and at disposal sites. The main impacts during the site preparation relate to the acquisition of land affecting residential land, agriculture land and small areas around fences of some religious facilities and local residents. In the construction phase, impacts from dust, vibration and noise as well as issues of social security and occupational safety are much likely to arise. In addition, the transportation and disposal of dredging sludge will also be an area of concern. However, these can be limited or mitigated to the lowest levels by the implementation of the ESMP.

Subproject construction operations might cause a number of negative impacts on the social life of residents in the Subproject area, by bringing about changes in their living conditions and disturb their daily routines as well as production and economy. Emerging issues might include increase in air pollution and traffic accidents, land subsidence or breakdown of drainage or road system, accumulation of sediments and sludge at manholes or canals among others. Nevertheless, these impacts are short-term and can be mitigated.

Mitigation measures:

Measures to control pollution and limit adverse impacts on environment in the construction and operation phases proposed and recommended in this report. Besides the application of

appropriate managerial and technical measures, awareness raising and behavior change communication to local people should be paid attention to help maintain the good environment. All the measures are proven to be feasible and able to meet Vietnamese environmental standards.

The environmental monitoring program will be carried out as soon as the State's approval and the license of subproject construction and operation have been obtained. Monitoring data will be stored and serve as a legal basis for compliance with the Environmental Protection Law of Vietnam as well as the environmental safeguard policies of World Bank. These data will also serve the evaluation of the effectiveness and environmental sustainability of the project.

An environmental and social management plan (ESMP) is in place to ensure the management, monitoring, reporting, preparation and adjustment of measures to minimize environmental pollution during project implementation. The project owner, contractors and project management unit, will be responsible for implementing this plan in cooperation with local state management agencies and authorities.

Public consultations have been conducted to share the project contents, potential environmental impacts and mitigation measures to local residents and concerned stakeholders. So far, the project has been receiving great support from the local communities and authorities.

8.2.RECOMMENDATION

This is an environmentally significant project, contributing to the sustainable growth of Soc Trang City and in particularly helping Vinh Long to achieve several key targets for becoming the class III city by 2020. Therefore, the Owner would like to propose for DONRE's appraisal and approval of the ESIA report of the project as well as WB's approval for timely and prompt deployment of the project.

During the Project implementation, the Project PMU/ Project owner would seek the participation, coordination, support and constructive comments from line departments and local authorities in carrying out the environmental protection efficiently. In particular, the Project would like DONRE to provide capacity support for PMU staff and related operational workers in the areas of environmental compliances and environmental management and awareness raising and communication on environmental protection to local people.

In order to ensure the synergy between this project and other investments of the city, PMU would like to urge the PC to accelerate the implementation and operation of the proposed waste and wastewater treatment facilities so that the project can connect into.

8.3. COMMITMENT OF IMPLEMENTATION

During the operation of the project, the Owner commits to carrying out seriously the regulations of Vietnam's environmental protection laws, including: the Law on Environmental Protection No.55/2014/QH13 passed by the National Assembly of the Socialist Republic of Vietnam dated 23 June, 2014; Decree No.80/2014/ND-CP dated 6 August, 2014 by the Government on drainage and wastewater treatment; Decree No.19/2015/ND-CP dated 14 February, 2015 by the Government detailing the implementation of some Articles of the Law on Environmental Protection; Decree No.18/2015/ND-CP dated 01 April, 2015 by the Government on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan; Circular No.27/2015/TT-BTNMT dated 29 May, 2015 by MONRE on strategic environmental assessment, environmental impact assessment and environmental protection

plan, and other relevant documents. The Owner also commits to complying with WB's environmental safeguard policies.

In addition, the Client commits to carrying out environmental protection and mitigation measures as mentioned in Chapter 5 and implementing the environmental and social management plan for the Subproject as mentioned in Chapter 6, and fulfilling commitments towards the communities specified in Chapter 7. The Owner also commits to make compensation and overcoming environmental pollution once environmental incidents and risks occur during the implementation of the project and taking steps of environmental recovery in accordance with to legal regulations on environmental protection when subproject operation has been completed.

APPENDIX 1: SUUP VINH LONG SUB-PROJECT DREDGED MATERIALS MANAGEMENT PLAN

1. Location of Dredging, Volume and Characteristics of Dredged Materials

-Dredging of small cannal round LIA 01, 03 and 04. The volume of dredging sludge estimated about 16,200m^3.

-Upgrading and Dreding of Kinh Cut and Cau Lau river. The volume of dredging sludge estimated about 39,000m^3.

- Construction of P2-P9: The volume of dredging sludge estimated about 1,210m^3

2. Final Disposal Site

According to the analyses in chapter 2, 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 the sediments would 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 Hoa Phu Waste Treatment facility

The disposal site- Hoa Phu landfill is away approximately 12 km and 14 km from dredging area.

Although a separate management plan is prepared for the excavated materials of the entire project, disposals of the excavated materials will also follow the above principles. During construction phase additional tests for deeper layer will also be carried out by the contractors.

3. Contractor's Dredging Management Plan

The Contractor is required to prepare a Contractor's Dredging Management Plan (CDMP) and submitted to the Environmental Consultant of the Construction Supervision team and the PMU Environmental Officer for review and approval. The CDMP will include, but not limited to the followings:

1) The Scope of Works in the Contract package, construction method and schedule

2) Volume and quality of water quality and sediment quality in the dredging area covered by the contract

3) Water users that may be affected by the dredging and embankment lining

4) Materials uploading and transportation method: indicate proposed route of the transport from the dredged site to the disposal area, time of operation, type of vehicles/trucks and proposed measures to reduce the leakage of the dredged materials from the transport trucks,

5) Schedule to inform the nearby communities about the project, disclosure of name and contact number for possible complaints.

6) Potential social and environmental impacts, including the site-specific impacts and risks

7) Mitigation measures to address the potential impacts and risks. The mitigation measures should be proposed based on ESIA/ECOP, ESMP, SEMP, the potential

impacts and mitigation measures presented in Section 4 and 5 of this Plan and the following requirements:

8) Environmental Quality Monitoring plan carried out by the contractor (particularly pH,DO, TSS, BOD, salinity etc. for water and heavy metals including pH, Hg, As, Cd, Cu, Pb, Zn and Cr, Organic Materials and Mineral Oils for sediments and soil

9) For soil and sediment: The number of samples taken will follow the following guidelines

Table 1 . The number of Sediment samples

Volume of dredged (m3)	**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 CDMP
- Excavated soil are separated from dredged materials from source. Excavated soils will be reused on-site and off-site as much as possible and transported to the nearest disposal site appraised under ESIA, or identified and approved during detail engineering design or construction phase;
- The mitigation measures are adequate to address the potential social and environmental impacts associated with various steps and activities, areas of influence and receptors of dredging, temporary storage, transportation and final disposal of the dredged materials.
- Field survey are carried out by the Contractor during the preparation of the CDMP in order to identify if there are additional sensitive receptors not identified previously under CCSEP and proposed additional site-specific mitigation measures accordingly.
- Contractor's environmental monitoring plan are included
- Commitments to carry out corrective actions when excessive pollution is determined, or when there are complaints about environmental pollution, social impacts from any stake holders

4.Potential Impacts and Mitigation Measures for Dredging and Embankment lining

Impacts and Description	Mitigation Measures
AT DREDGING and TEMPORARY LOADING AREAS	
Odour and air pollution, nuisance Decomposition of organic matters under anaerobic conditions generates strong odour-generated gases such as SO_2, H_2S, VOC etc. When the muds are disturbed and excavated, these gases are released much faster into the air.	- Inform the community at least one week before dredging is started - Minimise the duration of temporary loading of dredged materials on-site - temporary loading materials must be transported to the disposal site within 48 hours

Impacts and Description	Mitigation Measures
Exposure to odour pollution affect the health of workers, local residents and cause public nuisance	- Load the materials on-site tidily - Do not load the materials temporarily outside the construction corridor determined for each canal section - Avoid loading the sludge in populated residential areas or near public buildings such as kindergarten. Load the sludge as far from the houses and buildings as far as possible - Cover the temporary sludge loads when loading near sensitive receptors or longer than 48 hours unavoidable
Dust and nuisance Temporary loading of sludge at the construction site cause nuisance to the public Dry and wet mud may be dropped along the dredging area and on transportation route causing nuisance to the public and traffic safety risks	- Avoid temporary loading of dredged materials on-site - Dredged materials must be transported to the final disposal sites earliest possible and no later than 48 hours from dredging. - Use truck with water-tight tank to transport wet/damp dredged materials; - All trucks must be covered tightly before leaving construction site to minimise dust and mud dispersion along the road
Traffic Disturbance 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	Arrange worker to observe and direct excavators driver when traffic is busy
Social Disturbance 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 Conflicts may also be arisen if workers, waste, materials, equipment etc. are present outside the construction corridor	- Inform the community at least one week before construction is started - Monitor to ensure that physical disturbances are within the construction corridors only - Contractor recruit local labours for simple works, brief them about project environmental and safety requirements before started working - Contractor register the list of workers who come from other localities to the commune at the construction site - Led the water leaked from wet/damp dredged materials going back to the river, not to affect garden or agricultural land - Keep the areas to be disturb minimal - Enforce workers to comply with codes of conducts
Landslide and soil subsiding risks at dredging	- During field survey for the preparation of

Impacts and Description	Mitigation Measures
area 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 Deep excavation also cause risks to the existing buildings nearby, particularly the weak structures or located too close to the deep excavation area.	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 - Consider and select appropriate dredging method that allow minimising soil subsiding risks, for example carry out stepped excavation, stabilise slops in parallel to dredging - Apply protective measures such as sheet piles at risky locations
Water Quality Degradation Turbidity in water will be increased when the mud is disturbed; Water leaked from dredged material and suface runoff through disturbed ground also contain high solid contents. Muddy water entering irrigation ditch will cause sedimentation. Aquatic livest in the canal would also be affected by turbid water.	- Build coffer dams surrounding the dredging area and pump the water out before starting dredging - If dredging is carried out directly onto the water, dredge at intervals to allow suspended materials to resettle before continuing. Observe water colour at 20 m upstream and stop dredging when water colour there started to change
Increased Safety risk for the Public	- Place stable barriers along the construction corridor boundary to separate the site with nearby structures - Place warning signs and reflective barriers along the construction area, at dangerous locations and within sensitive receptors - Ensure adequate lighting at
Health and Safety risk to the workers The health of workers may be affected due to exposure to odour and other contaminants from sludge Risk of being drown	- 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. - 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.
Others	- Other relevant measures specified in ECOP or proposed by the contractors as necessary
MATERIAL LOADING AND TRANSPORTATION	
Dust and nuisance, traffic safety risks Dust or wet materials may be dropped along the transportation route	- Use water-tight tank trucks for transporting wet/dam materials - Cover the materials tightly before leaving the construction site

Impacts and Description	Mitigation Measures
	- Do no overload material on the trucks
AT FINAL DISPOSAL SITE	
Landslide and soil subsiding risks at final Disposal site 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	- Level the materials after being disposed off - Slopes of the dumps will not be steeper than 45o - Build/create the walls to protect slopes - Create and maintain drainage at the foot of each dump higher than 2 m
Soil and Water Quality Pollution - The disposal of salty soil would not affect the existing soil quality - No risks of subsidence and landslide for residential areas around this area - No impacts on river water quality.	- 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: + Build drainage ditches surrounding the designated disposal area + Use impermeable materials to cover the walls surrounding the materials to isolate it with the surrounding + Other measures proposed by the contractors to meet pollution control targets

5. Specific Guidance for Dredging at Cau Lau and Kinh Cut 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

APPENDIX 2: DUE DILIGENCE REVIEWS

Due diligence reviews related to Vinh Long sub-project are conducted for (1) Hoa Phu Landfill in Hoa Phu Commune, Long Ho District, Vinh Long city; (2) Residential resettlement and commercial area in ward 4, Vinh Long city; (3) Vinh Long City's wastewater collection and treatment funded by ADB. Detailed assessment is presented in Table below:

01. Project name	**Hoa Phu Landfill in Hoa Phu Commune, Long Ho District, Vinh Long city**
Description	Hòa Phú disposal site (18.36 ha) receives the solid waste and domestic waste from Vinh Long City and 5 districts of Măng Thít, Long Hồ, Tam Bình, Bình Tân and Vũng Liêm of Vinh Long province. The site managed by One Member Vinh Long Public Utility Ltd and operated since 2012 with total landfilling capacity of 86,000 tons. Currently it received 70,000 tons of waste with daily load of about 120 tons. Dredging materials will be physically screened to remove garbage before being dumped to waste cells, sprayed with biological enzyme and covered with 20 cm layer of sand to minimize bad odor. After 2- 3 months being dewatered and pathogens removal, the material can be used for leveling purposes at the disposal site. The leachate from the landfill is stored in a lagoon next to the sanitized landfill. The leachate is often pumped back to the landfill to increase the moisture, accelerating the biological degradation processes. Water level in the lagoon is measured and controlled to avoid overflow, especially in the rainy season. The treatment of leachate in the pond follows chemical and biological treatment, disinfection and being discharge to the natural lake. *Relationship with the SUUP project*: All dredged materials from SUUP project in Vinh Long city will be disposed at this landfill.
Current status	Operational
Current status of EIA/EMP	EIA approved by Vinh Long Provincial People's Committee
Due Diligence review	Hoa Phu Landfill has been designed and constructed following the national standards with sufficient technical facilities for solid waste treatment. The capacity of landfill is capable to handle an increase amount of waste coming from the SUUP subproject. Environmental impacts due to the waste of the SUUP subprojects are assessed and mitigation measures are proposed adequately. As reported by Vinh Long Department of Natural Resources and Environment, the facility and its performance are in compliance with the environmental protection regulations. The land acquisition and site clearance were completed since 2010. 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.
02. Project name	**Residential resettlement and commercial area in ward 4, Vinh Long city**
Description	The RS is located in ward 4, Vinh Long city with total area of 94,600 m2, allocating adequately among lands for technical infrastructures (houses, roads, sidewalk, trees…) and social infrastructures (market, kindergartens, culture house…). The site provides accommodations for 536 households living in either apartments (150 households) or houses (386 households).

	The project owner: Urban Management Department of Vinh Long City Financing by: Vinh Long public budget, Vinh Long Electricity Company and Vinh Long Water Supply Company. Total investment amount: 88,700,000,000 VND **Relationship with the SUUP project:** There are 193 households to be relocated in Vinh Long subproject due to land acquisition. This resettlement site can provide 128 land plots to the affected households but only 51 households wish to move in. Other households prefer other options. With a complete infrastructure of power supply, water supply, traffic roads, etc. and facilities to easily approach services (health, education, etc.), the affected people will soon be settled, helping to reduce social impacts due to the implementation of the subproject.
Implementation situation	2007 – 2009
Current status of EIA/EMP	Approved at the Decision No. 1866/QĐ-UBND of Vinh Long Provincial People's Committee dated 01/10/2008
Due Diligence review	The subproject completion time is at the end of 2008. Therefore, there are no cumulative impacts in combination with the SUUP subproject. The land acquisition and site clearance has been implemented since 2006 and completed in 2008. 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.
03. Project Name	**Vinh Long City's wastewater collection and treatment funded by ADB**
Description	This ADB funded project in Vinh Long City's area aims to control environment's pollution especially in water environment. Investment cost: 45.05 million USD of which ADB's fund is 39.77 million USD and the counterpart fund is 5.28 million USD. *Relationship with the SUUP project:* Wastewater from the SUUP project area of LIA1, LIA 3 and LIA 4 and Resettlement Site will be collected and treated at ADB funded Wastewater Treatment Plant (WWTP). The drainage system in LIA 1, LIA3 and LIA 4 and Resettlement Site will be connected with the interceptors of the ADB project. The increase of wastewater generated from the SUUP project is within the treatment capacity of the WWTP.
Current status	Project's expected duration: 5 years from 2016 to 2020
Detail of EMP	Report on environmental impact assessment and social aspects of the project are being under prepartion in compliances with with ADB's safeguard policies and environmental protection regulations of the Government of Vietnam. This ESIA will be evaluated and approved by the ADB and Vietnam Government.

Due Diligence review	Wastewater from LIA1, LIA 3 and LIA 4 and the Resettlement Site will be collected and transferred to the ADB funded WWTP for treatment. Installation of drainage system in LIA 1, LIA3 and LIA 4 and Resettlement Area will make a connection with the wastewater interceptors of the ADB drainage network. . The increase of wastewater generated from the SUUP project is within the treatment capacity of the WWTP. The potential environmental impacts due to the sub-project are to be assessed and mitigation measures are to be proposed. Overall, the likelihood of impacts is small and manageable.
04. Project Name	**Vo Van Kiet Street: (Section 2: Cau Lo bridge)**
Description	The Vo Van Kiet Street is divided into 3 sections. Two sections of Vo Van Kiet street are under Component 2 of the SUUP: Section 1 of Vo Van Kiet street: from Mau Than to Cau Lo riverbank, and section 3: from Cau Lo riverbank to Nguyen Hue. The section 2 (Cau Lo bridge) will be implemented by local funds; This is considered a linked project with the investments under the SUUP subproject for Vinh Long City. - Expected to be implemented during the 2017-2019 period.
Current status	Section not yet started;
Detail of EMP/EMP	Not yet available
Due Diligence review	Should follow the provision of the RPF once implemented.