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PEOPLE'S COMMITTEE OF BAC LIEU PROVINCE
PEOPLE'S COMMITTEE OF BAC LIEU CITY

THE VIETNAM SCALING UP URBAN UPGRADING PROJECT
SUBPROJECT OF BAC LIEU CITY, BAC LIEU PROVINCE

(Draft Final)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

BAC LIEU – February 2017

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SUBPROJECT OF BAC LIEU CITY, BAC LIEU PROVINCE

PROJECT OWNER	CONSULTANT
PEOPLE COMMITTEE OF BAC LIEU CITY	INTERNATIONAL ENGINEERING CONSULTANT JOINT STOCK COMPANY (INTEC)

BAC LIEU – February 2017

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ABBREVIATION AND ACRONYMS

Ahs	Affected Households
AC	Asphalt concrete
CeC	Cement concrete
CSC	Construction Supervision Consultant
DED	Detailed Engineering Design
DOC	Department of Construction
DOF	Department of Finance
DONRE	Department of Natural Resources and Environment
DOT	Department of Transport
DPI	Department of Planning and Investment
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ECOPs	Environmental Code of Practices
ESMP	Environmental and Social Management Plan
EMS	Environmental Management System
FS	Feasibility Study
IEMC	Independent Environmental Monitoring Consultant
LIAs	Low Income Areas
MOC	Ministry of Construction
NUUP	National Urban Upgrading Program
MD	Mekong Delta
ODA	Official Development Assistance
PMU	Project Management Unit
PPU	Project Praparation Unit
PSC	Provincial Steering Committee
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framwork
RP	Resettlement Plan
P/CPC	Provincial/City People''s Committee
UDA	Urban Development Agency
URENCO	Urban Environmental Company
WB	World Bank

CHAPTER 1. INTRODUCTION AND PROJECT DESCRIPTION

1.1. BACKROUND AND OBJECTIVES OF THE PROJECT

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

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

Like other municipalities across the country, the MD has undergone a rapid urbanization process with a rate of about 25 %. The municipalities have changed towards civilization, modernization and better recreational opportunity with new urban spaces. These are providing better environmental quality for living and working. However, the process of urban expansion in the MD also revealed a number of limitations, including: a) Existence of poor and low income residential areas, which are undergoing challenges due to fast urbanization and migration; b) Infrastructure systems were spontaneously developed and unplanned; c) Technical and social infrastructure facilities are incompatible and overloaded; d) Urban drainage systems have become obsolete and degraded causing local inundations; e) Environmental pollution is being increasingly exacerbated due to untreated solid waste and wastewater.

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

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

the urban upgrading project is totally appropriate. This will help these provinces gradually move towards a comprehensive and sustainable urban development as well as improve the resilience of cities through technical assistance to strengthen the capacity building at provincial level.

1.1.2. Project Objectives

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

a. Overall objectives

(i) Improving the accessibility of people to basic urban infrastructure service in low-income areas;

(ii) Enhancing connection to the main infrastructure network; and

(iii) Building the capacity of municipalities on urban planning to climate change adaptation.

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

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

b. Specific objectives

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

1.1.3. Project Components

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

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

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

The package of tertiary investments in each LIA is determined in conjunction with a Community Upgrading Plan (CUP) which is based on extensive community consultations and social surveys

to identify priority investments. Investments are designed with flexible standards and attention to universal accessibility, and are screened to minimize social and environmental impacts. Inundation solutions at the tertiary investments are aligned with recommendations from the hydraulic modelling at the primary and secondary scale. The consultation process and updating of CUPs will continue throughout the project life, from upstream identification through to construction.

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

Component 2 provides support to improve priority networked infrastructure in line with the broader city development agenda, and with a view to increasing connectivity of primary and secondary infrastructure with tertiary infrastructure in LIAs. Social infrastructure facilities such as markets, community halls, public places, schools and green spaces will also be included to benefit urban poor, where needed. An initial hydraulic model will be developed for the catchment areas of the upgrading sites and integrated with existing urban plans for flood and salinity intrusion control, drainage, and waterways investments. Investments that increase urban connectivity of roads and drainage networks are prioritized to encourage compact urban development and reduce flood risk within the core city and particularly for populations living in LIAs.

Component 3 – Resettlement Sites

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

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

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

1.2. LEGAL AND TECHNICAL BASIS FOR ESIA PREPARATION

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

1.2.1. National Regulations and Technical Basis

a) Law and Legislative Documents

Administrative framework on Environmental Assessment

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

Furthermore, the law also indicated to consultation on, inspection and approval of the planning for environmental protection (Article 11, chapter II) as well as the list of entities subject to

strategic environmental assessment in appendix I and II of the Decree No. 18/2015/ND-CP dated February 14, 2015 of the Government.

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

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

- Law on Environmental Protection No.55/2014/QH13 passed by the National Assembly on 23 June 2014 and took effect since 01 January 2015;
- Construction Law No. 50/2014/QH13 issued on 18 June 2014 and took effect since 01 January 2015;
- Land Law No. 45/2013/QH13 passed by the National Assembly of the Socialist Republic of Vietnam on 29 November 2013 and took effect since 01 July 2014;
- Law on Water Resources No. 17/2012/QH13 passed by the National Assembly on 21 June 2012;
- Labour Law No. 10/2012/QH13 passed by the National Assembly of the Socialist Republic of Vietnam XIII on 18/06/2012;
- Urban Planning Law No. 30/2009/QH12 passed by the National Assembly of the Socialist Republic of Vietnam XII on 6/17/2009;
- Biodiversity Law No. 20/2008/QH12 passed by the National Assembly of the Socialist Republic of Vietnam XII on 11/13/2008;
- Law on amending and supplementing some articles of the Law on Fire Prevention 40/2013/QH13 passed by the National Assembly of the Socialist Republic of Vietnam XIII on 11/22/2013;
- Law on Protection of People's Health 21/ LCT/HDNN was the National Assembly of the Socialist Republic of Vietnam VIII, adopted on 30/06/1989;
- Decree No. 59/2015/ND-CP of 18 June 2015 of the Government on management of construction investment projects;
- Decree No. 18/2015/ND-CP of 14 February 2015 of the Government on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plans;
- Decree No.19/2015/ND-CP of 14 February 2015 of the Government detailing the implementation of a number of articles of the Law on Environmental Protection;
- Decree No. 38/2015/ND-CP of 24 April 2015 of the Government on management of waste and discarded materials;

- Decree No. 43/2014/ND-CP of 15 May 2014 of the Government detailing the implementation of a number of articles of the Land Law;
- Decree No. 44/2014/ND-CP of 15 May 2014 of the Government on land valuation;
- Decree No. 45/2014 / ND-CP dated 05/15/2014 of the Government on collection of land use fees;
- Decree No. 47/2014/ND-CP of 15 May 2014 of the Government on compensation, support and resettlement when the State recovers land;
- Decree No. 80/2014/ND-CP of 06 August 2014 of the Government on drainage, and wastewater treatment;
- Decree No. 179/2013 / ND-CP dated 11/14/2013 of the Government on sanctioning of administrative violations in the field of environmental protection;
- Decree No. 25/2013/ND-CP of 29 March 2013 of the Government on environmental protection charges of waste water;
- Decree No. 174/2007/ND-CP of 29 November 2007 of environmental protection charges for solid waste;
- Decree No. 59/2007/ND-CP of 09 April 2007 of the Government on solid waste management;
- Decree No. 149/2004/ND-CP dated 07/27/2004 of the licensing regulations for exploration, exploitation and use of water resources, waste water discharge into water
- Circular No. 27/2015/TT-BTNMT of 29 May 2015 of the Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment and environmental protection plans;
- Circular No. 36/2015/TT-BTNMT of 30 June 2015 on hazardous waste management;
- Circular No. 32/2013/TT-BTNMT of 25 October 2013 of the Ministry of Natural Resources and Environment on the issuance of national technical regulations on environment;
- Circular No. 19/2011/TT - BYT dated 06/6/2011 of the Ministry of Health guidelines occupational health management, health workers and occupational diseases
- Circular No. 22/2010/TT-BXD of 03 December 2010 of the Ministry of Construction on labor safety in civil construction works;
- Decision No. 02/2009/TT-BTNMT dated 19 March 2009 of the Ministry of Natural Resources and Environment on the assessment of capacity to receive wastewater of water sources;

b) Vietnam's Applicable Standards and Regulations

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

❖ ***Water quality***

- QCVN 01:2009/BYT - National technical regulation on drinking water quality.
- QCVN 08-MT:2015/BTNMT - National technical regulation on surface water quality.
- QCVN 09-MT:2015/BTNMT - National technical regulation on underground water quality.
- QCVN 14:2008/BTNMT - National technical regulation on domestic wastewater.
- QCVN 40:2011/BTNMT - National technical regulation on industrial wastewater.
- QCVN 25:2009/BTNMT - National technical regulation on wastewater of the landfill sites: Permitted maximum concentration of pollution parameters in wastewater of the solid waste landfill sites when discharging into receiving sources.

❖ ***Air quality***

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

❖ ***Quality of soil and sediment***

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

❖ ***Noise and vibration***

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

❖ ***Water supply and drainage***

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

❖ ***Labor safety and health***

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

c) Legal documents related to the Subproject

- Decision No. 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 Viet Nam Scaling Up Urban Upgrading Project from 21 to 29 March 2016;
- Aide Memoire of World Bank team on preparation of the Viet Nam 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 "The Vietnam Scaling Up Urban Upgrading project sub-project of Bac Lieu City". The report was approved by the People's Committee of Bac Lieu City in conjunction with the consultant.
- The designs of the project "The Viet Nam Scaling Up Urban Upgrading project sub-project of Bac Lieu City".
- The relevant legal documents were provided by People's Committee of Bac Lieu City.

1.2.2. World Bank's Safeguard Policies

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

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

- Environmental Assessment (OP/BP 4.01)1
- Involuntary Resettlement (OP/BP 4.12) 2
- Natural Habitats (OP/BP 4.04) 3

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

- Indigenous People (OP/BP 4.10);
- Physical Cultural Resources (OP/BP 4.11) 4 .

World Bank Group Environmental, Health, and Safety Guidelines[5]

- 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 BAC LIEU SUBPROJECT

In recent years, Bac Lieu city has been making effort in building a comprehensive technical infrastructure system in order to improve the urban traffic condition and the City's development. However, due to the limited investment capital, the infrastructure system for the urban development and the development of a land-fund has not been completed yet, which poses huge influence on the targets set by the City and slows its development.

At the same time, drainage and sanitation conditions in residential areas are also big concerns in Bac Lieu city. Environmental pollution mitigation in urban main drainage canals has been improved thank to the mobilization of people living along canals to pick waste and mount waste screens to keep canals clean. This helps people have fresh air and urban landscape. However, the contamination on some canal sections does appear. A lot of waste and wastewater from households living along canals is discharged again into canals, making water black with floating waste and foul smell etc. Once again, the urban face and the drainage become poor and the canal water is seriously polluted.

The status and restrictions on infrastructure and environmental sanitation in Bac Lieu city (asynchronous infrastructure due to so long investment, lack of connection to main arterial roads, degradation of canal embankments, incapacity of the sewerage system in solving flooding and inundations; lack of technical infrastructure in low income areas and especially severe impacts of floods and droughts caused by climate change, etc.) affects the living conditions of urban residents.

To contribute to building and developing Bac Lieu city to be one of the regional centers, the investment of "*Viet Nam Scaling up Urban Upgrading Project – The Bac Lieu city Sub-project"* is fully consistent with the urban development orientation of Vietnam in general and of the

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

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

whole Mekong Delta in particular. The Project will contribute greatly to the development of the city and help the city achieve the development goals in the future.

1.3.1. Subproject Location

Bac Lieu city is the administrative, political, economic, cultural, social, scientific, technical, service, security and defense center of Bac Lieu province. It is the focal trading point of the provinces. Bac Lieu city situates in southeast of Bac Lieu Province, on the East Coastline, and in the Mekong Delta Region. It is about 280 kilometers far from Ho Chi Minh city, about 110 kilometers far from Can Tho city on the south and about 67 kilometers far from Ca Mau city on the north.

Bac Lieu city has 7 internal wards (1, 2, 3, 5, 7, 8 and Nha Mat ward) and 3 suburban communes (Hiep Thanh, Vinh Trach, and Vinh Trach Dong). The total natural area of land is 17,525.88 ha . The City's administrative boundaries are as follows:

- The North and the northwest border on Vinh Loi district;
- The West borders on Hoa Binh district;
- The South borders on the East Sea;
- The East borders on Soc Trang province.

The proposed construction works for the components are expected to be implemented in 8 wards, include: Ward 1, 2, 3, 5, 7, 8, Nha Mat Ward and Hiep Thanh Commune.

Figure 1.1: The location of Bac Lieu city in Mekong Delta Region

1.3.2. Detailed Description of Bac Lieu Subproject Investment Items

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

Table 1.1: The main investment construction items of Bac Lieu Subproject

No	Investment items in Bac Lieu	Description
1	**Component 1**	**Upgrading tertiary infrastructure in 5 LIAs (LIA 1, 2, 3, 5, 6) with total area of 70.38 ha, and 7,000 people**
	Upgrading teriary infrastructure in LIAs 1, 2, 3, 5, 6	Main construction works include: - Widening main alleys with current width of 3- 4 m into concrete ones with minimum width of 4 m and a total length of 5.9 km. - Upgrading, rehabilitating small alleys with current width of 2 - 3 m into concrete ones total length of 4.9 km. - Building D400 – D800 reinforced concrete culvert system with a total

		length of 26.5 km. - Dredging small canals with a total length of 0.13 km. - Install water supply pipes with diameter of D63, and a total length of 15.9 km. - Provision of lighting and waste bins.
2	**Component 2**	**Upgrading, constructing roads connecting to LIAs; upgrading, renovating canals in urban areas**
2.1	Rehabilitating Cau Xang canal, the section from Xang bridge to Tra Kha Tra Khua canal	Main construction works include: - Dredging Cau Xang canal with current depth of 1.2-1.5 m into designed depth of 1.5 m along existing width from 4-17 m, length of 4.5 km; - Constructing a management road along both sides with average width of 3 m, length of 7.4 km/side. - Construction of B60 reinforced concrete drainage ditches along both sides with the length of 7.4 km. - Provision of lighting and tree planting.
2.2	Upgrading, widening Lo Ren street	Main construction works include: - Upgrading existing Lo Ren street with width of 3 - 4 m into 25.5 - 30.5 m, length of 6.0 km. - Constructing the drainage system, including: stormwater system for 1 sidewalk with a D400-D800 reinforced concrete pipeline 3.2 km in length; (ii) UPVC 220 wastewater collection system with the length of 3.2 km. - Provision of lighting and tree planting along the road
2.3	Upgrading, expanding Lo Bo Tay street	Main construction works include: - Upgrading existing Lo Bo Tay street with width of approximately 3 m into 15 m (7m wide pavement and 4m wide sidewalk for each side), length of 6.1 km. - Constructing 12 reinforced concrete box culverts with length of 21 m, width of 3.3 - 6.0 m; 01 reinforced concrete bridge with length of 18 m and width of 15 m at intersections with the irrigation canal. - Installing the drainage system, including: stormwater drainage system for 1 sidewalk with a D400-D800 reinforced concrete pipeline, length of 6.1 km; UPVC 220 wastewater collection system with the length of 6.1 km. - Provision of lighting and tree planting along the road.
2.4	Upgrading, widening Huong Lo 6 street	Main investment items include: - Rehabilitating existing 4 m wide asphalt road into 9 m wide asphalt road (7 m wide pavement, 1 m wide earthworks for each side) with the length of 1.0 km. - Constructing lighting and planting systems along the alignment.
2.5	***Constructing internal connection roads; in the western area of Nguyen Dinh Chieu street, extended Hai Ba Trung street.***	
2.5.1	Constructing internal roads for connecting Nguyen Dinh Chieu street with Ba Huyen Thanh Quan street	Investment items include: - Constructing a new road section with the width of 17 m (7 m wide pavement, 1 m wide earthworks for each side), 0.55 km in length. - Constructing the drainage system, including: stormwater drainage system for 2 sides with a D600 reinforced concrete pipeline, 1.1 km in length; UPVC 220 wastewater collection system with the length of 1.1 kmProvision of lighting and tree planting along the road.

2.5.2	Constructing extended Hai Ba Trung street	Investment items include: - Constructing a new road section with the width of 29 m (14.4 m wide pavement, 9 m wide deviding strip, 2.8 m wide for each sidewalk), length of 0.1 km. - Installing the drainage system, including: stormwater drainage system for 2 sidewalks with a D600 reinforced concrete pipeline, 0.2 km in length; UPVC 220 wastewater collection system with the length of 0.2 km. - Provision of lighting and tree planting along the road
3	**Component 3**	**Constructing 3.04 ha Resettlement Area**
	Constructing resettlement area Ho Dieu Hoa (compensation reservoir)	- Constructing an internal road system with 15 m wide pavement and width of 4 m for each sidewalk and a total length of 1.12 km; - Constructing the water supply system with the HDPE D60-D90 pipeline, 2.24 km in length. - Constructing the drainage system, including: stormwater drainage system with a D600 reinforced concrete pipeline, 2.24 km in length; UPVC 220 wastewater collection pipeline with a length of 2.24 km. - Provision of lighting and tree planting along the road.

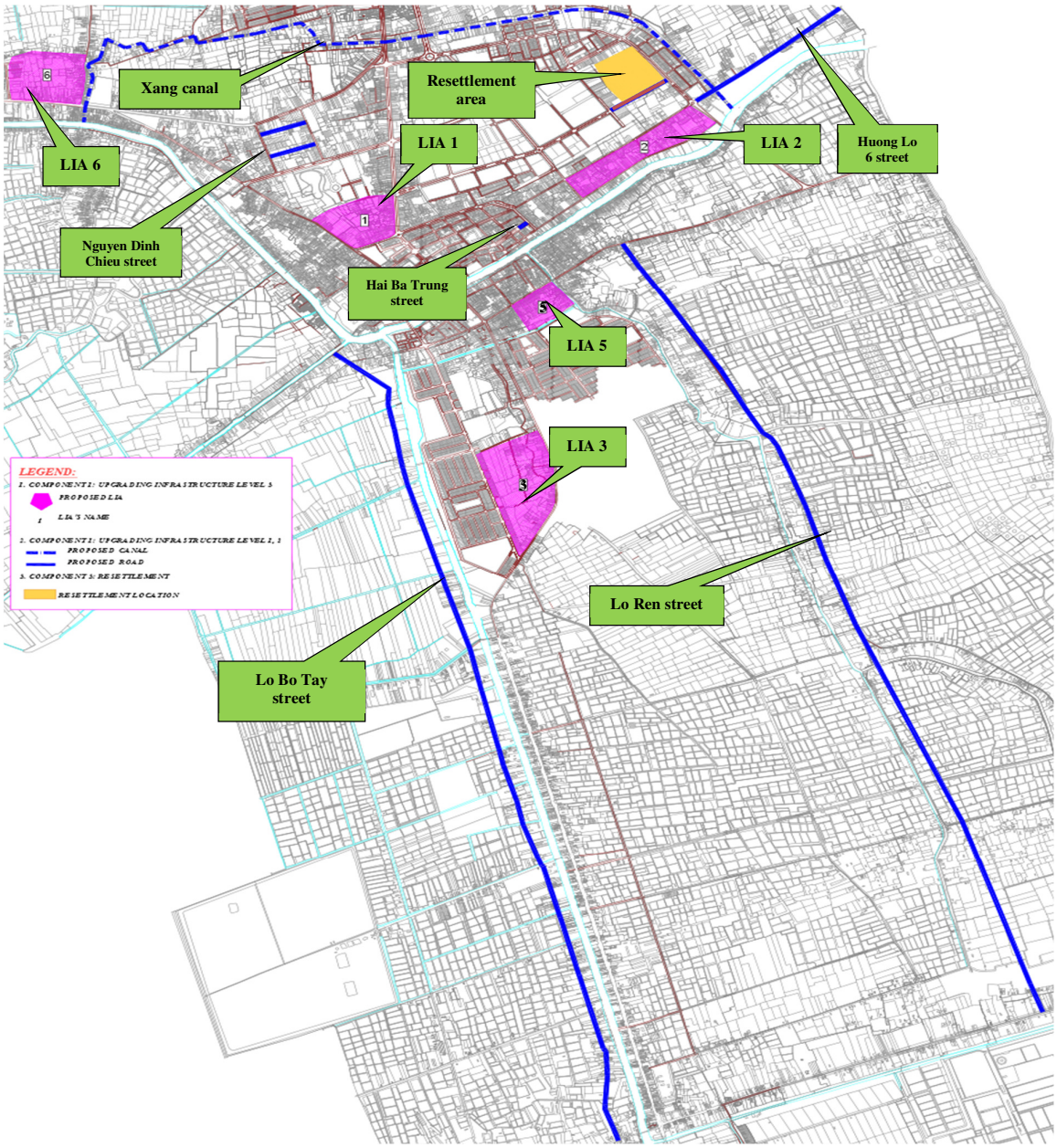


Figure 1.2: Map of investment items of Bac Lieu Subproject

1.3.3. Construction methods

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

➢ ***Road construction methods***

The road construction measure includes the following steps:

1. <u>Preparation</u>

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

2. <u>Concrete road construction</u>

- Step 1: Digging and dredging organic soil

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

3. Construction of asphalt concrete layer

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

➢ ***Embankment construction method***

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

1. Site preparations

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

2. Dredging

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

- Construction of temporary drain system;
- Demarcate construction section on the canal by using melaleuca piles or sand sacks at the two ends of the demarcated section. On average each section is 50-100 m long;
- Dry off the section by water pump in the pile/sack coffer;
- Use specialized equipment combined with manual labor to dry dredge canal to the designed elevation;
- Sludge is temporarily gathered in an identified area at site. After sludge volume reduces, transport it by truck to landfill;
- Construction of embankment as designed.

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

3. Construction of concrete embankment and auxiliary works

a. Construction of embankment

- The pilling test

- Casting the test pile to the designed length
- Excavating foundation to the designed elevation; positioning the test pile
- Installating positioning bracket
- Driving test pile and determining the length of mass piles

- The mass pilling

- Positioning and erecting pile driving machine
- Driving piles to the designed elevation

- Construction of embankment

- Applying geotextile layer to separate the sand filling and embankment foundation
- Constructing sand layers to the designed elevation
- Removing the pile shackle, driving pile to the steel bottom of embankment
- Pouring the concrete foundation primer
- Installating rebar, formwork and the bottom, and the embankment vertical wall
- Casting concrete floor and wall embankment

b. Construction of the on-dyke works

Constructing drainage system and other underground structures

Installating the embankment fence

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

1.3.4. List of machinery and equipment

Depending on the capacity of contractors for each component, construction machineries and equipment will be mobilized based on actual construction conditions as presented in Table 1.3.

Table 1.2: List of Machineries and Equipment

Machine	Component 1					Component 2						Component
	LIA 1	LIA 2	LIA 3	LIA 5	LIA 6	Cau Xang canal	Lo Ren street	Huong Lo 6 street	Lo Bo Tay street	Western coast street	Hai Ba Trung extension street	Resettlement area
Excavators with one bucket, bucket capacity of 0.8 m^3	-	-	-	-	-	3	5	3	5	2	1	3
Bulldozers 108 CV	-	-	-	-	-	3	5	3	5	2	1	3
Scraper 1.20 m^3	-	-	-	-	-	3	-	-	-	-	-	-
Self-propelled graders 108 CV	-	-	-	-	-	2	4	2	4	1	1	2
Excavator 2 m^3	-	-	-	-	-	2	4	2	4	1	1	2
Road roller 10 T	-	-	-	-	-	3	6	3	7	2	1	2
Wheeled Compactors 16T	-	-	-	-	-	2	3	3	3	2	1	2
Watering truck 5m^3	-	-	-	-	-	2	4	3	4	2	1	2
Crane 130 T	-	-	-	-	-	2	3	2	4	2	1	2
Mortar mixers	4	4	4	4	4	4	6	6	6	3	2	7
Water pumps	1	1	1	1	1	3	3	3	3	2	1	2
Asphalt machines	-	-	-	-	-	2	3	3	3	1	1	2
Pilling hammer	-	-	-	-	-	2	2	2	2	-	-	2
Generator	1	1	1	1	1	1	1	1	1	1	1	1
Tipper truck	3	3	3	3	2	5	6	6	8	3	2	6
Bending mowers	3	3	3	3	3	10	8	8	8	4	2	6
Electric welding machines	3	3	3	3	3	10	6	6	6	2	2	5
Welding transformers	1	1	1	1	1	4	2	2	2	2	1	4
Toad compactor	5	5	5	5	5	5	6	5	6	4	2	5
Concrete Drill	3	3	3	3	3	4	2	2	2	1	1	2

1.3.5. Demand for Raw Materials, Fuel and Disposal Site

1.3.5.1. Demand for raw materials

❖ **Quantity**

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

Table 1.3: Type and quantity of main raw materials

Items	Quantity					
	Cement (kg)	**Sand (m^3)**	**1×2 Aggregate (m^3)**	**Asphalt (kg)**	**Macadam type 1 (m^3)**	**Macadam type 2 (m^3)**
LIA 1	549,959.08	628.19	1,209.59	-	-	1,529.6
LIA 2	727,430.18	830.90	1,599.92	-	-	2,023.2
LIA 3	513,141.73	586.13	1,128.61	-	-	1,427.2
LIA 5	383,418.12	437.96	843.30	-	-	1,066.4
LIA 6	209,973.92	239.84	461.82	-	-	584
Xang canal	2,761,300.8	3,154.08	6,073.25	-	-	7,680
Lo Ren road	115,681.5	3,194.25	3,049.29	904.074	8,640	12,000
Huong Lo 6 street	38,560.5	623.23	615.68	169,513.88	1,620	2,250
Lo Bo Tay street	117,031.12	4,188.68	3,953.63	1,200,440.76	11,472.3	15,933,75
Western coast street	21,208.28	655.00	622.01	186,465.26	1,782	2,475
Extended Hai Ba Trung street	3,856.05	119.09	113.09	33,902.78	324	450
Resettlement area	124,250.50	2,008.17	1,983.86	546,211.38	5,220	7,250
Total	**5.565.811,76**	**16,665.51**	**21,655.05**	**3,040,608.04**	**29,058.3**	**54.669,15**

❖ **Supply sources**

- Rocks and quarries will be transported from mines in Dong Nai, An Giang to the construction sites by waterways.
- Sand will be transported from sand mines along Co Chien river (Vinh Long) to the construction sites by waterways.
- Soil will be transported from soil mines in Bac Lieu city to the construction sites by road.
- Iron, steel, cement,.... are purchased at retail outlets or construction materials stores nearby the construction sites.

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

Table 1.4: Location and distance of supply material sources

No.	Parameter	Materials		
		Stone	**Sand**	**Soil**
1.	Location	Dong Nai, An Giang	Co Chien River (Vinh Long)	Near construction site
2.	Distance	100-200 km	100-200 km	20-50 km
3.	Supply ability	2.000 m^3 -5.000 m^3	2.000 m^3 -5.000 m^3	2.000 m^3 -5.000 m^3
4.	Mode of transportation	Waterway	Waterway	Roadway
5.	Environmental lisence	Permitted	Permitted	Permitted

The above-mentioned mines and quarries are licensed by Provincial People's Committee of Dong Nai, An Giang and Vinh Long. They do not only provide construction materials for this subproject, but also for other projects of neighbouring provinces.

1.3.5.2. Fuels demand

- **Power and fuel supply**

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

- **Water supply**

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

1.3.5.3. Waste disposal sites

Civil construction works of the Bac Lieu Subproject will generate wastes such as excavated soils, dredging sludge, domestic solid and hazardous wastes. These wastes are generated from the following construction activities:

- Excavated soil: according to the Feasibility Study, the total of excavated soil is about 277,336 m^3. This excavated soil does not contain hazardous substances (according to soil analysis presented in Chapter 2), and therefore, it can be reused for ground leveling. Waste spoils disposal sites will be surveyed for capacity, distance to the subproject area and agreement with the local authorities. The possible spoil disposal sites will be indicated in the Bidding document.
- Dredging sediment from Cau Xang canal and a small canal in LIA 2 is expected to be 96,260 m^3. According to the analyses, the sediments from the canal dredged work are not hazardous, with the levels of heavy metals lower the national standards. However, it has high amount of organic compounds and pathogenic microbials (e.g. Ecoli) thus should not be used directly for used for agricultural purpose. This could rather be drained out and kept at least 03 months so as to remove the microbial and partial decompostion of organic compounds. The sediments could then be used for prennial crops or planting tree for urban landscape purpose, based on the actual needs of local pepple. Otherwise, it will be transported and disposed at No. 4 – Trang An disposal site which is located near National Highway 1A toward Bac Lieu city center, near the intersection of National Highway 1A - Tran Phu street. The area has 3 disposal cells (4A, 4B, 4C) used for dredging Bac Lieu river

from Km290+000- Km297+300 under the World Bank financed Mekong Delta Waterway Transport Infrastructure Development Project (WB5) whose project owner is Project management Unit of Waterways. The disposal cells have total areas of 44,058.73 m^2, 35,265.55 m^2 and 28,090.19 m^2, respectively. These cells are equipped with PVC canvas lining bottom, girdle shaped dykes are constructed for 4 sides. The cells consist of 2 compartments, containing and depositing compartments. There is also water collection and drainage sewer system which drains water to the water drainage system of the area.

- Domestic solid waste: Solid waste generated from activities at the site will be collected under a contract with Bac Lieu Urban Environment Company (URENCO) for transportation and treatment.
- Hazardous waste will be collected and temporarily stored on construction sites. Then, they will be transported and treated by an authorized company through a service contract. This company should have license and meet specific conditions as regulated by the Circular No. 36/2015 dated 30 June 2015 by MONRE on hazardous waste management.

1.3.6. Area of Influence

In the course of ESIA preparation, the identification of the affected area plays an important role. The Bac Lieu subproject will implement upgrading infrastructure in low income areas (LIAs), construction of main roads connecting the City's inner area, dredging canals, construction of infrastructure for resettlement. Therefore, the affected area not only occurs within construction sites of the subproject are but also expands into the surrounding areas, such as receiving water bodies (rivers, canals) etc; the affected area also includes raw materials mines and transportation routes for materials and waste as follows (see Figures 1.3):

- Upgrading tertiary infrastructure in LIAs (LIA 1, LIA 2, LIA 3, LIA 5 and LIA 6): construction activities will affect the residents living in Ward 1, 2, 3, 5 and 7.
- Construction of Lo Bo Tay Street: construction activities will have impact on local residents in Ward 2 and Nha Mat ward.
- Construction of Lo Ren Street: construction activities will affect residents in Ward 5 and Hiep Thanh commune.
- Construction of Huong Lo 6 Street: construction activities will affect residents in Ward 1.
- Constructing internal connection roads: in the Western area of Nguyen Dinh Chieu, extened Hai Ba Trung streets. Construction activities will affect residents in Ward 7 and Ward 3.
- Renovation of Cau Xang canal: households living along two canal banks within ward 7 and 8 can be influenced during dredging activities. At the same time, as Cau Xang canal is linked with Bac Lieu River, upper Bac Lieu River will be affected also.

In addition to these areas, dumping site, anticipated transportation route for raw material and disposal waste also belong to affected boundary of the sub-project. People who are involved in transport, local residents and other sensitive buildings along the route are considered as affected objects. The routes for transportation of construction materials and wastes (Cao Van Lau, Nguyen Thi Minh Khai, 23/8, Highway 1A). There are mostly on the City's main roads with the high density of traffic and population, headquarters, sensitive structures along. The roads width is about 6-30 m wide. The road structure is asphalt-concrete which is in good state (except Cao Van Lau Street). Cao Van Lau street is currently a asphalt-concrete and narrow road, but many sections are being degraded. Trucking material and waste will increase vehicle density, which generate dust, emissions, noise, vibration and affect people and structures on the roads.

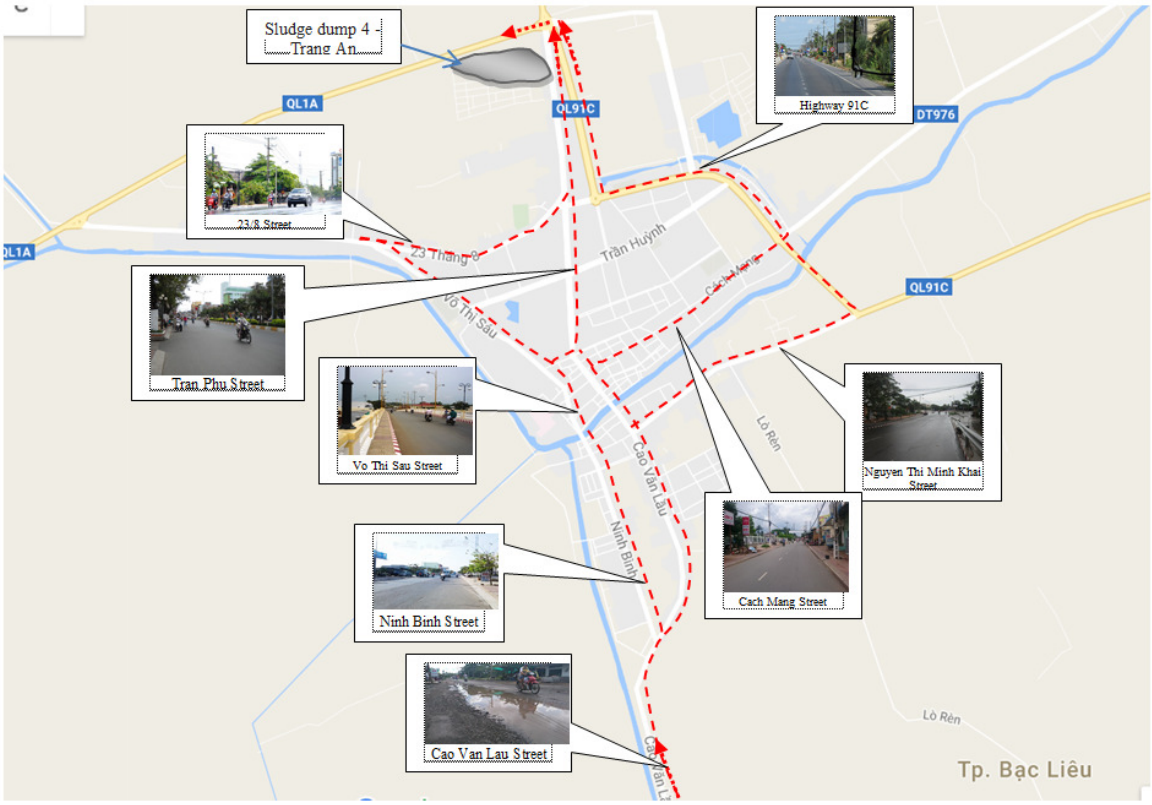


Figure 1.3: The affected area expected for transporting raw materials and wastes

1.3.7. Human resource and implementation management

❖ **Government of Vietnam and World Bank**

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

❖ **People's Committee of Bac Lieu Province**

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

❖ **Sub-project owner - People's Committee of Bac Lieu City**

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

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

1.3.8. Investment Fund and Implementation Schedule of the Subproject

❖ **Investment fund**

Total investment fund of the Subproject is US $ 43,456,757, in which:

- ODA fund: US $ 35,000,000 accouting for 80.55 % of total investment.
- Counterpart fund: US $ 8,456,756 accounting for 19.5 % of total investment.

❖ **Implementation schedule**

Estimated implementing period: 6 years, from 2016 to 2021.

1.4. ESIA METHODS

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

1. ***Checklist:*** this method is a common approach which is widely to applied for defining the study area, sampling sites, identifying influence/impact areas, sensitive areas may be affected by the project's activities during pre-construction and construction phases.
2. ***Rapid assessment:*** Empirical emission factors and coefficients were applied for calculating fugitive exhausts and dust (TSP) emission; predict noise and vibration generation spreading over nearest settlements; greenhouse gas emission; solid and hazardous wastes; etc. For air emissions, Sutton model…., was adopted to modeling emissions of dust and exhausted gases as a rapid assessment for the project's activities. Further, WHO's rapid inventory source techniques (1993), including Environmental Assessment Sourcebook (Volume II, Sectoral Guidelines, Environment, World Bank, Washington D.C 8/1991) and Handbook of Emission, Non-Industrial and Industrial source, the 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 Bac Lieu city, etc), the implementation of on-site measurements, sampling, investigations and field surveys on natural environment components (air, water, soil and flora and fauna) in the project area was conducted throughout the year both in dry and rainy seasons.
8. ***Sample analysis:*** All water, air and soil samples collected in the field were stored and brought the laboratory for analyzing at Au Viet Center.
9. ***Public consultation:*** Public consultation is used to 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 inputs 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 subproject, local mass organizations, including women's unions, local, state and central governments, other donors 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 subproject area. These data are very crucial to make the basis of environmental impact assessment and prediction when implementing the subproject, as well as proposing countermeasures for minimizing adverse impacts caused by activities in the construction and operation phases.

CHAPTER 2. NATURAL, ENVIRONMENTAL AND SOCIO – ECONOMIC BASELINES OF THE SUBPROJECT AREA

2.1. GEOGRAPHICAL SETTINGS

2.1.1. Topographical and Geological Conditions

2.1.1.1. Topography

The topography of Bac Lieu city is relatively flat and low, inclining from Northwest to Southeast. The average altitude ranges about 0.2 - 0.8 m and the average slope ranges about 1 - 1.5 cm/km. In the City, there are ponds, lakes, fields and shrimp lakes which are divided by ditches and canals. The terrain is favorable for drainage but difficult for construction activities. Bac Lieu city generally has two main types of terrain which is divided into two areas as follows:

- The Northern area of Highway 1A is a low-lying land (the average altitude is 0.2 – 0.3 m). Such terrain is very favorable for utilizing tidal water to drain but constitutes acidic water low-areas which hinder cultivation.
- The Southern area of Highway 1A is higher (the average altitude is 0.4 - 0.8 m), which forms unconstant sea-sand dunes and create a high coastal terrain lowering from the coast into the inland.

2.1.1.2. Geology

Bac Lieu city has sedimentary originality of river - wetland, river-sea, wetland - sea sediment types and marine sediments formed about 6,000 years ago (Holocene). Alluvial materials mainly include clay and sand, fine powder together with flora relics, shells. The distribution of geological sedimentary units and the correlation with soil formation of different types as follows:

- *Marine sediments (m Q13 and m Q23):* Mainly distributed along coastal alluvial areas, and coastal line, forming heavily saline soil layers, regularly saline soil layers under mangrove forest and potential acid sulfate soil which is regularly saline. These soil types have a relatively thick upper layer of clay and clay mixed with fine marine sand at depth (approximately 90 – 100 cm); ground is relatively stable, and soil maturity can develop deeply (> 50 cm);
- *River - sea sediments (am Q23):* Evenly distributed throughout the province, forming salty soils during dry season, with upper thick clay layer, and lower salty layer (> 70cm); ground is stable and developed with clearly differentiated soil layers and distributed on medium terrain.
- *Wetland - sea sediments (bm Q23):* Forming saline acid sulfate soil types; lower clay layer contains lots of organic substances with highly accumulated Pyrite (FeS_2). In the areas with hard and stable ground, long development duration and high intensity of exploitation leads to oxidation of Pyrite into Jazosit, forming active saline acid sulfate soil types - ; most of active saline acid sulfate soil types in the province have acid sulfate layer leached for a long period, so it has been completely or partially hydrolyzed.
- *River - Wetland sediments (ab Q23):* Sedimentary materials are mainly clay, vegetable relics and peat, distributed in the Northern and Northeastern area of the province. Soil types formed on the sediment have heavy mechanical compositions. The lower clay layer contains lots of organic substances and alum generating materials.

2.1.1. Climatic, Hydrological and Oceanographical Conditions

2.1.1.1. Climate

The climate conditions of Bac Lieu city generally features the equatorial monsoon climate regime in the Mekong Delta region and the specific characteristics of Ca Mau Peninsula. The climate factors indicate two distinct seasons, the rainy season and the dry season.

- **Temperature**

The average temperature is increasingly high in a year, averaging 27.3°C. Annual temperature regime in Bac Lieu is between 24.3 - 29.7°C in the dry season and 25.2 - 29.1°C in the rainy season. The highest temperature varies from 24.3 - 29.7°C, and the lowest temperature is 27.2^0C.

The temperature amplitude between the months is not significant (1-2°C) but the temperature amplitude between day and night is quite large (dry season: 8-10°C, rainy season: 6-7°C), which is favorable for plant growth and development.

- **Rainfall**

The rainfall regime is seasonally distinct. The rainy season starts from May to November, accounting for 90 % of the annual rainfall. The dry season lasts from December to April of the following year. The annual average rainfall is 1,801.5 mm, distributing unevenly over time and between months in the rainy season. The rainfall is concentrated in May to September. In some months, the rainfall is over 389 mm. Average number of rainy days is about 110-120 days/year.

- **Humidity**

The annual average evaporation is 1,233 mm. The most evaporation appears in dry season months (694 mm equal with 56 % of the annual evaporation). The average air humidity is 82.6 %, and around 76 – 80 % in the dry months.

- **Sunshine hours**

The average sunny hours are 6.6 hours/day. The total temperature is from 9.75°C to 9.85°C. The average lighting time lasts 2,202 hours/year. The total average radiation is around 4.46 kcal/cm^2/year.

- **Wind, Storm**

In a year, there are 3 main wind directions. The average wind speed reaches 3 - 3.5 m/s. In dry season strong winds reach 8-9 m/s. Southeast winds often appear dry and hot from January to April. Southwest winds from the sea carry water vapor from May to October. Northeast winds are dry and cold from November to December. In rainy season thunderstorms and tornadoes do appear with the wind speed at level 7, level 8, especially in coastal areas.

2.1.1.2. Hydrological and Oceanographical Conditions

- **River systems**

Bac Lieu has numerous rivers, canals and ditches such as Bac Lieu river, Cau Xang Canal, 30-4 Canal, etc. meeting water demands for agriculture, aquaculture and drainage in urban areas.

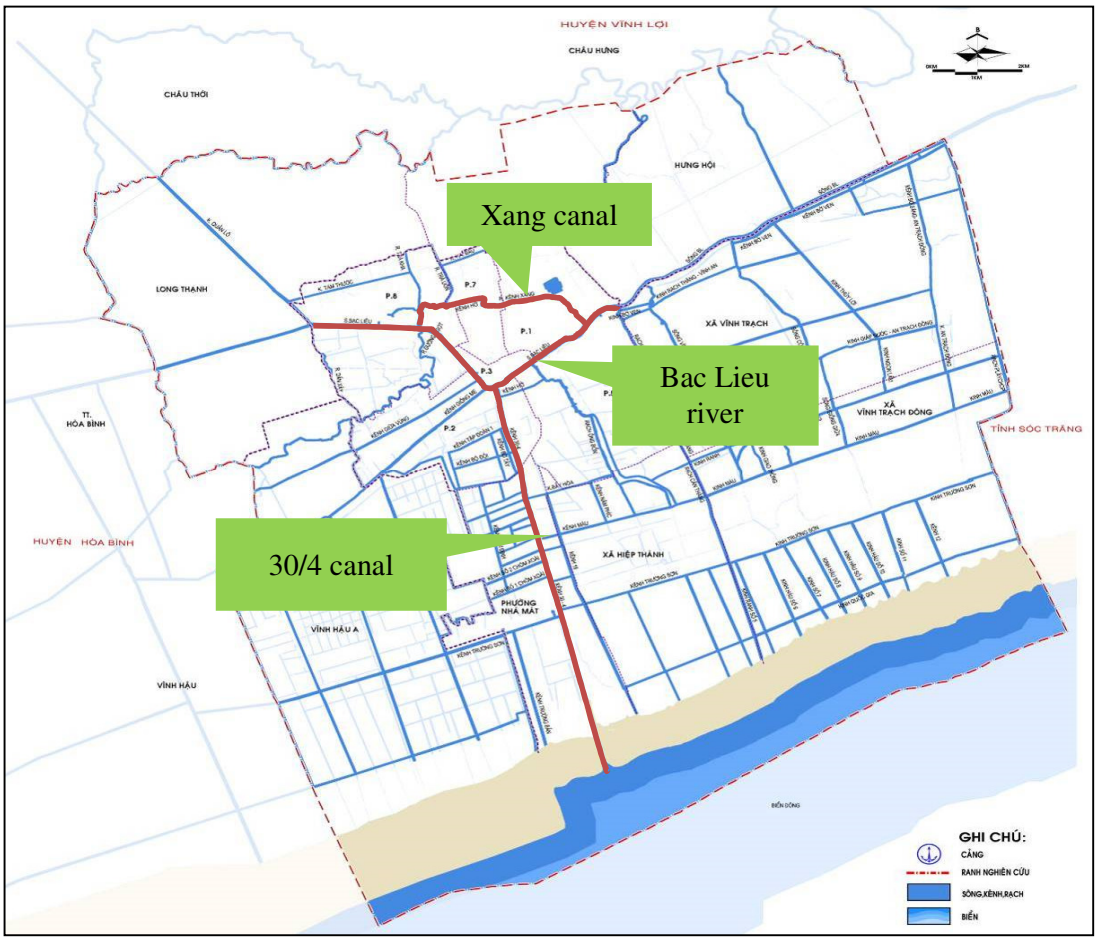


Figure 2.1: Hydrological diagrams of Bac Lieu city

❖ **Saltwater intrusion**

The salinization appears due to the direct impact of the irregular semi-diurnal regime of the East Sea. In recent years, the fairly complete maintenance of dikes and sluice gates prevents saltwater intrusion along Highway 1A and Bac Lieu river resulting in significant delay in salinity in the northern area. Currently, the saltwater – freshwater regulation is gradually being improved to serve agricultural and aquaculture practices in both North and South of Highway 1A, Bac Lieu - Ca Mau canal, which is oriented for the production planning in the province. In the dry season, the salinity in the rivers and shrimp ponds increases. In the estuary areas, the salinity is higher and lower in infields. In contrast, the decline of salinity is faster in the rainy season (both in the rivers and shrimp fields). Therefore, a number of sub-regions in the suburban communes and Ward 7, Ward 8, the good salt-washing and fresh-keeping enable 01 rice-crop rotation in shrimp fields in the wet weather).

❖ **Water levels and tides**

The City's hydrological regime is closely associated with the rainfall and wind regime as well as the terrain characteristics and tides as follows:

Tides: Bac Lieu city is located in the affection region of the semi-irregular tide of the East Sea (the tidal amplitude ranges about 2.8 - 2.9 m). Since the completion of the sluice gates that prevent saltwater along Highway 1A and because the tidal acreage is shrunk, tidal level in the South of Highway 1A in general and Bac Lieu city in particular is higher than before, which facilitates leading saltwater into shrimp areas and salt-making areas. High sediment makes canals in shrimp areas deposited quickly, so the active irrigation regulation faces difficulty. In the coming time, to solve the good supply and drainage for aquaculture, the City should pay

attention to dredging the irrigation and dike systems to actively regulate water resources to serve the effective farming and aquaculture.

2.1.2. Natural resources

❖ **Land resources**

The land resource in Bac Lieu city includes 3 main groups with 8 types of soils as follows:

Sandy Soil

The sandy soil group occupies an area of 1,555 ha (10.08 % of the natural area of the city) and distributes in average – high terrain. It is capable of draining water and concentrates in Vinh Trach Dong commune and Nha Mat ward with 2 typical types of soil as follows: i) Sand dunes (Cz) occupies an area of 363 ha (2.35 % of the natural area of the city); and ii) Sea sand (C) occupies an area of 1,192 ha (7.73 % of the natural area of the city).

Saline Soil

This group covers an area of 9,606 ha (62.25 % of the city's natural area). In Bac Lieu city, it is divided into the following soil units:

- *Heavy and regular saline soil:* Covering an area of 1,738 ha, accounting for 11.27 % of the total natural area of the city. It is distributed in sea-dike areas in the coastal communes and wards of the city.
- *Average saline soil:* Covering an area of 732.63 ha, accounting for 4.75% of the total natural area of the city. It is distributed in lowlands along rivers and canals.
- *Less saline soil:* this is the largest area of of 7,135 ha of the saline soil group, accounting for 46.24 % of the total natural area of the city.

Acid Sulfate Soil (ASS)

The ASS group covers an area of 2,843 ha, accounting for 18.43 % of the natural area of the city. It concentrates in low areas, including:

- *Potential ASS:* Covering an area of 777 ha, accounting for 5.04 % of the total area of the city, which is distributed in Hiep Thanh commune, Vinh Trach Dong commune and Nha Mat ward, Ward 2, Ward 5 and Ward 8.
- *Active ASS:* Covering an area of 1,542 ha, accounting for 9.99 % of natural land area of the city.
- *Hydrolyzed ASS:* Covering an area of 524 ha, accounting for 3.40 % of the total natural land area of the city.

❖ **Water resources**

Salt water

Saltwater comes from sea and is mixed with rainwater. It is not suitable for freshwater crops and livestocks but is the valuable resource for aquaculture development, making salt, mangrove development, etc. In fact, aquaculture is the key economic sector, which has been making major contributions to the provincial socio - economic development in general and in Bac Lieu city in particular in recent years.

Surface water

Surface water in Bac Lieu city is divided into two areas:

- In the North of Bac Lieu - Ca Mau canal and Highway 1A: Owing to the irrigation system of Quan Lo - Phung Hiep Project, the irrigation is quite favorable for agricultural production.

- In the South of Highway 1A and Bac Lieu - Ca Mau canal: in dry season all canals are saline with high salinity concentration (15-30 ‰), which facilitates aquaculture and salt-making. In the rainy season, the salinity remains at 5-15 ‰ only and is still suitable for aquaculture parctices.

The surface water quality (rivers, pons, lakes, and rainwater) changes seasonally. The rainfall in the province in rainy season accounts for 90 %, therefore, in rainy season freshwater is dominant but by the end of rainy season, water is often acidic. In dry season water is usually affected by saltwater intrusion.

Groundwater

The City is rich groundwater 4 hydrological formations which contains water at different levels:

- Holocene aquifer formation: is the groundwater complex contains free transient presence, sediment thickness varies from 40-70 m with small reserve, the quality does not meet the drinking water standards in term of microbilogy.
- Pleistocene porous aquifer formation: is the porous form with the depth of 80-150 m. The total reserve is about 716,440 m^3/day, varying region by region. The water quality is good. This is the biggest aquifer but due to uneven distribution it is only suitable for small-scale mining and requires throughly exploitation before mining.
- Pliocene porous aquifer formation: the sediment thickness varies 130-180m. The total water reserve is abundant with about 361,300 m^3/day but due to the high mineralization in water (1.28 - 9.40 mg/l), sometimes it is up to 21.56 mg/l, this water source is not eligible for the clean water suppy for the City.
- Miocene porous aquifer formation: the sediment thickness varies 450- 500m. The total water reserve is about 273,600 m^3/day. This is a strong pressure aquifer with high mineralization (1.49 to 3.92 mg/l) and high temperature (39-40 ^oC), which is potential for the exploitation of mineral water.

❖ **Biological resources**

According to the statistics, Bac Lieu province has 78 flora species of 38 families, which are mainly Rhizophoraceae, Bruquiera, Avicennia marina, and Ceriops, and 03 fauna species, 08 species of reptiles and amphibians, 80 species of marsh birds (waterfowl), 25 shrimp species and 258 species of saltwater fish etc. Besides, the province has two state-run bird gardens and other private bird gardens, which are distributed in the districts: Phuoc Long, Gia Rai and Dong Hai with the rich biodiversity.

The biological resources in the subproject area are those of the wards: 1, 2, 3, 5, 7 and 8, which are in the high urbanization speed, so the ecosystem characterizes the urban ecosystem. The diversity of this ecosystem is very poor not supporting any natural habitats as defined by the Bank policy, and includes domestic animals and plants cultivated by man. Specifically in the project area the terrestrial ecosystem mainly are domesticated animals as dogs, cats, chickens and fruit trees (coconut, papaya etc.), vines (spinach, loopah etc.), shade trees (bamboo, Ceiba pentandra (L.) Gaertner etc.) and several shrubs such as *Phyllanthus urinaria* L., Purple taro, *Pistia stratiotes*, *Udu cyperus* Linn, weeds etc. The underwater ecosystem is not diversified, too because canals are polluted. The aquatic flora and fauna include water spinach (cultivated by people), water hyacinth, etc., black carp, tilapia, carp, and such crustaceans as shrimps, crabs; molluscs as several species of mollusks, which are found in the aquatic environment of Cau Xang canal.

❖ **Mineral resources**

In Bac Lieu province in general and Bac Lieu city in particular, there are virtually no kinds of economic mineral and high reserve resources that can serve the industrial exploitation except a

few types of minerals as construction materials with small reserves such as filling sand, clay, brick, and mineral sands, etc.

❖ **Forest resources**

The forestry land area accounts for approximately 5,433.60 ha, which mainly includes protective forest (4,494.80 ha). Forest trees are Avicenna alba, Rhizophora apiculata, Melaleuca cajuputy.

Bac Lieu forests feature two types of ecological characteristics of the Mekong Delta: coastal mangrove forests and inland forests. Coastal mangrove forests give high biological productivity and are valuable for environment and protection. The mangrove ecosystem is quite diverse and rich in biological fauna and flora.

❖ **Marine resources**

Bac Lieu city has a 12.5 km coastline with wide territorial waters and continental shelfs. The intertidal zone is the home for bivalve reproduction such as clams, oysters, etc. The City's 30/4 canal discharges into the East Sea, creating favorable conditions for the construction of fishing ports and storm shelter piers. In addition, the City is rich in marine aquatic resources which supplies aquatic foods for the region and facilitates the social and economic development of the coastal region and landscapes the environmental and ecotourism development.

According to the survey documents and data, the sea in Bac Lieu city in particular and in Bac Lieu province in general owns a diverse ecosystem with large marine reserve. It is rich in variety of over 600 fish species, 33 shrimp species and hundreds of squids and other molluscs. Many types of seafoods with large reserves and high economic values are shrimps, Lutjanus sanguineus, Polydactylus quadrifilis, Mottled eagle ray - Aetobatus narinari., Acanthocybium solandri, Fsenopsis Anomala, Otolithoides biauritus etc. As surveyed by the fishery sector, the fish, shrimp reserve in this region is about 250,000 tons. We can exploit 50-60 thousand tons annually. The brackish coastal area constitutes a distinct ecological zone and is potential for the aquaculture development. In addition to fishery resources, the sea provides important quantity of salt for the industries and the daily lives. In dry season, the salinity in seawater is upto 30 ‰, making the salt production can reach 40-50 tons/ha. Also the sea water is a precious resource for the development of coastal protective forests.

In recent years, thanks to the rational exploitation of marine resources and coastal areas, the fishery economy has become a key export sector and the development impetus of the entire economy - society of Bac Lieu province in general and Bac Lieu city in particular. The coastal area of Bac Lieu city is only far from the provincial center of 8 km and far from National Highway 1A 10 km. It is very favorable for the development of Nha Mat tourist area and the largest center of the coastal eco-tourism. Bac Lieu Sea region is also plays an important role for the protection of national security of the Mekong Delta region.

2.2. ENVIROMENTAL QUALITY BASELINES IN THE SUBPROJECT AREA

In order to assess the status of environmental components in the subproject area, the subproject owner and consultant, in collaboration with Au Viet Center for Environmental Analysis, carried out site investigations, sampling and collecting relevant information on environmental status conditions. Collected samples were transported to the laboratory for analyzing in accordance with Vietnamese standards. The location map of monitoring sites and detailed results of each sampling site for all physical environmental components are shown in Appendix 4.

2.2.1. Air Quality

The subproject's owner and consultant conducted monitoring, sampling and analyzing 19 air samples in the subproject area. Sampling dates: in 29-30 July 2016; weather conditions: sunny, light wind, temperature is 29-34^{0}C; humidity: 60-80 %.

The sampling locations and analysis results are shown in Table 2.1.

Table 2.1: Analysis Results of Air Quality

Code	Name	Location	Parameters					
			Dust	NO_2	SO_2	CO	Noise	Vibration
			µg/m³	µg/m³	µg/m³	µg/m³	dBA	dB
A1	Lo Bo Tay street	Lo Bo Tay street cross to Khom Kinh Te street	117	32	25	5,010	55.1	29.54
A2		Front of seed production facilities Thanh Phi 1	104	36	29	5,000	54.6	33.97
A3	Lo Ren street	Lo Ren street cross to Nguyen Thi Minh Khai street	152	34	30	5,030	63.4	35.56
A4		Low population area along Lo Ren street	163	33	27	<5,000	57.3	36.90
A5	Huong Lo 6 street	Ton Duc Thang street cross to Huong Lo 6 street	114	37	28	5,110	68.4	35.56
A6		Front of Electric – Electronics facility – My Thu	125	41	31	5,015	66.8	35.56
A7	Nguyen Tat Thanh	Nguyen Tat Thanh street cross to Nguyen Thai Hoc street	136	35	30	5,370	73.2	33.97
A8	LIA 1	Tien Su temple	102	37	32	<5,000	67.2	33.97
A9		Church on Vo Thi Sau street	127	36	29	5,040	70.3	36.90
A10		Tam Tam Kindergarten	129	29	21	5,650	71.1	33.98
A11		Alley 13 of Vo Thi Sau street	154	24	23	5,180	66.9	33.98
A12	LIA 2	Vegetable wholesale market on Hoang Van Thu street	168	32	25	5,540	69.7	35.56
A13		Linh Chau pagoda	143	37	22	5,130	52.7	35.56
A14	LIA 5	Alley opposite the Ong Te temple	158	34	24	5,135	59.3	35.56
A15		Alley belongs to LIA 5 area	164	35	29	5,210	50.7	35.56
A16		Ong Chau temple	152	39	27	5,140	53.4	36.90
A17	LIA 3	Than Hoang temple	137	31	25	5,310	64.4	33.98
A18		Middle of LIA 3	165	36	28	5,011	52.6	35.56
A19	LIA 6	Market on 23/8 street	169	38	29	5,320	70.7	35.56
A20	Xang canal	Xang canal cross to Highway 91C	182	52	45	5,650	60.6	35.56
A21		Pagoda belong to Ward 8	137	32	29	5,240	60.4	33.98
A22	Resettlement area	Resettlement area	115	38	30	5,150	67.7	35.56
QCVN 05:2013/BTNMT (Average 1 hour)			**300**	**200**	**350**	**30,000**		
QCVN 26:2010/BNTNMT							**70**	
QCVN 27:2010/BNTNMT								**75**

Notes:

- QCVN 05:2013/BTNMT: 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
- (*): analysis parameter is certified by Vilas

Remarks:

- Analytical results show that the air quality at all sampling locations is in allowable limits of QCVN 05:2013/BTNMT, except for dust content at some sampling points, namely: At the points A4, A12, A15, A18, A19 and A20, dust concentrations are much higher than the others due to high traffic density (points A12 and A19) or dust generated from movement of means of transportation in pathways (A4, A15, A18, A20) which are not completely concreted.
- From the above-mentioned analysis and comparison, it can be concluded that the ambient air quality in the project area is still in good condition and safe for residents and workers during the project implementation.

2.2.1. Water Quality

2.2.1.1. Surface water

Sampling sites and monitoring results of surface water quality are shown in Table 2.2, respectively.

Table 2.2: Monitoring Results of Surface Water Quality

Code	Sampling time	Measurement and Analysis Parameters														
		pH (*)	**DO**	**TSS (*)**	**COD** (*)	**BOD_5 (*)**	**Phosphate (*)**	**Ammonia** (*)	**Nitrite** (*)	**Nitrate**	**Chloride**	**Iron**	**Total surfactant**	**Oil &Grease**	**Coliform**	**E. coli**
		-	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	MPN/100 ml	
SW1	ST	7.15	4.99	**251**	25.6	**18.7**	**0.523**	**1.27**	ND	1.65	ND	1.30	0.032	0.189	**$90x10^3$**	0
	NT	7.13	5.36	**464**	3.20	1.75	0.007	0.005	ND	0.067	ND	1.43	ND	0.021	$3.3x10^3$	9
SW2	ST	7.10	4.50	**262**	**192**	105	**0.982**	**2.765**	0.009	2.576	ND	1.00	ND	0.971	**$63 x10^3$**	**120**
	NT	7.29	6.20	**594**	3.20	1.70	0.002	ND	ND	0.011	ND	1.20	ND	ND	$2.7 x10^3$	3
SW3	-	7.5	5.50	**331**	**331**	**176**	**1.592**	**3.682**	0.018	4.832	ND	**2.67**	ND	**1.87**	**$33x10^3$**	0
SW4	-	7.7	6.70	**123**	6.40	3.82	0.012	0.097	ND	0.062	ND	**1.75**	ND	ND	$1.2 x10^3$	0
SW5	ST	7.20	9.5	**203**	**288**	**112**	**1.325**	**3.921**	0.021	4.623	ND	1.49	ND	1.64	**$21x10^4$**	**120**
	NT	7.11	9.5	**291**	**64**	**35.6**	**1.206**	**2.153**	0.009	3.147	ND	1.50	ND	ND	**$8.1x10^3$**	60
SW6	ST	7.30	**3.6**	40	3.05	1.67	ND	ND	ND	0.003	ND	0.85	ND	ND	$1.2x10^3$	30
	NT	7.25	**3.4**	**212**	**96**	**51.2**	**1.832**	**3.142**	0.006	4.521	ND	0.77	0.135	0.712	**$18x10^3$**	**270**
SW7	ST	7.27	**3.2**	**114**	3.20	1.7	ND	ND	ND	0.004	**541**	1.10	ND	ND	**$45x10^3$**	**330**
	NT	7.24	**2.8**	15	12.8	7.2	0.142	0.625	ND	0.581	**588**	1.33	ND	ND	**$51x10^3$**	**390**
SW8	ST	7.19	**2.8**	15	**76.8**	**41.8**	**0.476**	**2.163**	0.014	2.347	**625**	1.41	0.057	0.372	**$15x10^3$**	**2100**
	NT	7.25	**3.3**	**325**	12	6.8	0.273	0.741	ND	0.625	**583**	**1.53**	ND	ND	$6.3x10^3$	**330**
SW9	-	7	5.2	**232**	9.6	5.13	0.151	0.648	ND	0.421	**666**	**2.60**	ND	ND	$7.1x 10^3$	**270**
QCVN 08-MT:2015/BTNMT	**Class B1**	**5.5-9**	**≥ 4**	**50**	**30**	**15**	**0.3**	**0.9**	**0.05**	**10**	**350**	**1.5**	**0.4**	**1**	**7,500**	**100**
	Class B2	**5.5-9**	**≥ 2**	**100**	**50**	**25**	**0.5**	**0.9**	**0.05**	**15**	**-**	**2**	**0.5**	**1**	**10,000**	**200**

SW1: Tap Doan 1 canal;
SW2: Chom Xoai canal;
SW3: Shrimp pond along Lo Bo Tay street (between routes);
SW4: Shrimp pond along Lo Bo Tay street (end of routes);
SW5: Giap Nuoc canal – An Trach Dong;
SW6: Cau Xang canal cross to Huong Lo 6 street;
SW7: Cau Xang canal cross to Nguyen Van Linh street;
SW8: Cau Xang canal cross to 23/8 street;
SW9: Ho canal.

Notes:

- ND: Not Detected LOD: level of detection ST: Spring-tide NT: Neap-tide
- QCVN 08-MT:2015/BTNMT: National Technical Regulation on Surface Water Quality.
- Class A2: Regulating water sources using for domestic water supply and must be properly treated; aquatic animals and plants conservation or other purposes as classes B1 and B2.
- Class B1: Regulating water sources using for irrigation or other purposes with similar quality requirement or other purposes as class B2.
- Class B2: Navigation/inland waterways and other purposes with the requirement of low water quality.

Remarks:

The analysis results show that organic pollution and high turbidity could be observed in canals and ditches in Bac Lieu city (TSS exceeds from 2.28 to 11.9 times; COD exceeds from 2.5 to 11 times; BOD_5 exceeds from 1.24 to 11.7 times; $P\text{-}PO_4^{3-}$ exceeds from 1.6 to 6.1 times; NH_4^+ exceeds from 1.4 to 4.36 times; Coliform exceeds from 2 to 12 times; E. Coli exceeds from 1.2 to 27 times in comparison with allowable values in QCVN 08-MT:2015/BTNMT - National Technical Regulation on Surface Water Quality.

For samples taken in Cau Xang canal, other parameters could be observed: DO is lower than the standard 0.9 to 1.4 times; Cl^- exceeds the standard from 1.5 to 1.9 times, E. Coli exceeds the standard from 2.7 to 21 times.

The reason for organic pollution is direct discharge of: (1) untreated domestic wastewater from people living along the canal and (2) wastewater, which contain a very high concentration of organic matter (i.e. feed residue) from aquaculture activities.

2.2.1.2. Groundwater quality

Currently, Bac Lieu gradually completes the clean water supply in the city. The majority of households and manufactures uses water supplied from local water plants for their living and production activities. Groundwater is mainly used for automobiles and motorbikes washing, livestocks and crops. Surrounding the project construction locations are densely populated areas without farming and livestock activities, and therefore, no demands for groundwater. Therefore, groundwater sampling was not considered in this report.

However, the existing data on the groundwater quality in Bac Lieu province carried out by Bac Lieu DONRE could be a good reference. The monitoring results showed that exceed of COD parameter in comparison with allowable limit in the standard of QCVN 09:2008/BTNMT, especially in both rainy and dry season during period of 2011-2014:

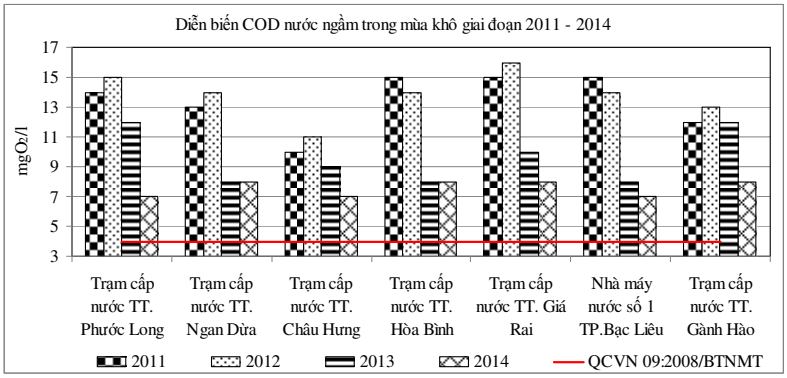


Figure 2.2: COD content in groundwater in the dry season (2011 – 2014)

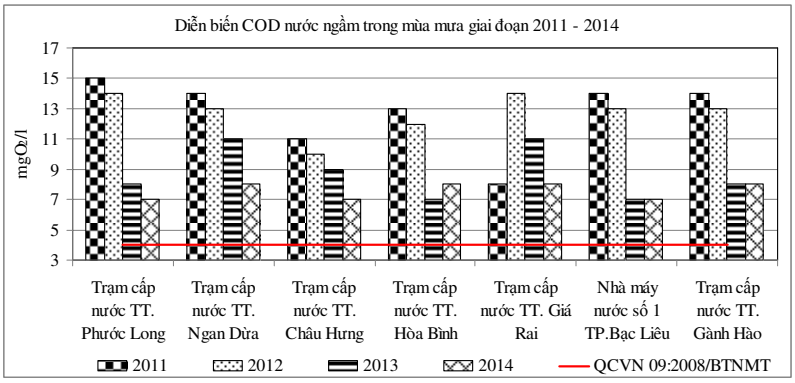


Figure 2.3: COD content in groundwater in the rainy season (2011 – 2014)

2.2.1.3. Domestic Wastewater Quality

Sampling sites and monitoring results are depicted in Table 2.3, respectively.

Table 2.3: Monitoring Results of Wastewater Quality

Code	Sampling location	Monitoring parameters										
		pH	**BOD_5**	**TSS**	**S^{2-}(per H_2S)**	**COD**	**N-NH_4^+**	**N-NO_{3-}**	**P-PO_4^{3-}**	**Coliform**	**Oil &Grease**	**Total Surfactants**
		-	mgO_2/l	mg/l	mg/l	mgO_2/l	mg/l	mg/l	mg/l	MPN/100 ml	mg/l	mg/l
WW1	Area vegetable wholesale market on Hoang Van Thu street	6.9	**109**	**359**	0.574	217.6	6.25	29.2	3.85	**12×10^5**	5.24	0.342
WW2	Residents living along Cau Xang Canal	6.87	**143.5**	**359**	0.864	268	5.76	26.5	3.12	**16.500**	5.48	0.256
WW3	Residents living along Cau Xang Canal	7.1	**51**	**261**	0.35	96	3.42	19.7	2.43	**6×10^8**	3.75	0.249
WW4	Khom market	7.3	**95.7**	**248**	0.175	192	3.12	18.6	2.11	**9×10^6**	2.94	0.186
QCVN 14:2008/BTNMT (Class B)		**5-9**	**50**	**100**	**4**	**-**	**10**	**50**	**10**	**5,000**	**20**	**10**

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

Comments: According to the analysis results, without any pretreatment steps, domestic wastewater in Bac Lieu city has high Coliform and BOD contents that are much higher than the national allowable limits in QCVN 14:2008/BTNMT (Column B). For example: BOD_5 exceeds from 1.02 to 2.87 times and TSS exceeds from 2.5 to 3.6 times.

2.2.2. Soil Quality

Sixteen (16) soil samples were collected for analyzing and assessing the baseline quality of the soils for which mitigation measures to be proposed for handling with excavated soils. Sampling sites and monitoring results of soil samples are shown in Table 2.4.

Table 2.4: Monitoring Results of Soil Quality

Code	Sampling site		Measurement and Analysis Parameters				
			As	Cd	Zn	Cu	Pb
			mg/l	mg/kg	mg/kg	mg/kg	mg/kg
S1	The starting point of Lo Bo Tay street (next the grave)		0.082	0.175	15.82	6.62	10.75
S2	Shrimp pond area along Lo Bo Tay street		ND	ND	ND	ND	ND
S3	Opposite Khanh Trang seafood processing company		ND	ND	12.57	8.75	7.25
S4	Low population areas along De Lo Ren street		ND	0.096	181.93	41.14	20.06
S5	Huong Lo 6, nearby Kenh Cau Xang bridge		0.475	0.065	63.2	36.75	15.75
S6	Opposite My Thu Electric – Electronics facility		ND	ND	12.92	4.76	ND
S7	Nguyen Tat Thanh street crosses to Nguyen Thai Hoa street		ND	0.035	14.75	3.82	ND
S8	Resettlement Area		0.075	ND	56.82	1.75	2.75
S9	Alley 13 Vo Thi Sau street		ND	ND	71.83	2.37	ND
S10	Midle of LIA 2 area		ND	0.128	42.75	25.74	5.35
S11	Alley next to Linh Chau pagoda		0.076	0.155	240.43	88.46	39.91
S12	Belong to LIA 3 area		ND	0.074	39.87	6.38	ND
S13	Low population area belong to LIA 6 area		0.137	0.052	83.25	4.53	8.37
S14	High population areas belong to LIA 6 area		ND	ND	9.96	5.45	ND
S15	Bordering Cau Xang canal, cemetery area		0.541	0.135	167.52	35.72	9.83
S16	Low population areas along Cau Xang canal		0.645	0.205	**379.33**	47.93	12.31
QCVN 03-MT:2015/BTNMT		**Industrial purpose**	**25**	**10**	**300**	**300**	**300**
		Agricultural purpose	**15**	**1.5**	**200**	**100**	**70**
		Residential purpose	**15**	**2**	**200**	**100**	**70**

Notes:

ND: Not Detected.

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

Remarks: The monitoring results show that:

- The content of Pb, Zn, As, Cd of monitoring soil samples meets the requirement of QCVN 03-MT:2015/BTNMT for industrial purposes; 15 out of 16 soil samples are suitable for the use of soils for industrial purposes. Only one soil sample (at the site of S16) has the concentration of Zn is 1.6 times higher than allowable level for industrial purposes.
- 14 out of 16 soil samples are suitable for the use of soils for agricultural and residential purposes. Only one soil sample (at the site of S11, S16) has the concentration of Zn is 1.2-1.9 times higher than allowable level for agricultural and residential purposes.
- The reason for this high content of Zn (at the site of S11, S16 samples) can be attributed by the use of fertilizer, pesticides. However, this is an exceptional case that may not have affect the soil environment. Further, this Zn content does not exceed the thresholds of hazardous waste in comparison with QCVN 07:2009/BTNMT – National technical regulation on hazardous thresholds.
- About 50 % excavated soils will be generated by the construction of civil works. This amount of excavated soils can be used for ground filling and leveling, the rest 50 % will be disposed of at regulated disposal sites. This case is no problem because the quality of excavated soils meets the requirement of industrial and residential purposes or can be applied for agricultural uses.

2.2.1. Sediment Quality

As per se the project's scope of construction works, the Cau Xang canals will be dredged. Accordingly, excavated sediment will be disposed at disposal sites. Therefore, canal sediment samples were collected for assessing the quality of dredging materials as baseline data. The sampling sites and monitoring results are shown in Table 2.5.

Table 2.5: Monitoring Results of Sediment Quality

Parameter	Monitoring result						QCVN 07:2009/BTNMT (ppm)	QCVN 43:2012/BTNMT (mg/kg)	QCVN 03-MT:2015/BTNMT (mg/kg)
	SM1	SM2	SM3	SM4	SM5	SM6			
Sampling site	Canal crossing Lo Bo Tay street	Canal crossing Lo Bo Tay street	Canal crossing Lo Ren street	At intersection of Cau Xang canal with provincial road (TL) 976	Along Cau Xang canal	Along Cau Xang canal			
	Heavy metal								
As	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	40	17	15
Pb	<5	<5	<5	<5	<5	<5	300	91,3	70
Cd	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	10	3,5	1,5
Zn	1.722	<1.5	<1.5	<1.5	<1.5	<1.5	5.000	315	200
Cu	<6	<6	<6	<6	<6	<6	-	197	100
Total hydrocarbon	<0.6	<0.6	<0.6	<0.6	1.8	2.2	-	100	-
	Organic Chlor – based Pesticides								
Aldrine	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 x10-^{3}	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	10	-	-
α-BHC, β-BHC, γ-BHC, δ-BHC	<0.045 $x10^{-3}$	<0.045 $x10^{-3}$	<0.045 $x10^{-3}$	<0.045 $x10^{-3}$	<0.045 $x10^{-3}$	<0.045 $x10^{-3}$	6	-	-
Endosulfan-I, Endosulfan-II	<0.006 $x10^{-3}$	<0.006 $x10^{-3}$	<0.006 $x10^{-3}$	<0.006 $x10^{-3}$	<0.006 $x10^{-3}$	<0.006 $x10^{-3}$	4	-	-
Endrin, Dieldrine, Heptachlor	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	0.2	0.0067	-
p,p'-DDT	<0.015 $x10^{-3}$	<0.015 x10-3	<0.015 $x10^{-3}$	<0.015 x10-3	<0.015 $x10^{-3}$	<0.015 $x10^{-3}$	20	0.0048	-
Chlordane	<0.045 $x10^{-3}$	<0.045 $x10^{-3}$	<0.045 $x10^{-3}$	<0.045 $x10^{-3}$	<0.045 $x10^{-3}$	<0.045 $x10^{-3}$	0.6	0.0089	-
Heptachlor epoxide	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	0.8	0.0027	-
DDE, DDD	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	<0.03 $x10^{-3}$	20	0.0058 - 0.0068	-
	Organophosphate pesticides								
Malathion, Parathion	<0.15 $x10^{-3}$	<0.15 $x10^{-3}$	<0.15 $x10^{-3}$	<0.15 $x10^{-3}$	<0.15 $x10^{-3}$	<0.15 $x10^{-3}$	2 - 20	-	-

Notes:

- QCVN 07: 2009/BTNMT: National technical regulation on hazardous waste thresholds.
- QCVN 03-MT:2015/BTNMT: National technical regulation on the allowable limits of heavy metals in the soils.

  QCVN 43:2012/BTNMT: National technical regulation on sediment quality.
- (-): Not regulated.

The monitoring results of sediment samples are compared with QCVN 43:2012/BTNMT – National technical regulation on sediment quality; QCVN 03-MT:2015/BTNMT – National technical regulation on the allowable limits of heavy metals in the soils; and QCVN 07:2009/BTNMT – National technical regulation on hazardous waste thresholds. The results show that:

- In comparison with QCVN 07:2009/BTNMT, all monitoring parameters meet the requirement of national permitted levels. This means that sediments from rivers and canals are not contaminated by heavy metals as their concentrations are much lower than permissible levels.
- In comparison with QCVN 43:2012/BTNMT for freshwater sediments, all measured values of 10 sediment samples meet the national regulated standards.
- As monitoring sediment samples meet the requirements of QCVN 07:2009/BTNMT (hazardous waste thresholds) and QCVN 03-MT:2015/BTNMT (limits of heavy metals in the soils). Thus, the sediments from the canals (96,260 m^3) 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 No. 4 – Trang An disposal site.

2.2.2. Aquatic Environmental Quality

Sampling sites are presented in Table 2.6 below.

Table 2.6: Aquatic Sampling Sites

Code	Sampling site
AQ1	Canal crosses to Lo Bo Tay street
AQ2	Canal crosses to Lo Bo Tay street
AQ3	Canal crosses to De Lo Ren street
AQ4	Cau Xang bridge crosses to HighWay 976
AQ5	Cau Xang canal
AQ6	Cau Xang canal

2.2.2.1. Plankton

❖ **Zooplankton**

Characteristics of species composition

The analysis results recorded 13 species and 2 larval forms. The Copepoda is dominant in the species composition with 53.3 %. Cladocera and Larva species account for 13.3 %, Oligochaeta, Ostracoda, Mysidacea for 6.7 %.

- Estuary and coastal species were observed, including: Paracalanus parvus, Schmackeria bulbosa, Acartia clausi, Acartiella sinensis, Oithona similis, Oithona brevicornis, Mesopodopsis slabberi.
- Indicator species for acidity water are *Stylaria fossularis, Heterocypris anomala*.
- Indicator species for nutrient-rich water environment are Moina dubia, Ceriodaphnia rigaudi, Acartia clausi, Oithona similis, Oithona brevicornis, Thermocyclops hyalinus.

Number of individuals and dominant species

The density of zootoplankton in the survey area ranges from 23 to 92 individuals/sample. Species: *Moina dubia, Oithona similis, Thermocyclops hyalinus* and *Mesopodopsis slabberi* are the dominant species.

❖ **Phytoplankton**

Characteristics of species

The Bacillariophyceae species account for 47.9 %, Cyanophyta for 16.6 %, Chlorophyta for 22.9 %, and Euglenophyta for 12.6 %. Some collected species help determine the river and canal salinity in the Subproject area.

- The indicator species acidic water are not much, including Phormidium tenue, Dinobryon sertularia, Silic Navicula phyllepta, Navicula clementis and Chodatella subsalsa,Closteriopsis longissima, Closterium acutum, Closterium macilentum distributed at the sampling locations.
- The indicator species for organic-contaminated and nutrient-rich environment, including *Cyanobacteria, Euglenophycota, Pandoriana moum, Pediastrum duplex, Scenedesmus javaensis, Scenedesmus quadricau*, distributed at the sampling locations.
- The number of plankton plants ranges from 475 – 4,400 individual/sample. The Silic *Cyclotella comta, Actinella, Guianensis*, as indicators for nutrient-rich environment, are predominant.

2.2.2.2. River-bed Invertebrate (large size)

Species structure

Approximately 15 large invertebrate species with predominance of Gastropoda species were detected. These include one species (6.6 %) of *Crustacea*, 10 species (66.7 %) of *Gastropoda*, and 4 species (26.7 %) of *Bivalvia.*

The coastal and estuary groups that migrate inland include: *Ocypoda ceratophthalma, Nerita (Nerita) articulata, Littorina scabra, Melampus fasciatus, Pythia plicata, Chicorus capucinus, Clea (Anentome) helena, Novaculina siamensis.*

The indicator species for acidic water include: *Sermyla tornatella, Melanoides tuberculatus, Lymnea viridis.*

The density and the most dominant species

The large invertebrate density in the survey area ranges from 9 – 56 individuals/sample with predominance of some species as *Littorina scabra, Sermyla tornatella, Novaculina siamensis.*

2.3. SOCIO-ECONOMIC CONDITIONS

2.3.1. Economic Development Situation

In 2015, the economic growth of Bac Lieu city reached 16.63%. This is a high growth rate in comparison with other localities in the country. The economic structure shifted towards increasing the proportion of industrial, construction and trading/service but at low speed.

Economic structure of Bac Lieu city in 2015 includes 45.57 % of services, 42.04 % of industries and construction, and 12.39 % of agriculture and fisheries.

Industrial –small handicraft

Industrial production and small handicraft of Bac Lieu city have relatively developed, meeting the market's demand. Value of industrial production and small handicraft in 2015 reached 1,193,288 billion dongs. There are 892 production facilities all over the city with 4,006 labors.

Agriculture - fishery

Agricultural production

Crops and secondary crops: in 2015, total rice productivity reached 11,705 tons, total secondary crop productivity reached 6,630 tons (mainly watermelon, calabash of all types, vegetables…).

Breeding sector: Cattle and poultry in the city develop relatively stable. By the end of 2015, there area 14,626 livestock (14,100 pigs, 223 cows and buffaloes, 291 goats); poultry of 26.672 (17,712 chickens, 8,960 ducks).

Aquaculture and fishery

In 2015, total fishery productivity is 38,545 tons (18,175 tons of shrimp, 20,370 tons of fish and other marine products). In general, fishery productivity increases gradually from 2012-2015. However, production meets many difficulties like: unsynchronous irrigation system, lacking of investment fund for production, prolonged sunny and hot condition making salinity of the shrimp farming increase, causing bad impacts on shrimp farming condition…

Trading – Service sector

Trading activities in 2015 continued to grow, total retail sales reached 7,486,819,000,000 billion dongs, 4,600 facilities all over the city with 15,802 lablors.

Since 2015, Bac Lieu city has opened Bac Lieu shopping center and Hiep Thanh market in Hiep Thanh commune with relatively stable prices for goods and compliance of the sellers with the regulation on price listing.

Tourism has been developed with 840,000 visits (25,800 international visits) and 261,000 visits using accommodation service. Total revenue from service and tourism is around 810 billion dongs.

2.3.2. Social Conditions

Population

Bac Lieu city a grade 2 with 10 administrative units of wards/communes (wards 1,2,3,5,7,8, and Nha Mat ward) and 3 communes (Hiep Thanh, Vinh Trach and Vinh Trach Dong). Population of the city by the end of 2015 is 155,194 people, population density is 887 people/km^2.

The Bac Lieu subproject covers 7 wards of the city. Total natural area of the project is 63.66 km^2, population is 116,667 people, accounting for 75.17 % population of the city. Population density of the project area is 2 times higher than the average population density of the city (1,833 people/km^2)

Ethnic

The survey carried out in the project area showed that Kinh people accounting for the major percentage (85.2 % total questionaires). Two ethnic minorities distributing in the region are Khmer (accounting for 7.9 %) and Chinese (6.9 %).

Gender

Gender is one important aspect in the interview as well as in social issues. Female-Male ratio reflect equilibrium and gender equality in family and society. Both genders have right to give out comments, makingdecision and discussing problems with each other. The surveyed results show that there is no big gap in male-female ratio in Bac Lieu city, specifically: 751/1263 surveyed people are male, accounting for 59.5 % and the percentage of female is 40.5 %. For wards in the city, Nha Mat ward has the greatest difference between male-female participating into the survey (69.4 % male, 30.6 % female) while ward 1 and ward 7 have rather similar percentage.

Vulnerable households

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

Education and healthcare

Education

Education reflects civilization and development of the country and society. Surveyed results in the project area show that 96.7% of children at school go to school. 42/1263 surveyed families in ward 5, 3 households in ward 8 and 6 households in Nha Mat ward still having children not going to school, accounting for 3.3 %. Ward 3 and ward 7 have implemented well the general education program with 100% schooling children.

Educational background of the people participating in the survey is mainly primary education level (accounting for 32.6 %); secondary (32.1 %). Number of people with highschool education account for 10.8 %; college/university and post graduate 17.7 %. However, there are still 6.7 % illiterate or uneducated, mostly concentrating in poor households in Nha Mat ward and ward 2. To improve people's knowledge and capacity to learn new technical and scientific advances as well as improve community's integration, education for people in general and children in particular is the vital task for each nation for its own development and prosperity.

Health

Percentage of sick people in the last two months before commencing this survey is 484/1263 people, accounting for 38.3 %; this is a rather high percentage and is the warning for community health in the project area.

In fact, the patients may have one, two or more symptoms of different diseases. 100 % of the sicked people answered the sheets about their sickness and condition of members in their family. The most common disease are colds, fever, headache with 465/484 votes (equivalent to 96.1 %), 41.1 % of frequent disease is headache. Other diseases such as dengue, diarrhea, injury, typhoid get small percentage.

here area many reasons for diseases in the community. The main reason as identified by the community is given as: environmental pollution (41.7 %), crowded housing (8.5 %), poor diet (11.2 %), flies and pests (30.0 %) and 27.1 % as other causes (living habits, low awareness of the community on prevention, care and treatment, the other objective factors ...). Thus the main cause leading to disease in the community in project area is unqualified living condition and environment. In addition, dirty houses and littering, unqualified food… can cause diarrhea and facilitate other disease agents.

Employment and Income - Expenditure

Employment

Sectoral infrastructure in an area reflects the socio-economic development orientation of that area. The amount of employment opportunities reflects economic development situation in the region. The process of surveying sectors in the project area is carried out to give out an overall assessment of the employment situation in the region, to be the basis for evaluating the economic potential of the region. The survey results show that hired labor force working in company/enterprise/production facilities account for the highest percentage (44.0%), people working in trading/service sector account for 15.4%, followed by 13.0% of people working in state-owned enterprises, state agencies…Percentage of unemployed people accounts for 7.5% in the surveyed people.

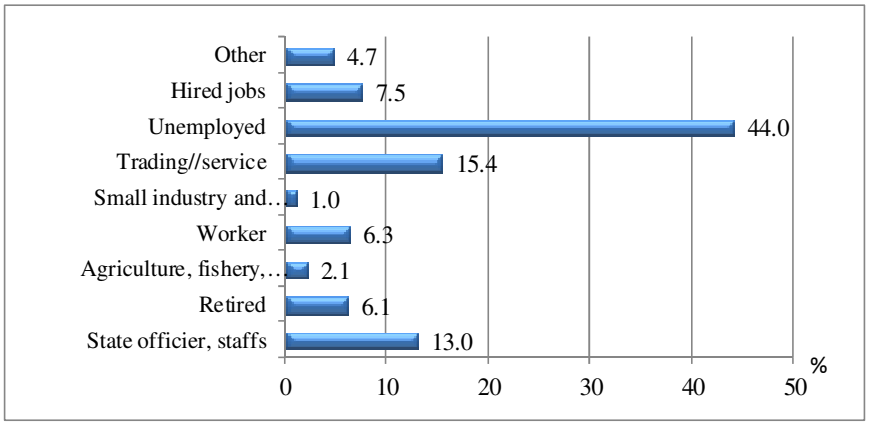


Figure 2.4: Employment status of the surveyed people

Career opportunities and selections relate directly to educational background of the people. The results of the survey are very practical: people illiterate or not completing primary school usually take seasonal hired jobs or doing their own small business; for those graduating from highschool, college or university or post graduate, they have more job selections.

In addition, job opportunities and job selections related directly to household economic condition. The survey results show that, poor households are those mainly having hired jobs (71.1 %), which are low-paid and seasonal, not very stable.

When being asked about members with stable jobs in the family, most people answered that people having stable jobs are state officers, workers, shop's owners, staffs in companies, small businesses… Employed people contributing into income of the family are generally 2 people (accounting for 40.4 %), 3 people (accounting for 25.6 %), 1 person (accounting for 17.2 %) and 4 people (accounting for 10.1 %). The percentage of families having 5-9 working people is very small, from 0.1-4.4 %.

Income - Expenditure

Income

When assessing the per capita income and revenues by household economy, there is clear gap between the poor household and rich households in the area: income per capita of rich households (5,182,903VND/person/month), 8.7 times of the income per capita of poor households (594,593VND/person/month), 3.7 times higher in comparison with medium households (1,365,965 VND/person/month), and 2.3 times higher in comparision with good households (2,2995,962 VND/person/month); poor households having income mainly from salaries/monthly and other source (hiring, taxi…) while rich households having revenues mainly from salaries and business activities.

Monthly average income of households is approximately 6.7 million dongs. Income per capita of people in poor households as assessment of surveyor is 594,593 VND/person/month, much lower than income per capita for standard of poor urban resident in 2016 – 2020 under Decision No.59/2015/QĐ- TTg by Government dated 19 September 2015 (900.000 VND/person/month). For wards, the two wards having lowest household income are ward 8 and ward 2, with average income of 5,184,520 VND/household/month and 5,247,450VND/household/month respectively. Ward 3 has the highest income in the project area (8,248,410VND/household/month) and there is no household with income lower than 2,000,000VND/month in this ward.

Proportion of households having income lower than 2 million dongs is 4.8%; most of households having income from 6÷10 million dongs (accounting for 43.1 %); households having income from 2÷6 million dongs account for 39.9 %; 12.2 % of households having income higher than 10 million dongs per month. Ward 8 is the ward having highest percentage of low-income households (less than 2 millions per month) in contrast with ward 5 which is the ward having 23% households of high income (over 10 millions per month).

These results show that there is clear gap between rich and poor in the city area, which is also one popular issue in Viet Nam's cities. It is required to have reasonable investment policy and action plan from the Government and authorities of all levels to increase living conditions for people in low-income area and to gradually clear the gap between the rich and poor in the city in particular and in the society in general.

Average expenditure

Average expenditure and the distribution of expenditure reflect priorities of households for their daily needs (food, travel and other living expenses) and needs for education, healthcare, entertainment, beauty…Generally, households with low income can only afford to pay for the essential items of life (food, electricity, water ...), while medium and rich households can have greater spending amount.

Average expenditure of one household per month is 5,5 million dongs all over the project area. There is great gap between the average expenditure of rich households (13 millions/month), 5.6 times higher than average expenditure of poor households (2.3 millions/month). In general, households with higher income will have higher expenditure but higher savings.

2.4. INFRASTRUCTURE CONDITIONS

2.4.1. Traffic connection

2.4.1.1. External traffic

Roadways

- Highway 1A: Crosses from the North of the city, connect Ho Chi Minh city with other provinces in the MD region via important intersections of Hung Vuong street and Tran Phu street. Width roadbed is 12 m, paving asphalt.
- Nam Song Hau: Connect Bac Lieu city with Soc Trang province, standard level III, road limit 46m, width roadbed 12 m. Section running throughs Bac Lieu city is 33 m (roadbed 2 x 9 m) to 42 m (roadbed 2 x 12 m) in width with 2 layers asphalted.
- DT977 street: (Giong Nhan street – Go Cat): connect Bac Lieu city with SocTrang province, to Dong Hai district, Bac Lieu province (begin point at Vinh Trach Dong commune, Bac Lieu city, end point at T-junction of Go Cat, Long Dien Tay commune, Dong Hai district. It has width road 6m, roadbed 3.5 m.
- DT977B street (Thuan Hoa street – Xiem Can): Width road 6.5 m, roadbed 3.5 m.
- DH36 (East Sea dyke): is the coastal road of Bac Lieu province, section throughs Bac Lieu city has length 12 km.

Waterways

- East Sea: in the South of Bac Lieu city, facilitating international exchange and development of tourism.
- Ca Mau – Bac Lieu canal: managed by the Central Government, begin point at Soc Trang and end point at Ca Mau, section running through Bac Lieu province is 48.5 km in length, 40 m in width, 7 m in depth, river level III.
- Co Co – Bac Lieu canal: managed by the Central Government, begin point at Soc Trang and end point at Ca Mau, section throughs Bac Lieu province has length 18 km, width 40 m, depth 7 m, river level III.
- Cau Sap – Ngang Dua canal: Canal level V, managed by provincal administration; begin point at Phung Hiep canal and end point at Ca Mau – Bac Lieu canal, width 20 m, depth 1.2 m.
- 30/4 canal: Canal level V, managed by Bac Lieu province administration, , begin point at Bac Lieu river and end point at East Sea, length 8.8 km, width 20 m, depth 1.2 m.

Headworks traffic

- Roadway: Intercity bus station in ward 7, Bac Lieu city.
- Waterway: with Nha Mat estuary and seaport, it has ability to build seaport, tourism harbor to facilitate development of sea traffic.

2.4.1.2. Internal traffic

- 23/8 street: the main urban street, from Tran Phu street to Cau Sap bridge, which 4 km long, and 31 m wide.
- Tran Phu street: the main radial axis street, section from Vanh Dai street to Ba Trieu street has width of 31 m; section from Ba Trieu street to Hai Ba Trung street has width 32.5 m; sectionfrom Hai Ba Trung street to Kim Son bridge has a width of 33.5 m.
- Cao Van Lau street and Bach Dang street: are the main streets connect from Kim Son bridge to Nha Mat bridge, 8.639 km in length, 30 – 58 m in width.
- Tran Huynh street: the main horizontal street, is from Vo Thi Sau street to Cau Xang canal has width of 26.5 m.
- Vo Thi Sau street: section from 23/8 street to Tran Huynh street has width 26.5 m, section from Tran Huynh street to Ba Trieu street has width 21 m, section from Ba Trieu street to Bac Lieu bridge has width 26.5 m.
- Nguyen Thi Minh Khai street: the main horizontal street has width 26.5 m.
- Hai Ba Trung street and Hoa Binh street: width 26.5 m.
- Bridges: Kim Son bridge, Bac Lieu 2 bridge (Ton Duc Thang bridge), Bac Lieu 3 bridge, Cau Xang bridge, Cau Ke bridge, Vuon Chim bridge, Truong Son bridge, Nha Mat bridge.

2.4.2. Water Supply Network

- Currently, there are two operating water supply plants with a total capacity of 22,000 m^3/day in Bac Lieu city.
- Water Plant No.1: located in Ward 1, capacity of Q = 10,000 m^3/day, exploiting 04 wells with depth of 120 – 250 m;
- Water Plant No.2: located in residental area of Ward 5, capacity of Q = 12,000 m^3/day, exploiting 04 wells with depth of 140 – 170 m; A water tower located in Tran Huynh street (volume W = 150 m^3, 22 m in height, made of reinforcement concrete), is still operating.

- Groundwater is exploited from Pleistocene aquifer with 08 wells 120 – 250 m in depth, which are managed by Bac Lieu Water Company to serve for urban residents.
- According to the data of Water Company and Center for Rural Clean Water and Sanitation, the total length of transmission and distribution network in Bac Lieu city is 44,459 m, diameter of pipes Φ60- Φ500.
- 100 % urban residents is supplied with clean water, water use standard of 120 l/person-day at a lost rate of 32 %.

In general, the current system can provide enough water to serve socio-economic development in Bac Lieu City. In the future, because rapid development of residential areas, industrial zones and resorts, it is required to upgrade and built more water supply systems to ensure for domestic and industrial purposes.

2.4.3. Current status of solid waste collection and treatment

Collection

The Center for Urban Service is responsible for collection and transportation of residential waste (including domestic waste at hospitals and production facilities, etc.) in Bac Lieu city. Wastes, in the alleys, will be collected and brought to gathering points by local residents, or to transferstation in main roads by Residential Clusters with trolleys (through an economic contract) before 4 AM and 12 PM. Wastes, after that, will be continuously collected and transported to Bac Lieu landfill by collection trucks of Bac Lieu Center of Urban Service

In Bac Lieu city, the Center for Urban Service carries out 04 collection routes at residential areas and 1 collection route at agencies with from 2 – 5 trips/day.

- Route 1: 5 trips on 2 shifts per day, morning shift works at 4:00 – 5:00 a.m, afternoon shift works at 14 – 16:30; collection boundary: ward 2, ward 5 and a part of ward 3. Roadmap of this route is from houses of ward 2, T-junction Nguyen Trung Truc – Cao Van Lau, Tran Phu business center (HB), Market of ward 2, Cemetery of ward 5, Chua Cau pagoda on Ton Duc Thang street ward 5, Primary School of ward 5, Dormitory ward 5, College of Medicine, Bac Lieu Hospital, Vo Thi Sau bridge ward 3, Son Ca 2 Kindergarten.
- Route 2: 5 trips on 2 shifts per day. Roadmap of this route is Vo Thi Sau street, extended Tran Phu street, Le Van Duyet street. Some collection points: T-junction Nguyen Dinh Chieu – 23/8 street, Xom Moi market, Dat Ngoc B cuisine on Vo Thi Sau street, port bus station, Tran Huynh park, Phung Ngoc Liem school on Le Van Duyet street.
- Route 3: 5 trips on 2 shifts per day, morning shift works at 4:00 – 5:00 a.m, afternoon shift works at 14 – 16:10. Roadmap of this collection route is Tran Huynh street, Hoang Dieu street, a part of extended Tran Phu street, a part of Le Duan street, a part of Cach Mang street. Some collection points: Tran Huynh school, Tran Huynh market, Cau Xang market, Print factory on Hoang Dieu street, water treatment plant, Bac Lieu University, Department of Natural Resources and Environment on Le Duan street, Chamber of education and training Bac Lieu city.
- Route 4: 3 trips per day from 9:30 AM to 14:00 PM. Roadmap of this route is ward 8 and Nha Mat ward. Some collection points: Tra Kha dump, Market of Ward 8, Cau Sap bridge, Tra Kha industrial zone, Beer factory, Hiep Thanh Clinic, People's Committee of Nha Mat ward, Viet Uc Company, Huong Bien restaurant, Army barrack.
- Route 5 – Agencies: currently, wastes are collected by Center of UrbanService from 7:30 to 9:00 a.m. Roadmap of this route is Labor Federation, administrative agencies on Tran Huynh ward 1 and on Nguyen Tat Thanh street, Social Protection, Police's dormitory 19/8, Bac Lieu University on Vo Thi Sau street, Agri bank on Tran Phu street, BIDV on Tran Huynh street, Lamps factory on Le Duan street.

Total garbage bins of Bac Lieu city are about 776 bins with different sizes (highest number is type 660 L with 398 bins, the rest is 240L with 342 bins and 120L with 36 bins). In addition, 50 kg/day of medical hazardous waste from Bac Lieu Hospital is burned in incinerator of hospital.

Treatment

The landfill of Bac Lieu city is located in Tan Tao hamlet, Chau Hung town, Vinh Loi district, which is about 3.5 – 10 km far from the project site. This landfill, with total area of 8.2 hectares and capacity of 100 tons/day, has function to receive and treat all wastes generated in Bac Lieu city, including domestic waste, waste sludge and construction waste.

2.4.4. Electrical System

Bac Lieu city is powered from the national power grid through 110/22 Kv – 2x40 MVA Bac Lieu station (located nearby the city's bus station) and 220/110 kV – 250 MVA Bac Lieu station (400m far from the station 110kV Bac Lieu to the North). The medium-voltage lines was built and operated at a voltage of 22 kV, all the overhead lines, use aluminum cable, aluminum conductor steel throughs on centrifugal concrete pillars 10 – 14 m high.

2.4.5. Drainage and Wastewater Treatment

Currently, the sewerage system of Bac Lieu city is the common one; built through many different stages including sewers, box culverts and ditches. This system is mainly concentrated in the inner city with major discharge flow to Bac Lieu River. Currently, many sections have been downgraded, causing inundations in some residential areas.

The total length of sewer is 46,925 m, including 1,434 manholes and sewer systems from other residential areas; 19 outlets on the inner roads; 04 pumping stations with a capacity of 10,000 m^3/h to pump forcibly when the tide rises and flooding due to heavy rain.

Domestic wastewater is partially treated by septic tank before discharging into the common system. No wastewater treatment plant is available in this city.

Watewater in suburban is discharged naturally into lakes, canals and into Ca Mau – Bac Lieu river. In addition, in places where drainage system is unvailable, sewage drained in the natural terrain and penetrates into the ground causing environmental pollution.

Inundation status

Drainage of most wards is bad when heavy rain due to large water flow while the small drain, creating great water pressure in the exhaust pipe, difficult circulation, causing flooding. Only drainage system of ward 7 and Nha Mat ward was rated as the best in the project area (over 60 % rated in all conditions). In some places, the drainage system to perform poorly even when it does not rain, this ratio is in wards 2, 7, 8 and Nha Mat ward 2.0 %, 2.9 %, 2.4 % and 9.1 % respectively.

2.5. ENVIRONMENTAL AND SOCIAL CONDITIONS AT THE SUBPROJECT SITE

Natural, socio-economic current status in the project implementation area is very important data for environmental impact assessment. Therefore, this natural, social-economic current status will be presented into details by each investment item of components.

Component 1: Upgrading level 3 infrastructure for 05 LIAs (LIA 1, LIA 2, LIA 3, LIA 5, LIA 6) within the scope: Expanding main alleys with the minimum width of 4 m, upgrading the existing small alleys with a minimum width of 2 m; synchronous investment in the technical infrastructure including water supply, drainage, lighting, green trees and provision of trash bins.

Upgrading LIA 1

LIA 1 has total area of 1.8 ha, located in ward 7 and bound by Vo Thi Sau street, Hoa Binh street, Tran Phu street and Tran Huynh park.

Households are mainly concentrated along main alleys surrounding the LIA such as Vo Thi Sau, Tran Huynh and Tran Phu streets. Meanwhile, along alleys, households are distributed sparsely, mainly vacant land interspersed with housing and garden land. Resident's houses mainly include corrugated-iron houses of class 4. Work force mainly engages in seasonal jobs, small business or hired jobs, etc.

There are 10 ethnic minority households in the Subproject area, in which: 9 Khmer households and 01 Cham household.

Most of the alleys connecting to residential areas are concrete ones with width of 1-4 m. Technical infrastructure is asynchronously invested, about 20 % of alleys has sewer systems directly connecting to sewer systems of the city, and the rest does not have sewer systems, so water will penetrates into land or overflows into lower areas. The project covers investment in upgrading 2.6 km of the alley in LIA 1. Upon upgrading, water drainage system in the LIA will be connected to the water drainage system of the city.

Sensitive receptors within the project scope include Bac Lieu provincial continuing education center, adjacent to alley No.13, Vo Thi Sau street. See section 2.6 for detailed description of this works.

Material and waste transport route during the construction of LIA 1: Cao Van Lau street → Ninh Binh street→ Vo Thi Sau street→ Hoa Binh street → Tran Phu street→ Highway 1A.

Location of LIA 1

Current status of LIA 1

Upgrading LIA 2

LIA 2 has total area of 2 ha, located in ward 1 and bound by Le Duan, Hoang Van Thu, Cach Mang Thang 8 streets and Highway 91C.

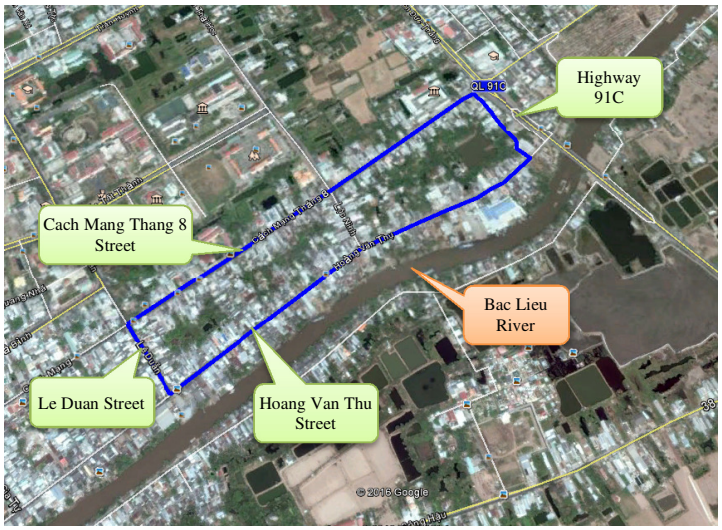
Most of alleys in the LIA has narrow width with concrete interspersed with earth structure. About 10 % of alleys has sewer systems directly connecting to sewer systems of the city, and the rest does not have sewer systems, so water will penetrates into land or overflows into lower areas. The project covers investment in upgrading 3.45 km of the alley in LIA 2. Upon upgrading, water drainage system in the LIA will be connected to the water drainage system of the city.

The LIA has small natural canals which drain water and stagnant ponds, lakes. Residents indiscriminately discharge waste, causing environmental pollution and restricting flow. Most of alleys are flooded during rainy season. About 130 m of the canal in LIA 2 will be dredged.

There are 02 Khmer households in the Subproject area.

There are no PCRs. Sensitive receptors within the project scope include Linh Chau Pagoda.

Material and waste transport routes during the construction of LIA 2: Cao Van Lau street → Tran Phu street → Cach Mang Thang 8 street→ Highway 91C→ Highway 1A.



Location of LIA 2

Current status of alleys in LIA 2

Upgrading LIA 3

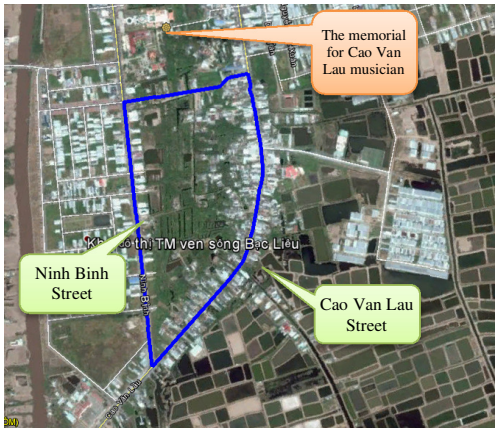
LIA 3 has total area of 12 ha, located in ward 2, Bac Lieu city, bound by Cao Van Lau, Ninh Binh streets and adjacent to the memorial for Cao Van Lau musician.

Similar to aforesaid LIAs, alleys in LIA 3 are small concrete ones with width of 1.5-4 m. Technical infrastructure has not been investment with about 90 % of the alleys having no water drainage system, leading to frequent flooding. The project covers investment in upgrading 2.3 km of the alley in LIA 3. Upon upgrading, water drainage system in the LIA will be connected to the water drainage system of the city along Cao Van Lau street. There are lots of vacant areas and low areas at middle of the LIA. Population is distributed sparsely with mainly corrugated-iron, brick wall houses.

There are 02 PCRs along the alleys under the item of upgrading LIA 3 Vinh Phuoc An pagoda is located along an unnamed alley on Cao Van Lau street; Phuoc An pagoda is located on alley 7, Cao Van Lau street.

There are 07 Khmer households in the Subproject area.

Material and waste transport routes during the construction of LIA 3: Cao Van Lau street→ Tran Phu street→ Highway 1A.



Location in LIA 3

Upgrading LIA 5

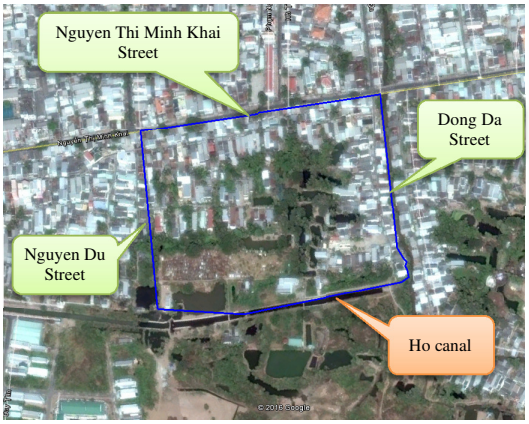
LIA 5 has total area of 8 ha, located in ward 5, Bac Lieu city, bound by Nguyen Thi Minh Khai, Nguyen Du, Dong Da streets and Ho canal along Nam Ky Khoi Nghia street.

Population is relatively dense. Some 4 m wide alleys have been newly constructed with full technical infrastructure. Remaining alleys have cement concrete structure interspersed with earth sections without water drainage system or lighting system. At present, these canals receive wastewater from residents surronding the area, so they are seriously polluted. The project covers investment in upgrading 1.57 km of the alley in LIA 5. Upon upgrading, water drainage system in the LIA will be connected to the water drainage system of the city.

There are 02 PCRs along the alleys under the item of upgrading LIA 5 Cemetery of Bac Lieu Buddhist Association and Ong Chau temple are located near alley 5 on Dong Da street. See section 2.6 for detailed description of this works.

There are no Khmer households in the Subproject area.

Material and waste transport routes during the construction of LIA 5: Cao Van Lau street → Nguyen Thi Minh Khai street→ Highway 91C→ Highway 1A.



Alleys in LIA 5

Upgrading LIA 6

LIA 6 has total area of 16 ha, located in ward 8, Bac Lieu city, bound by 23/8 street, Tra Kha street and 02 canals running into agricultural land in LIA 6.

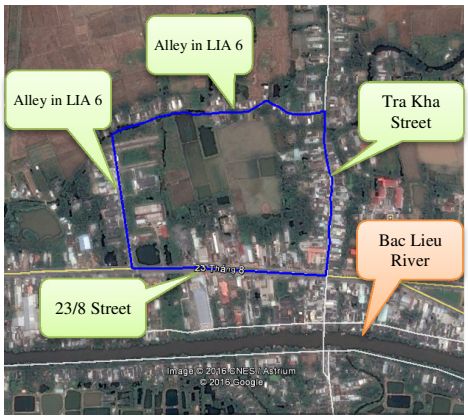
Most of land in LIA 6 is land for rice cultivation, garden land. A small proportion of residents living along 23/8 street has relatively good economic status because this is the main route leading to National Highway 1 and near Tra Kha and Khom markets. However, residents along Tra Kha street and small routes in the LIA 6 have lower economic status because they rely on agriculture.

Houses in the area mainly include 4th class (Class IV) or temporary houses. Labors engage in agricultural section, hired jobs and small business etc. In the LIA is a canal which drains water. The canal does not cut any alleys which are proposed for widening under the project. The project covers investment in upgrading 0.85 km of the alley in LIA 6. Upon upgrading, water drainage system in the LIA will be connected to the water drainage system of the city.

There are 68 Khmer households in the sub-component.

There are no PCRs or sensitive receptors along the alleys under the item of upgrading LIA 6.

Material and waste transport routes during the construction of LIA 6: Cao Van Lau street → Ninh Binh street→ Vo Thi Sau street→ 23/8 street→ Tran Phu street→ Highway 1A.



Alleys in LIA 6

Component 2: This component supports improvement of infrastructure network connectivity between LIAs with downtown areas through a complete network of roads, and rehabilitation and improvement of drainage capacity for canals in the city center Main investment items include: Constructing 05 new roads (Lo Bo Tay street, Lo Ren street, Huong Lo 6 street, internal roads to the West of Nguyen Dinh Chieu street, extended Hai Ba Trung street) and rehabilitating 01 canal in the inner city (Xang canal, section from Tra Kha to Tra Khua). Current status in the project implementation area is presented as follows.

Subcomponent 2.1: Rehabilitating Cau Xang canal, the section from Xang bridge to Tra Kha Tra Khua canal

Constructing Cau Xang canal embankment with total length of 4.5 km, including 5 sections:

- Section 1: 0.9 km long from intersection with Xang canal bridge to pumping station. Hard embankment in combination with soft embankment:
  - (i) Hard embankment: vertical, reinforced concrete structure with height of 2.0 m from the canal bottom;
  - (ii) Soft embankment: earth embankment, tilt, with height of 0.8 m, slope 1:1, width of 0.8 m with grass cover;
  - (iii) The green space above soft embankment has height of 0.4m, width of 0.6 m, slope 1:1.5 with trees planted above.

- Section 2: 1.0 km long from the pumping station to the end of existing stone section. Only constructing hard stone embankment for the section which has not been reinforced, tilt, slope 1:1, height 2.20 m and width of 3.2 m.
- Section 3: 1.2 km long from the end of existing stone section to Nguyen Thai Hoc street. Its structure is similar to that of section 1.
- Section 4: 0.6 km long from Nguyen Thai Hoc street to Tran Huynh street. Its structure is similar to that of section 2.
- Section 5: 0.8 km long from Tran Huynh street to Bac Lieu River. Its structure is similar to that of section 1.

Cau Xang canal is 4.5 km long and 4-30 m wide, starting from Xang canal bridge (on Huong Lo 6) and ending at Bac Lieu River. The canal runs through ward 1, ward 7 and ward 8, Bac Lieu city. The area of Cau Xang canal to Tra Kha - Tra Khua has been sedimented and seriously polluted because of waste discharged from households along the canal banks. At the same time, houses of these households are encroaching the canal bed, obstructing flow and causing dangers for the resident's daily lives.

Along Km0+00 to Km2+630, population is dense. There are 5 main asphalt roads of Bac Lieu city cutting across the canal (district road, Tran Huynh, Nguyen Van Linh, Nguyen Thai Hoc, Hung Vuong streets) with box culverts under the sections, length of 20– 40 m, width of 4-25 m, connecting Bac Lieu city center with suburbs at: Km0+160, Km0+820, Km1+260, Km1+360, Km2+090 and Km2+320.

From Km2+630 to Km4+020: Population is sparse. Houses mainly include temporary and class 4 ones. Residents livling along the canal use small wooden or concrete bridges to travel outside. There are about 9 temporary bridges along this alignment. Some small bridges with weak structure will be removed for the project implementation.

From Km4+020 to Km4+800: This area has high population density and roads connecting to households. The section under the project will be cut across by 03 internal roads at: Km4+340 (concrete bridge), Km4+450 (box culvert) and Km4+640 (box culvert).

There are 24 Khmer households, but no PCRs and sensitive receptors in the Subproject area.

Material and waste transport routes during Cau Xang canal rehabilitation:

- Cao Van Lau street→ Cach Mang street→ Highway 91C → Highway 1A.
- Cao Van Lau street → Ninh Binh street→ Vo Thi Sau street→ 23/8 street→ Tran Phu street→ Highway 1A.

Location of Cau Xang canal

Current status of Cau Xang canal

Subcomponent 2.2: Upgrading, widening Lo Ren street

The subproject will upgrade the existing road with length of 6km with full technical infrastructure along the alignment (rainwater drainage sewer system, wastewater collection system, lighting system and green trees). The road is divided into 02 sections with the following scale:

- Section 1: From Nguyen Thi Minh Khai street to external belt road with length of 3.2 km, width of 26.5 m (15 m wide pavement, 2 m wide separator strip and 4.75 m wide sidewalk for each side). Along section 1, constructing 3 box culverts (30 m long, size (2x2.5)m, 2x(2x2.5)m and (2x2.5)m) at Km0+900, Km1+585 and Km2+885 respectively.
- Section 2: From external belt road to Giong Nhan street with length of 2.8 km, width of 30.5 m (15 m wide pavement, 7.5 m wide separator strip and 11.5 m wide sidewalk for each side). Along this section, constructing 6 box culverts (34 m long, size of 2x2.5 m, at Km3+750, Km3+950, Km4+040, Km4+290, Km4+600, Km5+670); constructing 1 reinforced concrete bridge (3 spans with length of 12.5 m = 37.5 m, width of 9.8 m) at Km3+385.

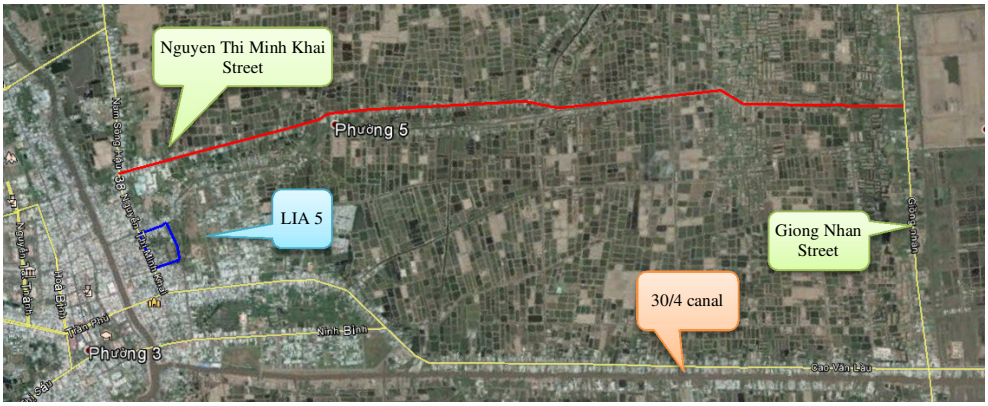
Lo Ren street starts from intersection with Nguyen Thi Minh Khai street to Giong Nhan street. The alignment runs through ward 5 and Hiep Thanh commune. At present, Lo Ren street is asphalt one with roadbed width of approximately 3 m, 0.3-0.5 m wide earth margin for each side without rain water drainage system and wastewater collection system. Along Lo Ren street are shrimp ponds of individual households and shrimp breeding business. there are about 96 shrimp ponds (distance of 10-100 m), these ponds take water from 10 existing canals cutting the existing road at: Km0+900, Km1+585, Km2+885, Km3+385, Km3+750, Km3+950, Km4+040, Km4+290, Km4+600, Km5+670. At these intersections, design solution of box culvert across the road is used to ensure no impacts on water for shrimp ponds.

Population in the project are is relatively sparse. Most of land is land of aquaculture, garden interspersed with housing land. Resident's houses mainly include corrugated-iron and class 4 houses.

There are 01 Khmer households in the Subproject area.

PCRs and sensitive works include: Tinh That Phap Thanh (about 30 m from the project area), 15 graves will be displaced during road construction.

Material and waste transport routes during the construction of Lo Ren street: Cao Van Lau street → Nguyen Thi Minh Khai street→ Highway 91C→ Highway 1A.



Lo Ren Street location

Current status of Lo Ren street

Subcomponent 2.3: Constructing Lo Bo Tay street

The project will upgrade the existing road with length of 6.1 km, width of 15 m with full technical infrastructure along the alignment rainwater drainage sewer system, wastewater collection system, lighting system and green trees.

Lo Bo Tay street is located in ward 2 and Nha Mat ward. It starts at intersection with Nguyen Thi Minh Khai street and ends at intersection with Giong Nhan street. Lo Bo Tay street is asphalt one with width 3-4 m, and earth margin of 0.5 m for each side. However, the alignment has not been synchronously invested. More than 1.2 km is earth road, and water drainage system and lighting system has not been equiped. Along the alignment, population is sparse. There are mainly shrimp ponds of households in the area. Houses are mainly temporary, corrugated-iron, class 4 houses.

30/4 canal is located on the right side of Lo Bo Tay street (in the direction from sea), 60-90 m from Lo Bo Tay road. 30/4 canal takes function of waterway, serving aquaculture and water drainage. Along the alignment under the project, there are about 64 shrimp ponds (distance of 2-100 m), these ponds take water from 13 canals at: Km0+395, Km0+967, Km1+347, Km1+624, Km2+202, Km2+517, Km2+710, Km2+937, Km3+458, Km3+797, Km4+165, Km4+390, Km4+912. The canals cutting across the alignment take the function of diverting water from 30/4 canal into shrimp pond along the alignment. Box culvert design solution is used at these locations to ensure no impact on water for shrimp ponds of residents.

There are 06 Khmer households in the Subproject area.

PCRs and sensitive works include: Bac Lieu Baptist Association (about 13 m away from the Subproject area), Primary school of ward 2B (about 4 m away from the Subproject area). 17 graves will be displaced during road construction.

Material and waste transport routes during the construction of Lo Bo Tay street: Cao Van Lau street → Nguyen Thi Minh Khai street→ Ninh Binh street→ Vo Thi Sau street→ Hoa Binh street→ Tran Phu street → Highway 1A.

Lo Bo Tay street location

Current status of Lo Bo Tay Street

Subcomponent 2.4: Upgrading, widening Huong Lo 6 street

The project will construct the road with length of 1 km and width of 9 m (7 m wide pavement, 1 m earth ground for each side) with full technical infrastructure such as rainwater drainage sewer system, wastewater collection system, lighting system and green trees.

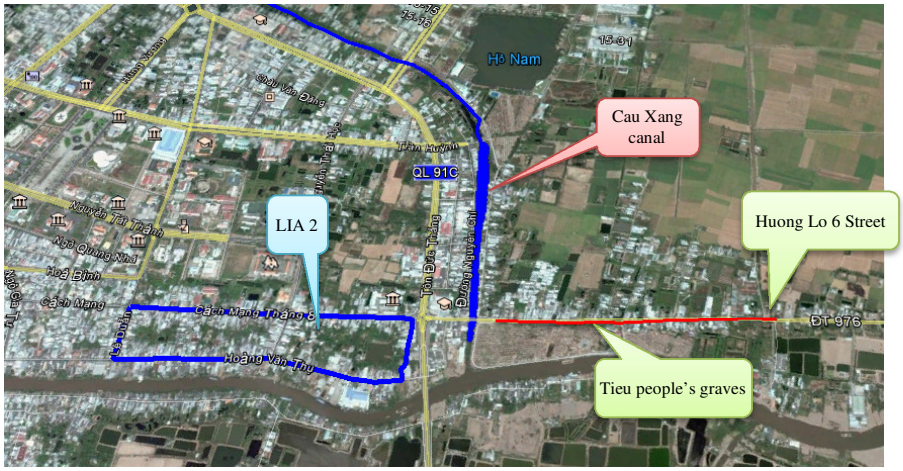
Huong Lo 6 - provincial road 976 is intercity road from Bac Lieu city to Vinh Loi district. Starting point is intersection with Xang canal bridge, ending point is at border of Vinh Loi district. The road is currently narrow with deteriorated pavement width of 4-5 m, affecting travel of residents and goods transportation.

Most of land along the alignment is vacant land, garden land interspersed with housing land of residents. Along district road 6 are Tieu people's graves. At present, the graves are covered by weed. Households mainly engage in agricultural sector, hired jobs, etc. Therefore, their income source is unstable. Their lives face lots of economic difficulties.

There are 01 Khmer households in the Subproject area.

PCRs and Sensitive works include: The Than shrine (about 1.5 m from the project area), Thieu Quang Sung Thien Duong pagoda (about 7 m from the project area) and graves of Tieu people (about 4 m away from the Subproject area).

Material and waste transport routes during the construction of Huong Lo 6: Cao Van Lau street→ Cach Mang Thang 8 street→ Highway 91C → Highway 1A.



Location of Huong Lo 6 street

Current status of Huong Lo 6 street

Subcomponent 2.5: Construction of internal roads in the West of Nguyen Dinh Chieu and extended Hai Ba Trung streets

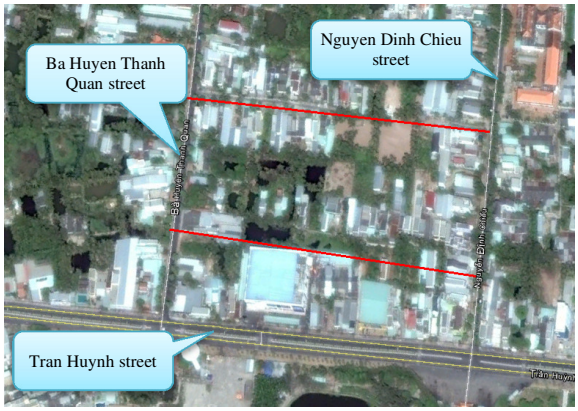
At present, Nguyen Dinh Chieu and Ba Huyen Thanh Quan streets have alleys connecting to inside residential areas however, it has not been smooth for both streets. Hai Ba Trung street has 2 wide lanes with separates in which green trees are planted. However, residents are encroaching speparators and sidewalk at the end of the alignment.

The project will cover investment in 02 roads with a total length of 0.55 km, width of 17 m, connecting Nguyen Dinh Chieu street to Ba Huyen Thanh Quan street. Construct extended Hai Ba Trung street with length of 100 m and width of 29 m. Rain water drainage sewer system, wastewater collection sewer system, lighting system and green trees will be provided along the roads.

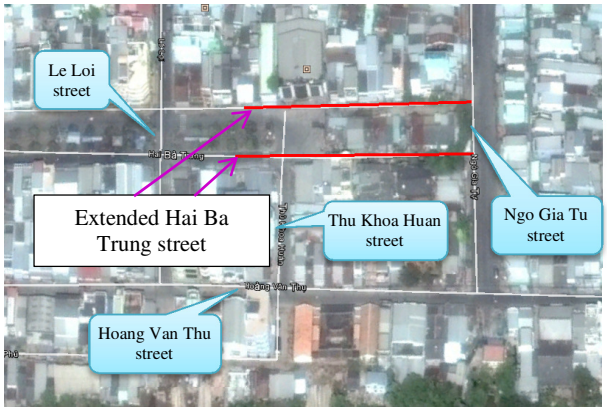
There are 01 Khmer households, no PCRs and sensitive receptors in the Subproject area.

Material and waste transport routes during the construction of Nguyen Dinh Chieu street: Cao Van Lau street → Ninh Binh street→ Vo Thi Sau street→ 23/8 street→ Tran Phu street→ Highway 1A.

Material and waste transport routes during the construction of extended Hai Ba Trung street: Cao Van Lau street → Hai Ba Trung street → Ngo Gia Tu street→ Cach Mang Thang 8 street→ Highway 91C → Highway 1A.



Location of internal roads



Location of extended Hai Ba Trung street

Component 3: Construct 3.04 ha resettlement area with full technical infrastructure (roads, water supply, lighting systems and green trees).

The resettlement area located in ward 1, adjacent to Highway 91C and existing residential areas. At present, the area expected to be constructed as resettlement area mainly includes vacant land. Residents live along Tran Huynh street and Highway 91C.

There are no ethnic minority households in the Subproject area.

PCRs and Sensitive receptors include: no Sensitive receptors in resettlement area and 11 graves relocated

Material and waste transport routes during the construction of the resettlement area: Cao Van Lau street → Cach Mang Thang 8 street→ Highway 91C → Highway 1A.

2.6. SENSITIVE CULTURAL RESOURCES AND SITES IN THE SUBPROJECT AREA

2.6.1. Bac Lieu Physical Cultural Resources

Bac Lieu city has 04 nationally ranked monuments, including: An Trach temple (hamlet 2, ward 5), Thanh Hoang ancient temple, also known as Ming pagoda (ward 3); Phuoc Duc ancient temple also known as Bang pagoda (ward 3); Phuoc Duc ancient temple, also known Ong Bon temple (ward 8).

- Anh Trach temple: Constructed in 1877 with area of 4 ha, located aon Bac Lieu river's Southern bank, cluster 2, ward 5. It is made up from sustainable materials: tile roof, masonry, pillars, rafters, lath, rafters, doors made from good wood types, and it is constructed in harmony with wide open space. It is approximately 220 m from LIA 5.
- Thanh Hoang ancient temple (Minh pagoda): It was built in 1865, located in ward 3, Bac Lieu city. It has Chinese kingdom architecture with embossed dragon pillars on precious wood and monolith granite; horizontal lacquered board, parallel sentences, blinds, reliefs ... are sophisticatedly embossed on precious woods. They become black over time. Thanh Hoang ancient temple about 500 m from LIA 1.
- Phuoc Duc ancient temple (Bang pagoda): Located at No 74, Dien Bien Phu street, ward 3, Bac Lieu city. The pagoda was built in 1810 with area of 580 m^2, it is designed with "Quoc" shape with the architecture under Minh Dynasty. It is approximately 500 m from LIA 1.
- Ong Bon temple: Located at ward 3, Bac Lieu city. Because of natural impacts, the temple was deteriorated over time. It was repaired, upgraded with architecture of the kingdom under Minh Dynasty - Chinese with high artistic value. It has been 100 years old. It is approximately 400 m from LIA 1.

The aforesaid cultural works are recognized as nationally historic, cultural monuments by the Ministry of Culture, Sports and Tourism, have high spiritual value for residents in Bac Lieu city ***Survey results show that the project implementation areas have safe distance from these monuments (from 220 m – 500 m)***. The subproject implementation will not cause direct impacts on nationally rated cultural monuments.

An Trach tample

Thanh Hoang ancient temple (Minh pagoda)

Phuoc Duc ancient temple

Ong Bon temple

All cultural works on which the Ministry of Culture, Sports and Tourism recognized as historic national culture and spiritual values for the people of Bac Lieu city. The report examined the practical and the results showed that the construction works of the project are a safe distance to the ruins (from 220 – 500 m). Thus, the process of implementation of the works will not cause direct impacts to cultural relics national level.

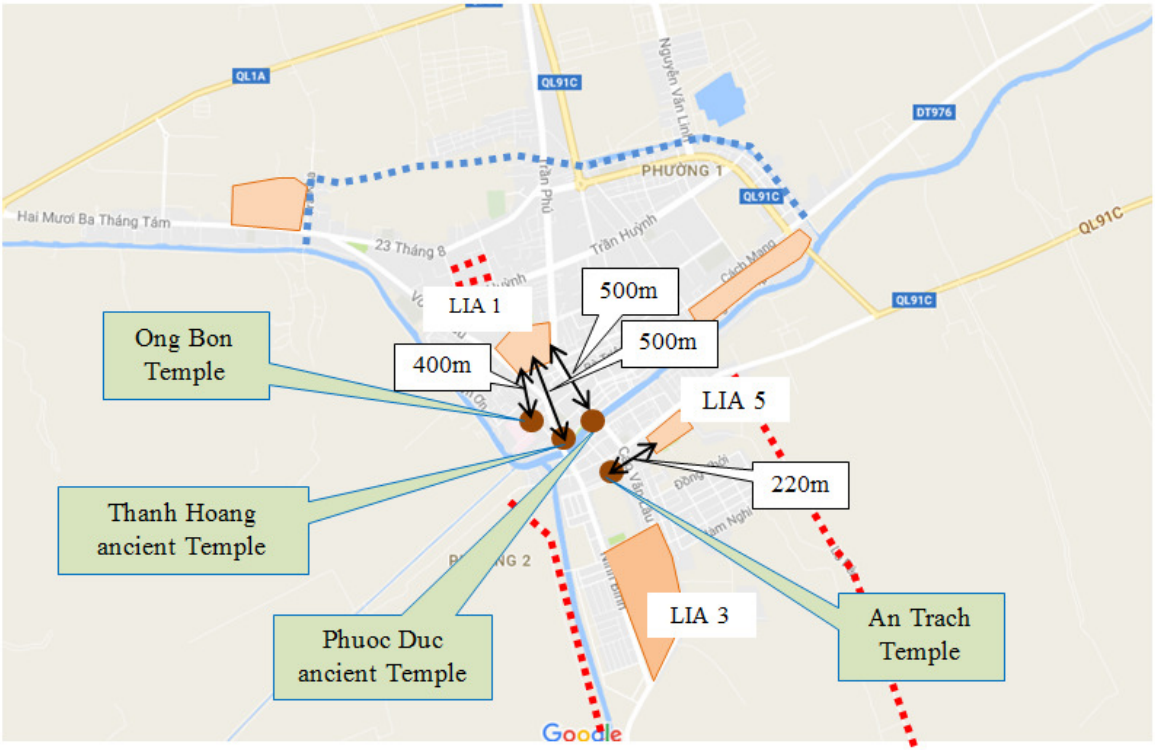


Figure 2.5: Position of the national monument for the construction works of the Subproject

2.6.2. PCRs and Sensitives Sites in the Subproject area

During the implementation of the Subproject in Bac Lieu City, 43 graves will be relocated, in which along Lo Ren road (15 graves), along Lo Bo Tay road (17 graves) and in resettlement area (11 graves). At the same time, PCRs and sensitive receptors can be affected by dust and noise during the construction phase and access to these structures will be limited.

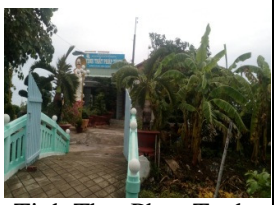
On the other hand, the transportation of materials and wastes will also affect PCRs along the transport routes.

List of physical cultural resources and sensitive receptors in the project area and along material and transport routes is summarized in Table 2.7.

Table 2.7: List of Sensitive Sites in the Subproject Area and Transport routes

Name/Picture	Location	Distant to the project	Description
Component 1: Upgrade infrastructure in LIAs (LIA 1, LIA 2, LIA 3, LIA 5, LIA 6)			
 Continuing Education Center of Bac Lieu province	LIA 1	0	▪ Its front is adjacent to Vo Thi Sau street. On the right side of the center is alley 13 of Vo Thi Sau street; ▪ Population is dense with high traffic volume.
 Linh Chau pagoda	LIA 2	3	▪ It is located at middle of LIA 2. There is a 2 m wide, 70 m long concrete alley from Cach Mang street to the pagoda. ▪ Households are densely concentrated along the alley.
 Ong Chau small temple	LIA 5	2	▪ Located in the alley of Dong Da street, in the Eastern area of LIA 5. Its front turns to the alley, and its back turns to the LIA. ▪ It is surrounded by resident's houses interspersed with gardens of coconut and some others fruit trees.
 Cemetery of Bac Lieu Buddhist Association		1	▪ It is located at the end of alley 3 of Nguyen Du street. On the right side of the cemetery is an open canal. There are 3-4 households in the cemetery and along the open canal. ▪ The cemetery was built in 1924 on the land donated by residents.
 Vinh Phuoc An pagoda	LIA 3	0	▪ It is located at the end of an unnamed alley of Cao Van Lau street. Its front turns to Cau Van Lau street, and 60 m from the street. ▪ The pagoda is surrounded by houses interspersed with gardens of coconuts, mangoes and some other fruit trees. On both sides of the alley is flooded land which is relatively polluted.

 Phuoc An pagoda		0	▪ It is located on right side of alley 7 of Cao Van Lau street. Its front turns to the alley. This is the place for bringing up orphans. ▪ Population around the pagoda is sparse, living on small business, and houses are interspersed with gardens.
▪ **Component 2:** Upgrading level 1, level 2 prioritized infrastructure (Lo Bo Tay street, Lo Ren street, Huong Lo 6, internal roads in the West of Nguyen Dinh Chieu street, extended Hai Ba Trung street, Cau Xang canal)			
 Family grave	Lo Bo Tay street	1 -70	▪ Along the alignment are lots of graves distributed sparsely fron the starting point to the ending point. The distance from graves to the road is 1m - 70 m. ▪ There are some graves located within campus of residents' houses, beside or behind their houses.
 Ba Nam cemetery		15 -40	▪ It is located on left side of Lo Bo Tay road from section of Nguyen Thi Minh Khai street and Lo Bo Tay road. ▪ Access road to the cemetery is Lo Bo Tay road which is 3 m wide asphalt concrete. On both sides are vacant land and stagnant ponds.
 Tieu people's grave area		4 -60	▪ They are sparsely distributed from the starting point to the ending point. Within the survey scope, distance from bank-line of the road to graves is 4 -60 m. ▪ Most of these graves are earth ones with area which is 3 times bigger than normal ones.
 Bac Lieu Baptist Association		13	▪ It is located on left side of Lo Bo Tay road. Its front turns to the road. It is 13 m from bank-line of the road. ▪ The road in this area is earth one which is marshy during rainy season. It is surrounded by vacant land and lots of ponds.
 Primary school of ward 2B		4	▪ It is located on the road accessing to Kinh Moi bridge Which is asphalt concrete road. ▪ It is 4 m from the school's fence to the project road. ▪ The school has been deteriorated, and its yard is usually flooded in rainy season.

 Graves	Lo Ren street	10	▪ There are about 8 graves along the alignment. There are 2-6 graves in each grave area. ▪ Most of graves are located within resident's house area It is at least 10 m from graves to sidewalk.
 Tinh That Phap Tanh		30	▪ It is located on left side of Lo Ren road There is a concrete bridge across a canal which connects the pagoda with a dyke (asphalt concrete structure).
 The Than shrine	Huong Lo 6	1.5	▪ It is located at intersection of Cau Xang alley and district road 6, on the right side of Xang canal bridge. ▪ It is surrounded by houses interspersed with gardens of coconuts and some other fruit trees. Traffic volume in this area is relatively low.
 Thieu Quang Sung Thien Duong pagoda		7	▪ It is located on the right side of crossroads of district road 6 and an unnamed alley. Its front turns to district road 6. This is the pagoda of Chinese Buddhists in Bac Lieu.
 Tieu people's grave area		4	▪ It is located of the right side of district road 6. According to local people, this grave area existed from the period Vietnam under the French rule without tombstones and covered by weed.. ▪ Behind the grave area are resident's houses interspersed with gardens. The grave area is very large with hundreds of graves.
▪ **Component 3:** Constructing resettlement area			
 Grave area	Resettlement area	In the area expected for construction	▪ The grave area is located in the Northern area of Nguyen That Thanh street, and within resident' house campus. ▪ The grave area is surrounded by gardens of some fruit trees such as mangoes, avocadoes... Mesh is installed on the right side of the grave area for raising ducks.

Along material and waste transport routes			
 Tien Su ancient shrine	LIA 1	4	▪ Located near roundabout of Tran Phu - Hoa Binh streets, its front turns to Hoa Binh street. ▪ Tran Phu and Hoa Binh streets are two main roads of Bac Lieu city. Traffic and house density is quite high. Tran Phu street has pavement width of about 20 m. Hoa Binh street has pavement width of 8-20m.
 Tin Lanh church	LIA 1, LIA 6	5	▪ Its front is adjacent to Vo Thi Sau street. This area has high population with closely concentrated resident's houses. The street has width of 8m, asphalt concrete structure and relatively good quality. ▪ This is the place for religious activities of local people.
 Sao Mai nursery school		5	▪ Its front is adjacent to Vo Thi Sau street, near Tin Lanh church. Along both sides are business stores of residents. ▪ Population is dense with high traffic volume.
 Kim Dong primary school		16	▪ Kim Dong primary school is located on left side with front turns to Vo Thi Sau (turns to the city center), opposite to alley 13 of Vo Thi Sau street. Population is dense, mainly living on business.
 Le Van Tam primary school	LIA 2, extended Hai Ba Trung street, Huong Lo 6	20	▪ Its front is adjacent to CMT8 street which is 8 m wide with relatively good asphalt concrete structure. ▪ It is located one the right side of CMT8 street, turning to the city center. ▪ Population is dense with high traffic volume.
 Primary school of ward 8A	LIA 6, Cau Xang canal	6	▪ It is adjacent to 23/8 street at intersection of Tra Kha and 23/8 streets in the Southeastern area of LIA 6. ▪ Traffic volume in this area is relativel high. Cross-section of the street is approximately 16 m wide with asphalt concrete structure It directly connects Bac Lieu city center with Highway 1.

 Than Hoang temple	LIA 1, LIA 2, LIA 3, LIA 5, LIA 6, Lo Bo Tay, Lo Ren streets, Huong Lo 6, Nguyen Dinh Chieu street, extended Hai Ba Trung street, Cau Xang canal and resettlement area	10	▪ It is located on the left side of Cao Van Lau street with direction from sea, in the Eastern area of LIA 3. ▪ Cao Van Lau is currently 7 m wide with deteriorated asphalt concrete structure with many blistering, asperity, stagnant sections in rainy season. ▪ There is a small unnamed alley on the left side of the temple. Its front turns to Cao Van Lau street , and it is 10 m from the street. ▪ The temple is surrounded by a relatively densely populated area interspersed with gardens.
 Chua xu Nuong Nuong temple		20	▪ It is located on the left side of Cao Van Lau street with direction from sea, in the Eastern area of the LIA. Its front turns to the street and it is 20 m from the street. ▪ he temple is surrounded by a relatively densely populated area. Residents mainly live on gardening and small business.
 Chau Xuong ancient temple		14	▪ Its front is adjacent to Cao Van Lau street. ▪ This is a place for spiritual activities of local people and visistors. ▪ The area has high population and traffic density.
 Ba Van Ban temple The five basic elements		6	▪ Its front is adjacent to Cao Van Lau street. ▪ This is a place for spiritual activities of local people and visistors. ▪ The area has high population and traffic density.
 Church		30	▪ Its front is adjacent to Cao Van Lau street. ▪ This is the place for religious activities of local people. ▪ It is opposite to Phan Ngoc Hien high school, and on the right side is primary school of ward 2. ▪ The area has dense population with high traffic volume especially during rush hours.

 Hiep Thanh primary school		14	▪ Its front turns to Cao Van Lau street, located on the left side of the road accessing to bird sanctuaries. The road accessing the school includes earth macadamized section 1x2 (the starting section) and ending concrete section with width of 2 m.
 Nguyen Thi Minh Khai secondary school	LIA 5, Lo Ren street	4	▪ Nguyen Thi Minh Khai street has 7 m wide pavement with relatively good asphalt concrete structure. Households are densely concentrated along both sides with high traffic volume. ▪ It turns to Nguyen Thi Minh Khai street with high traffic volume. ▪ Residents mainly live on service.
 College Of Art – Culture	LIA 6	26	▪ Its front is adjacent to 23/8 street, connecting the city center with National Highway 1A. ▪ The college is located in the area with dense population and surrounded by small business households, boarding houses for students. ▪ Traffic volume in the area is relatively high.
 Le Thi Cam Le secondary school	LIA 2, LIA 5, Lo Bo Tay, Lo Ren streets, extended Hai Ba Trung street, resettlement area	15	▪ Its front turns to National Highway 91C (Ton Duc Thang street). ▪ Residents in the area and along the National Highway mainly live on small business, boarding houses for students.
 Bac Lieu Vocational College		15	▪ Its front turns to National Highway 91C (Ton Duc Thang street). On the left side is Le Thi Cam Le secondary school.
 Technical economic college	Huong Lo 6	40	▪ Located one provincial road 976, about 40 m from the roundabout. It is surrounded mainly by restaurants, boarding houses and students.

CHAPTER 3. ANALYSIS OF ALTERNATIVES

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

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

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

This section analyzes the alternatives - "Without project" and "With project"

(i) **“Without Project”**: In the case of not implementing the project, the existence of negative issues remains in the project area, including:

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

(ii) **“With Project”**: When the Project implements the 04 components: (i) Upgrading tertiary infrastructure in the LIAs; (ii) Upgrading primary and secondary priority infrastructure; (iii) Resettlement; (v) Capacity building and technical assistance for urban management.The achievements from the Project implementation should include: completed Bac Lieu City transport network; increased the accessibility of communities in low-income areas (LIAs) to basic technical and social infrastructure; improved hygiene and sanitation conditions significantly through dredging, upgrading and renovating inner canals and installing urban drainage systems. These investment construction works will bring benefits for Bac Lieu City, aiming to become a resilient city to climate change impacts and to mitigate vulnerabilities due to sea level rise, flood risks, and landslides, etc.

The analysis results are shown in Table 3.1.

Table 3.1: Analysis of Alternatives "WITHOUT PROJECT" AND "WITH PROJECT"

Major Environmental and Social Issues	WITHOUT PROJECT	WITH PROJECT
Environmental issues		
Air Pollution	Air pollution from the following sources: ▪ Uncollected garbage and the backlog of solid wastes leading to the accumulation of garbage and causing bad odor in low-income areas (LIAs); ▪ Incomplete and deteriorated roads, especially the internal roads in LIAs, causing traffic congestion is also an additional reason for air pollution.	The project aims to solve problems of environmental pollution, include: ▪ The upgrading and expansion of alleys in LIAs will enable the accessibility of trucks for collecting garbage daily to avoid the backlog that causes environmental pollution; ▪ Upgraded and renovated alleys and roads will increase efficient connectivity of transport links, which minimizes congestion during rush hours; ▪ The implementation of the Project will also causes environmental negative impacts on ambient air quality due to construction activities. However, these effects are short term and will cease when the construction phase is completed.
Water Pollution	Canal water is seriously polluted by the direct discharge of domestic wastes and effluent from squatter households along the canals.	The quality of surface water will be improved by relocating squatters and households living along canals, and dredging canals for better flow conditions.
Landslide	Landslide risks are increased due to heavy rains, strong tidal surges, sea level rise and climate change consequences.	Reducing landslide risks by new embankments protecting rivers' and canals' banks.
Drainage Capacity	Urban areas are still flooded by upstream floods, high tides and heavy rains.	Reducing flooding caused by rains and tides through the installation of drainage systems in 05 LIAs, 05 roads and upgrading Cau Xang canal.
Climate Change Adaptation	▪ Bac Lieu city is severely affected by climate change consequences, including: abnormal changes in water flow regime, which results in severe floods in the wet weather; freshwater shortage, droughts and salt intrusion in the dry season; etc. ▪ Landslide events often occur and are complicated mainly in urban residential areas and main transport routes that damage people's property and lives.	▪ The Project has a broad scale of effect on the development of multi-sector urban infrastructure, in addition to improving the institutional capacity of urban management, administrative reform, traffic, land use and in coping with climate change. This will have positive effect on the development of multi sectors, including: industries, services, agriculture, tourism, etc.
▪ Social issues		
Land Acquisition and Resettlement	Not affected by land acquisition and resettlement.	▪ About 2,092 households are estimated to be affected, including 1,994 partially affected households and 98 fully

		affected households
Disturbance of daily community activities	No impacts on the lives and activities of local people in Bac Lieu city and community relationships.	Livelihoods and daily activities of local people as well as community's relations will be affected by relocation and construction activities.
Accessibility of social infrastructure	Local communities (LIAs) suffer from risks and incidents such as fires, natural disasters, diseases, etc. due to the limited accessibility to technical and social infrastructure.	▪ Improved technical infrastructure (traffic, drainage, lighting, etc.) will enable the connectivity between areas and among areas of the region. ▪ Losses of lives and property will be minimized due to risks and incidents.
Health and Sanitation Improvement	Environmental sanitation conditions are exacerbated due to flooding and poor water quality which increase in epidemic disease.	Improved environmental sanitation conditions will minimize the spread of diseases, especially for households living along Cau Xang canal
Increasing Land Value	Low land value	▪ Upgrading and renovation of roads will lead to the formulation of new residential areas and social infrastructure. This means that the value of land in these areas will be multiplied many times higher than the orginal value. ▪ Constructing the embankment of Cau Xang canal will enable open space and better landscape.
Urban Landscape	Poor urban landscape without infrastructure improvement	Encroached households will be relocated, creating open space along the river banks with riverside landscape architecture, public spaces, planting and restoration of traditional architecture.
Benefits	None	▪ About 8,103 poor HHs and 111,807 people are direct and indirect beneficiaries. ▪ Additionally, living condition of households along canals will be stable.

3.2. "WITH PROJECT" ALTERNATIVE

This section will provide alternative analysis of technical options for the Project's components, including: (i) Upgrading tertiary infrastructure in LIAs (Component 1) and (ii) Renovating Cau Xang Canal (Component 2). There is no alternative analysis for the investment Subcomponents of road construction of Component 2 (sub-components 2.2 – 2.5) and Component 3 (Resettlement Area). However, with the proposed civil construction works of these components, a wide range of benefits and advantages were recognized in the above-mentioned in Section 3.1.

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

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

- *Option 1:* Expanding alleys and lanes with high traffic flow capacity and can be widened to a concrete alley of 4m in width. The centerline of the alleys/lanes remain the same.
- *Option 2:* Upgrading and improving existing alleys/lanes (which are difficult to expand) to be concrete alleys, accompanied by water supply, drainage and lighting systems.
- *Option 3:* Combining Option 1 and Option 2. In LIAs, widening main alleys with minimum width of 4m will be prioritized; small alleys will be improved in aacordance with the baseline status where the width is more than 2 m.

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

Table 3.2: Alternative Analysis of Component 1

No.	Content	Option 1	Option 2	Option 3
1	**Description**	▪ Expanding all alleys in LIAs with 4 m wide. The expansion will be made toward both sides from the current centerline. ▪ Technical infrastructure will be installed coupled with road expansion, including: elevation and surface concrete, installation of sewerage and lighting systems, and trees).	▪ Upgrading and improving existing alleys/lanes with current width of 2 – 3 m. ▪ Installing technical infrastructure, including: water supply, drainage and lighting systems, and trees.	▪ Widening main alleys with minimum width of 4 m will be prioritized; small alleys will be improved based on current status with the width is more than 2 m. ▪ Installing technical infrastructure, including: elevating and surfacing with concrete, installing drainage and lighting systems and trees.
2	**Technical assessment**	▪ The 4 m wide alley is adequate to arrange technical facilities which enable the traveling of fire fighting trucks and ambulances. ▪ It is difficult for construction activities due to compensation and site clearance. ▪ Good landscape, wide alley and easy travel.	▪ The narrowness of alley width is difficult to arrange technical infrastructure and obstruct the travelling of fire trucks and ambulances. ▪ It is easy for construction activities as in line with the current baseline. ▪ Poor landscape because the alleys are narrow.	▪ The 4 m wide alley is adequate to install technical facilities which enable the traveling of fire trucks and ambulances. ▪ Small lanes and alleys can be easily connected with main roads. ▪ Ensuring landscape and public amenities.
3	**Social assessment**	▪ Ensuring the sustainability of residential areas with the future growth. ▪ Minimizing traffic accidents since alleys are expanded and better visibility. ▪ Improving living conditions of local people because of convenient and easy accessibility to social infrastructure services. ▪ Causing disturbance of daily activities for local people due to great	▪ The city future development orientation is not secure. ▪ Living conditions of local people are not much improved due to the alleys are still narrow. ▪ Construction activities will be easy because of not having many site clearance works. ▪ No disturbance of local daily activities because of not having compensation and site clearance. ▪ Conflicts and grievance will be	▪ The city future development orientation is not secure. ▪ Living conditions of local people are not much improved due to the alleys are still narrow. ▪ Less disturbance of local daily activities because number of affected households is minimized. ▪ Construction and operation activities will be easier. ▪ Conflicts and grievance will be minimized since construction works are

No.	Content	Option 1	Option 2	Option 3
		volume of compensation and site clearance. ▪ It could result in conflicts and compensation complaints during the pre-construction phase.	minimized as construction works are in line with current baselines.	in line with current baseline.
4	**Environmental sustainability**	▪ Urban environmental hygiene and sanitation conditions are improved substantially. ▪ Urban flooding is eliminated because stormwater runoff and wastewater will be collected. ▪ Domestic solid wastes will be collected thoroughly due to the expansion of alleys. ▪ Demolition of buildings, construction of alleys, drainage and lighting systems will cause negative environmental impacts (noise, dust, debris and construction solid wastes).	▪ Environmental hygiene and sanitation conditions are improved substantially. ▪ Urban flooding will no longer occur because stormwater and wastewater will be collected. ▪ Environmental problems are not totally eliminated because of narrow alleys limiting garbage collection. ▪ Without site clearance, there is no environmental effect of noise and dusts.	▪ Urban environmental hygiene and sanitation conditions are improved substantially. ▪ Flooding is eliminated because stormwater and wastewater will be collected. ▪ Domestic solid wastes will be thoughroughly collected due to the expansion of alleys. ▪ Demolition of buildings, construction of alleys, drainage and lighting systems will cause negative environmental impacts (noise, dust, debris and construction solid wastes).
5	**Investment effectiveness**	▪ The price of land and house will be rapidly boosted. ▪ Compensation and resettlement costs are higher due to more affected households. ▪ High cost for a large amount of construction works.	▪ Land and house values are not much boosted because of insignificant improvement of small alleys. ▪ Compensation and resettlement costs are minimized. ▪ Low costs for construction. ▪ High effectiveness of investment because of short alleys.	▪ House and land values increase rapidly. ▪ Compensation and resettlement costs are higher due to more affected households. However, these costs are higher than Option 2 and lower than that of Option 1. ▪ Construction cost will be higher than that of Option 2 but lower than Option 1.
	Selection	In terms of social, environmental and effective aspects, the analysis shows that: ▪ Option 1 has the highest cost of investment and land clearance because of widening all alleys in LIAs with minimum width of 4m. Hence, option 1 is not selected. ▪ Option 2 has the lowest cost of investment and land clearance. However, this option does not thoroughly address environmental		

No.	Content	Option 1	Option 2	Option 3
		problems, i.e uncollected solid waste still remains due to narrow alleys limiting the accessibility of collection trucks. ▪ Option 3 presents more advantages which are overwhelming Option 1 and Option 2 because of reasonable cost for investment and land clearance. More importantly, this option will improve environmental sanitation in LIAs, minimize local flooding and collect waste thoroughly. Therefore, Option 3 is **selected.**		

3.2.2. Component 2: Upgrading primary and secondary priority infrastructure – Renovation of Cau Xang Canal

As previously stated in Table 1.2 (Chapter 1), the Project will invest on construction works of improving the urban canal system. According to the project owner, Cau Xang Canal (sub-component 2.1) was selected to renovate due to its degradation of environmental and sanitation conditions. Cau Xang Canal starts from Xang bridge (crossing Huong Lo 6) and ends at the intersection point of Bac Lieu River. It crosses over wards 1, 7 and 8 which are dense population at some sections of the canal. The Canal was being deposited by domestic solid wastes discharged by households along the canal. In addition, the encroachment of local houses causing the stagnation of water flow that makes canal water is increasingly polluted. Further, daily activities of local people are in danger of this encroachment.

Therefore, civil construction works of this sub-component include dredging, embankment in association with landscaping, and constructing a 3 m wide road for improving sanitation and living conditions of local people on both sides with 7.4 km in length. The drainage and lighting systems will be also constructed along the canal banks and landscaping with green trips along sidewalks.

The Cau Xang canal was built with a few scattered embankments in some areas. Its width varies from 4m to 17m and the current depths are also different from section section, from -1.5 m to +1.2 m. Therefore, the Canal is devided into 5 sections for selecting construction works in terms of cost – benefit as follows:

- Sections 1, 3 and 5 are not embanked, and therefore, a combination of hard (concrete) embankment and soft (Eco-based) embankment is proposed for these sections.
- Sections 2 and 4 are available embanked. However, they are being degraded and need to be enahnaced by stone-based embankment.

This section provides technical alternatives for the selection of embankment structure as a part of renovation works. There are three (03) proposed technical alternatives (Table 3.3) as follows:

- Option 1: Soft/ eco-based embankment which is a combination of concrete wall at the lower part and stone with sods in the upper part of the embankment;
- Option 2: Slope embankment by stones;
- Option 3: Vertical concrete embankment by reinforced concrete wall.

Table 3.3: Analysis of Alternatives for Embankment Structure of Cau Xang Canal

	OPTION 1	OPTION 2	OPTION 3
Description	Ecological soft embankment (reinforced concrete at the canal bottom in combination with soft embankment of grass and trees to ensure landscape)	Slope embankment with coarse stone	Vertical embankment with reinforced concrete wall.
Technical	- High stability. Low risk of landslide because of vertical embankment construction above regular water level. - Short construction duration. Simple construction solution. - Convenient for operation and maintenance - Connectivity to constructed embankment sections is not ensured.	- Stability is acceptable but lower than other options. Landslide may reoccur because the roof structures have lower bearing strength than that of option 2. - Short construction duration. Simple construction solution. - Convenient for operation and maintenance - Connectivity to constructed embankment sections is ensured.	- Highest stability. Structures are sustainable. - High construction volume, long construction duration and complicated construction solution. - Convenient for operation and maintenance - Connectivity to constructed embankment sections is not ensured.
Environmental	- Flow is narrowed down, but narrowing level is lower than that of option 2. - Environmental impacts during construction phase (dust, noise, vribration, waste) are at medium level.	- Flow is narrowed down because of tilting roof embankment. - Environmental impacts during construction phase (dust, noise, vribration, waste) are at medium level.	- Flow is not narrowed down because of vertical embankment. - Environmental impacts during construction phase (dust, noise, vribration, waste) are at high level.
Social	- Impacts of land acquisition and resettlement are high.	- Impacts of land acquisition and resettlement are high.	- Impacts of land acquisition and resettlement are low.
Investment cost	- Low construction cost.	- High construction cost.	- High construction cost.

Option 1 and option 2 are selected as investment options for Cau Xang canal rehabilitation because of lower investment cost, environmental impacts at medium level and connectivity to construction embankment sections is ensured.

3.2.3. Component 3: Construction of Resettlement Area

The Resettlement Area is located nearby Ho Dieu Hoa with an area of 3.04 ha. This area stretches along National Highway 91C, and borders with existing residential zone. The proposed area is planned for the provincial resettlement purposes, and is consistent with detailed master plan of Bac Lieu City. Given with this available planning, this Component, therefore, has no alternative analysis.

CHAPTER 4. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

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

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

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

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

4.1. EVIROMENTAL AND SOCIAL IMPACT ASSESSMENT

4.1.1. Positive impacts

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

- Additional economic, social, environment and aesthetic benefits from the construction of linear parks along Cau Xang canal/ embankment i.e. open space for recreation of local people.
- Minimize inundation through upgrading existing drainage systems: The project will improve the existing drainage capacity, while taking into account of future planning. The upgrading and renovation of roads accompanied by technical infrastructure, especially the drainage system, play an important role in minimizing urban flooding which is predicted to be severe in the context of climate change (extreme weather events and sea level rise). The subproject would also enable the city authority to achieve objectives set in urban upgrading

and planning along with the on-going projects in Bac Lieu city in particular, and Bac Lieu province in general.

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

4.1.2. Potential Negative Impacts

4.1.2.1. Type and Scales of Impacts

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

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

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

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

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

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

Component	Physical			Biological		Social				Others	
	Air, noise, vibration	*Land, soil, water*	*Solid waste, sediment*	*Forest, Natural habitats*	*Fish, aquatic species*	*Land acquisition and resettlement*	*Native ethnic group*	*Physical Cultural Resources, the sensitive points*	*Livelihoods, community disturbance*	*Local flooding, traffic, safety*	*Off-site impacts*
Component 1: Upgrading the tertiary infrastructure in LIAs (including LIA 1, LIA 2, LIA 3, LIA 5, and LIA 6): total area of 39.8 ha; 591 affected HHs, in which 579 HHs are partially affected and 12 HHs are completely affected. Main tasks include: upgrading and enlarging alleys; building drainage system; providing lighting; planting trees; placing waste bins along alleys.											
- Upgrading Area LIA 1: area: 1.8 ha, located in Ward 7 of Bac Lieu City; impacts from resettling 113 AHs in which 107 HHs are partially affected and 06 HHs are completely affected. Sensitive sites include: 01 school; - Upgrading Area LIA 2: area: 2 ha, located in Ward 1 of Bac Lieu City; impacts from resettling 115 AHs in which 111 HHs are partially affected and 04 are completely affected. Sensitive sites include: 01 Pagoda; - Upgrading Area LIA 3: area: 12 ha, located in Ward 2 of Bac Lieu City; impacts from resettling 133 partial affected HHs. Sensitive sites include: 02 religious works; - Upgrading Area LIA 5: area: 8 ha, located in Ward 5 of Bac Lieu City; impacts from resettling 142 AHs in which 140 HHs are partially affected and 02 HHs are completely affected. Sensitive sites include: 02 religious works (01 temples and 01 cementery); - Upgrading Area LIA 6: area: 16 ha, located in Ward 8 of Bac Lieu City; impacts from resettling 88 partial affected HHs. No PCRs and sensitives receptors in the area.											
Pre-construction stage	N	N	N	N	N	M	M	N	M	N	N
Construction stage	M	M	L	L	L	N	M	L	M	M	M
Operation stage	L	L	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) Impacts from land acquisition and resettlement; (ii) Risk of UXO (see 4.2) - Construction stage: (i) Local flooding; (ii) Offensive odor from sediment dredging small canal in LIA 2; (iii) Social disturbances and increased traffic risks; (iv) Damage to water supply and communication systems; (v) Impacts caused by transportation activitie; (vi) Impacts to PCRs and sensitives receptors: Vinh Phuoc An Pagoda, Phuoc An Pagoda in LIA 2; Linh Chau Pagoda; Cemetery of Bac Lieu Buddhist Association, Ong Chau Temple in LIA 5; Bac Lieu Provincial Continuing Education Center and (vi) Impact caused by transportation activities. - Operation stage: (i) Local flooding due to inadequate operation and maintenance (O&M); (ii) Traffic safety; (iii) Environmental sanitation at waste sites.										
Component 2: Upgrading prioritized primary and secondary infrastructure, including dredging and rehabilitating Cau Xang Canal; upgrading, rehabilitation and building of 05 roads/ streets (Lo Ren Street, Lo Bo Tay Street, Huong Lo 6 Street, the internal link of Nguyen Dinh Chieu – Ba Huyen Thanh Quan and extended Hai Ba Trung Street); impacting 855 HHs, in which 635 HHs are partially affected and 220 HHs completely affected.											
Sub- Component 2.1: Rehabilitating Cau Xang Canal to Tra Kha – Tra Khua - Scope of construction: 4.5 km long; - Land acquisition and resettlement: 437 partially AHs, 44 completely AHs; 5,022 m^2 residential land and 10,192 m^2 agricultural land - Main tasks: dredging and embanking the canal, building 4m-wide operational roads on both canal sides, drainage system, lighting system, green trees; - No existing sensitive works around the construction area.											

Component	Physical			Biological		Social				Others	
	Air, noise, vibration	*Land, soil, water*	*Solid waste, sediment*	*Forest, Natural habitats*	*Fish, aquatic species*	*Land acquisition and resettlement*	*Native ethnic group*	*Physical Cultural Resources, the sensitive points*	*Livelihoods, community disturbance*	*Local flooding, traffic, safety*	*Off-site impacts*
Pre-construction stage	N	N	N	N	N	M	N	N	M	N	N
Construction stage	M	M	M	L	L	N	N	M	M	M	M
Operation stage	L	L	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) land acquisition and resettlement (see 4.2) - Construction stage: (i) Offensive odor from dredged sediment; (ii) impact due to transportation of the dreged sediments; (iii) Risk of subsidence during construction; (iv) Impacts on resident access traffic; (v) Risk of damage the existing infrastructure; (vi) Localzed flooding. - Operation stage: (i) Risks of flooding from lack of O/M; (ii) Risk of flow clogging and contamination because of littering; (iii) Traffic safety.										
Sub-Component 2.2: Upgrading, widening Lo Ren street - Scope of investment: 6.0 km in length, divided into 02 segments: (i) segment from Nguyen Thi Minh Khai Street to Vanh Dai Ngoai Street: 3.2 in length, 26.5 m in width (road surface of 15 m, a median strip of 1 m in width, and sidewalks of 5.25 m each); and (ii) segment from Vanh Dai Ngoai Street to Giong Nhan Street: 1.8 km in length, 30.5 m in width (road surface of 7.5 m and sidewalks of 11.5 m each) with adequate accompanying infrastructure. - Land acquisition and resettlement: 307 partially AHs; 23 completely AHs; 65,419 m^2 agricultural land and 15,326 m^2 residential land; - Infrastructure: sidewalks, drainage system, green trees; lighting system on both sides of the street and on the median strip; - Sensitive works: HHs' shrimp farming ponds (5m at the nearest place from the existing road) and some PCRs such as Phap Tanh Buddhist Temple about 40 m form the Project and graves in residents' premises along the route.										
Pre-construction stage	N	N	N	N	N	M	N	N	M	N	N
Construction stage	M	M	M	L	M	N	N	M	L	L	M
Operation stage	L	L	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) Impact on water flow; (ii) Impact on water quality by constructing bridge on route; (iii) Impacts on aquaculture; (iv) Impact on water supply and communication infrastructure; (v) Impacts on PCRs and sensitives Points. - Operation Stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe.										
Sub-Component 2.3: *Upgrading, expanding Lo Bo Tay street* - Scope of investment: 6.1 km in length, 15 m in width (road surface of 7 m and sidewalks of 4 m each) with adequate infrastructure; - Land acquisition and resettlement: 436 partially AHs; 20,106 m^2 agricultural land and 52 m^2 residential land; - Infrastructure: sidewalks, drainage system, green trees; lighting system on both sides; - Sensitive works: HHs' shrimp farming ponds (2 m at the nearest place from the existing road), Mang Non Primary School, Baptist Church of Bac Lieu, High School of Ward 2B and a number of family graves and graveyards along the street.										
Pre-construction stage	N	N	N	N	N	L	L	L	L	N	N

Component	Physical			Biological		Social				Others	
	Air, noise, vibration	*Land, soil, water*	*Solid waste, sediment*	*Forest, Natural habitats*	*Fish, aquatic species*	*Land acquisition and resettlement*	*Native ethnic group*	*Physical Cultural Resources, the sensitive points*	*Livelihoods, community disturbance*	*Local flooding, traffic, safety*	*Off-site impacts*
Construction stage	M	M	M	L	M	N	N	M	L	L	M
Operation stage	L	L	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) Impact on water flow; (ii) Impact on water quality by constructing bridge on route; (iii) Impacts on aquaculture; (iv) Impact on water supply and communication infrastructure; (v) Impacts on PCRs and sensitives Points. - Operation Stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe.										
Sub-Component 2.4: Upgrading Huong Lo 6 Street - Scope of investment: 1 km in length, rehabilitating existing 4 m wide asphalt road into 9 m wide asphalt road (7 m wide pavement, 1 m wide earthworks for each side); - Land acquisition and resettlement: 115 partially AHs; 12 completely AHs; 1,580 m^2 agricultural land and 598 m^2 residential land; - Infrastructure: sidewalks, drainage system, green trees; lighting system on both sides; - Sensitive works: The Than Temple on Cach Mang Thang Tam Street, 1.5 m from the Project; Thieu Quang Sung Thien Duong Pagoda in the alley on Huong Lo 6 Street about 7 m from the Project; additionally, a number of graves in residential areas (2 – 15 m from the Project).										
Pre-construction stage	N	N	N	N	N	M	M	M	L	N	N
Construction stage	M	M	M	L	N	N	M	M	M	M	M
Operation stage	L	L	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) Impact on water supply and communication infrastructure; (ii) Impacts to PCRs and sensitive sites. - Operation Stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe.										
Sub-Component 2.5: Constructing internal connection roads; in the western area of Nguyen Dinh Chieu street, extended Hai Ba Trung street. *Constructing internal roads for connecting Nguyen Dinh Chieu street with Ba Huyen Thanh Quan street* - Scope of investment: 0.55 km in length; 17 m in width (7m wide pavement, 1 m wide earthworks for each side)) with adequate accompanying infrastructure; - Land acquisition and resettlement: 59 partially AHs; 07 completely AHs; 2,555 m^2 agricultural land and 1,418 m^2 residential land; - Building consistent infrastructure, including: drainage system, green trees; lighting system on both sides; - No existing sensitive works around the construction site. *Constructing extended Hai Ba Trung* - Scope of investment: 0.1 km in length; 29 m in width, 9 m wide deviding strip, 2.8 m wide for each sidewalk with adequate accompanying infrastructure; - Land acquisition and resettlement: 10 HHs (completely affected); - Building consistent infrastructure, including: drainage system, green trees; lighting system on both sides; - No sensitives work.										
Pre-construction stage	N	N	N	N	N	L	N	N	L	N	N

Component	Physical			Biological		Social				Others	
	Air, noise, vibration	*Land, soil, water*	*Solid waste, sediment*	*Forest, Natural habitats*	*Fish, aquatic species*	*Land acquisition and resettlement*	*Native ethnic group*	*Physical Cultural Resources, the sensitive points*	*Livelihoods, community disturbance*	*Local flooding, traffic, safety*	*Off-site impacts*
Construction stage	M	M	M	N	N	N	N	N	L	L	M
Operation stage	L	L	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) Impacts on people's activities on the two sides; (ii) Impact on water supply and communication infrastructure. - Operation Stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe.										
Pre-construction stage	N	N	N	N	N	M	N	N	L	N	N
Construction stage	M	M	M	L	N	N	N	M	M	M	M
Operation stage	L	L	L	N	N	N	N	N	N	L	N
Component 3: Resettlement site - Scope of construction: The Project will purchase available ground from existing resettlement sites in the City and build a new resettlement site (Ho Dieu Hoa [balancing lake] resettlement site with an area of 3.04 ha) in Ward 1 of Bac Lieu City with adequate technical infrastructure. - Land acquisition and resettlement: 61partially AHs; 26,003 m^2 agricultural land and 14 m^2 residential land; - Technical infrastructure: traffic roads, power supply, water supply, drainage system and other accompanying social facilities such as culture house, health station, kindergarten, etc.; - No sensitive works around the construction area.										
Pre-construction stage	N	N	N	N	N	L	N	N	L	N	N
Construction stage	M	M	M	N	N	N	N	N	L	L	M
Operation stage	L	L	M	N	N	N	N	N	N	L	N
Remark	- Pre-Construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement (see 4.2) - Construction stage: Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2nd note below) - Operation stage: Impacts from wastewater and solid waste; Local inundation.										
Notes: - (1) The following criteria are used to assess the level of impacts: None (N) – No impacts; Low (L) – Small work, small impacts, localized, reversible, temporary; Medium (M) – Small works in sensitive/urban areas, medium-scale with medium impacts, reversible, able to be mitigated and managed, localized, temporary; High (H) – Medium-scale works in small sensitive/urban areas, large-scale works with significant impacts (social and/or environmental), many of which are irreversible and require compensation. Both M and H require monitoring and implementation of mitigation measures as well as an appropriate institutional capacity in terms of safety. - (2) Most impacts of small and medium scale works are localized and temporary and can be mitigated through the application of technical solutions and good construction management practice with strict supervision, inspection and consultation with the local community.										

4.1.3. Impact Assessment for Investments under Component 1 – Upgrading Tertiary Infrastructure in LIAs

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

4.1.3.1. Component 1- Impacts during Preparation

Impacts on land acquisition

Fully or partially land acquisition will affect AHs both physically and mentally, even causing social problems and prolonged litigation. Though plans have been studied to minimize the relocation, about 12 households will be relocated under Component 1. The detailed impact assessment for land acquisition and resettlement under this component is given in Section 4.2 – Social Assessment.

Remaining unexploded ordnances (UXO)

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

4.1.3.2. Component 1- Impacts during Construction

A. Generic Impacts during Construction

Construction phase including the following activities: dredging 130 m of small canals in LIA 2; Constructing and installing drainage sewers; constructing lighting system, and pavement of the alleys. These activities will cause environmental impacts such as emission, solid waste, wastewater, noise, vibration, ect. Besides, this phase also causes typical impacts namely odor and dredged material management, local flooding, disturbance to communities and impacts on traffic. However, these impacts are non-continuous, short-term and mostly temporary.

- **Impacts from dust and emission**

Dust caused by demolition

There are 142 households having affected structures with total land acquisition of 4,972.8 m^3. The structures within acquisition scope in the LIAs include mainly residental houses such as: class-4 houses, yards, fence, gate piers. There are no sensitive receptors within acquisition scope.

Most of the structures to be demolished are built with masonry and bricks. Demolition of these structures will generate dust.

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

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

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 3.5 m/s);

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

→ E_d = 0.04656 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: Forecasts of dispersed dust from demolition

Item	Volume of demoliton (m^3)	Construction stage (Quarter)	Dust load (kg/day)
LIA 1	1,147.2	2	1.6
LIA 2	1,517.4	2	2.12
LIA 3	1,070.4	2	1.5
LIA 5	799.8	2	1.12
LIA 6	438	1	1.22

Note: Unit weight of debris: 1.8 tons/m^3

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 3.5 m/s and a distance of 10-110 m from generating sources, height of 1.5-15 m, the concentration of pollutants created by demolition can be calculated as follows:

- For LIA 1: Dust concentrations vary between 0.17-1.21 mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3).
- For LIA 2: Dust concentrations vary between 0.18-1.57 mg/m^3.
- For LIA 3: Dust concentrations vary between 0.17-1.15 mg/m^3.
- For LIA 5: Dust concentrations vary between 0.18-0.9 mg/m^3.
- For LIA 6: Dust concentrations vary between 0.18-0.98 mg/m^3.

The data indicate that at the distance of 10 m from construction site, dust concentration is 3 – 5.3 times higher than the standard; at the distance of 40 m from construction site, dust concentration is 1.17 to 1.5 times higher than the standard and meets the standard at the distance of 110 m from construction site. Within this distance, the existing households along the alleys under construction, workers at construction sites, traffic participants along the alleys and 5 PCRs (Linh Chau Pagoda; Vinh Phuoc An Pagoda; Phuoc An Pagoda; Ong Chau small Temple; Cemetery of Bac Lieu Buddhist Association) and a school (Continuing Education Center of Bac Lieu province) in 5 LIAs will be affected. The specific affected receptors are included in Table 4.5.

However, dust caused by demolition activities is raw dust, with big weight, so it is rapidly deposited to the ground. At the same time, demolition activities are not implemented on a large scale. Demolition will be implemented with successive method, resulting in a limited impact radius. However, givne the densely populated alleys, the impact is assessed as moderate.

Dust pollution from earthwork, grading and constructing pavement and drainage

During the construction phase, excavation activities include removal of organic matters on top soil layer and digging for drainage system installation. Due to the narrow alleys, big machineries and mechanical devices will not be deployed. The task will be carried out by man power and basic equipment (crowbars, hoes, shovels, small concrete mixer, concrete drilling and cutting machines, etc.). These activities will generate dust directly adversely affecting workers at the construction sites and local people.

According to dust emission formula [1] by the guidelines of environmental assessment sourcebook (World Bank, 1991) and US EPA, 1995: → E = 0.03403 kg/ton [k = 0.35; U (wind velocity) =

3.5 m/s; M (average humidity) = 14 %]. The loads of dispersed dust generated by excavation can be forecasted as follows (Table 4.3):

Table 4.3: Forecasts of dispersed dust from excavation

Item	Volume of excavating and backfilling (m^3)	Construction stage (Quarter)	Dust load (kg/day)
LIA 1	7,648	16	0.85
LIA 2	10,116	18	0.99
LIA 3	7,136	16	0.79
LIA 5	5.332	12	0.79
LIA 6	2.920	6	0.86

Note: Unit weight of soil: 1.4 tons/m^3

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 3.5 m/s and a distance of 10-50 m from generating sources, height 1.5-7.5 m, the concentration of pollutants created by excavation can be calculated as follows:

- For LIA 1: Dust concentrations vary between 0.18-0.71 mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3).
- For LIA 2: Dust concentrations vary between 0.19-0.83 mg/m^3.
- For LIA 3: Dust concentrations vary between 0.19-0.69 mg/m^3.
- For LIA 5: Dust concentrations vary between 0.19-0.69 mg/m^3.
- For LIA 6: Dust concentrations vary between 0.19-0.74 mg/m^3.

The data indicates that at the distance of 10m from construction site, dust concentration is 2.3 – 2.77 times higher than the standard; at the distance of 30 m from construction site, dust concentration is 1.03 to 1.3 times higher than the standard and meets the standard at the distance of 50 m from construction site. Within this distance, existing households along the alleys, workers at construction sites, traffic participants along the alleys will be affected. See Table 4.5 for scope and affected objects.

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

Dust and emission generated from transportation

Dust and exhaust gases from transportation: According to the standards established by the World Health Organization (WHO) (*Assessment of Sources of Air, Water and Land Pollution –Part 1: Rapid Inventory Techniques in Environmental Pollution, WHO, 1993)*, 15-ton diesel vehicles will generate loads of dust and exhausted CO, SO_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 20 km. The total passages of trucks and the generated dust loads in the process of transportation are calculated as follows:

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

Construction Items	Volume of material (m^3)	Transport time (months)	Number of vehicles (trip/day)	Volume of waste (trip/day)	Transport time (months)	Number of vehicles (trip/day)	Total vehicle (trip/day)
LIA 1	6,785.34	3	26	1,147.2	1.5	6	32
LIA 2	8,974.95	3	32	1,517.4	1.5	6	38
LIA 3	6,331.09	3	22	1,070.4	1.5	4	26

LIA 5	4,730.57	3	18	799.8	1.5	4	22
LIA 6	2,590.63	2	14	438	1	4	18

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 3.5 m/s, and a distance of 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 0.11-0.13 mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3); CO contents 5.65 mg/m^3 (compared with 30 mg/m^3); SO_2 contents 0.032 mg/m^3 (compared with 0.35 mg/m^3); and NO_x contents 0.037 mg/m^3 (compared with 5 mg/m^3).
- *For LIA 2:* Dust concentrations vary between 0.16-0.17 mg/m^3; CO contents 5.54 mg/m^3; SO_2 contents 0.025 mg/m^3; and NO_x contents 0.033 mg/m^3.
- *For LIA 3:* Dust concentrations vary between 0.13-0.14 mg/m^3; CO contents 5.31 mg/m^3; SO_2 contents 0.025 mg/m^3; and NO_x contents 0.03 mg/m^3.
- *For LIA 5:* Dust concentrations vary 0.15-0.16 mg/m^3; CO contents 5.14 mg/m^3; SO_2 contents 0.024 mg/m^3; and NO_x contents 0.034 mg/m^3.
- *For LIA 6:* Dust concentrations vary 0.16-0.17 mg/m^3; CO contents 5.32 mg/m^3; SO_2 contents 0.029 mg/m^3; and NO_x contents 0.038 mg/m^3.

Dust:

In general, the loads of dust generated in the process of transporting are forecast as being not substantial and would be distributed evenly along transportation routes, between 0.11 and 0.17 mg/m^3. According to calculations, the dust concentration would not exceed the national standards on ambient air quality (QCVN 05: 2013/BTNMT) outside 25 m of distance. 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 Cao Van Lau street, Vo Thi Sau street, Ninh Binh street, Tran Phu street, Highway 91C, Highway 1A and some other internal transport of the city. These are also main transport routes through the city. The results of air quality analysis in Chapter 2 shows that the air quality in these areas is currently fairly good. Therefore, the subproject impacts of dust would be visible. The receptors affected by dust would be the residents living along the routes. Dust pollution would hinder businesses and services located along the routes leading to a drop in the number of customers. However, these impacts can be fully controlled and minimized if all necessary mitigation measures would be carried out during construction. The impact level of dust during transportation is there by assessed as being medium.

Exhaust gases:

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

Table 4.5: Component 2 - Impact objects and scope of dust, noise and vibration

Construction item	Affected object	Distance from work (m)
LIA 1	- In the project area: residential area along alleys, workers at construction site and 01 sensitive receptor: Continuing Education Center of Bac Lieu province - On transportation route: inhabitants, passengers, PCRs and sensitive sites along the route: Tien Su ancient shrine, Tin Lanh church, Sao Mai nursery school, Kim Dong primary school.	0 - 20
LIA 2	- In the project area: residential area along alleys, workers at construction site, Linh Chau Pagoda. - On transportation route: inhabitants, passengers, PCRs and sensitive sites along the route: Le Van Tam primary school, Than Hoang temple, Le Thi Cam Le secondary school, Bac Lieu Vocational College, Chua xu Nuong Nuong temple, Chau Xuong ancient temple, Ba Van Ban temple, Church, Hiep Thanh primary school.	2 – 30
LIA 3	- In the project area: residential area along alleys, workers at construction site; Vinh Phuoc An pagoda, Phuoc An pagoda. - On transportation route: inhabitants, passengers, PCRs and sensitive sites along the route: Than Hoang temple, Le Thi Cam Le secondary school, Bac Lieu Vocational College, Chua xu Nuong Nuong temple, Chau Xuong ancient temple, Ba Van Ban temple, Church, Hiep Thanh primary school.	4 – 30
LIA 5	- In the project area: residential area along alleys, workers at construction site; Ong Chau small temple; Cemetery of Bac Lieu Buddhist Association - On transportation route: inhabitants, passengers, PCRs and sensitive sites along the route: Than Hoang temple, Le Thi Cam Le secondary school, Bac Lieu College, High School of Economics of Technology, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	4 – 40
LIA 6	- In the project area: residential area along alleys, workers at construction site - On transportation route: inhabitants, passengers, PCRs and sensitive sites along the route: Sao Mai nursery school Kim Dong primary school, Primary school of ward 8A, Le Thi Cam Le secondary school, Bac Lieu College, High School of Economics of Technology, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	5 – 35

- **Impacts on water environment**

Stormwater runoff

The flow of rainwater in the construction area depends on climate condition in the region. Total storm water generated from the project area during the construction is estimated as following equation:

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

In which:

S : Total project area (m^2).

φ : The flow coefficient of the surfaces ($\varphi = 0.2$ if surface is mostly land, $\varphi = 0.4$ if surface is mostly macadam (no binders), $\varphi = 0.6$ if surface is mostly asphalt, concrete).

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

- 166.7 : conversion factor for q in volume metric
- q: rain intensity = 166.7 x i, with i is the highest water level of the area in the highest rainy month (Hoang Hue – 2000). According to hydrography data of the region, the highest water level in June is 344.8 mm with 23.1 rainy days and 3 rainy hours each day, thus i = 0.083 mm/minute → q = 13.82 (l/s.ha).

Table 4.6: Flow of rainwater in the area – Component 1

Item	Storm water drainage area (m^2)	Flow coefficient	Rainwater flow rate (l/s)
LIA 1	7,648	0.4	4.23
LIA 2	10,116	0.4	5.59
LIA 3	7,136	0.4	3.94
LIA 5	2,920	0.4	1.61
LIA 6	7,648	0.4	4.23

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

Table 4.7: Concentration of pollutants in runoff storm water

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

Sources: WHO, 1993

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

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

Oil-contaminated water from the construction vehicles

The project uses diesel oil as fuel to operate construction machinery and equipment. The oil could be spilled due to the work of loading and unloading oil (transportation of oil from the container to the machine position and manipulating the oil into machinery). In case of incidents, oil from punctured or cracked fuel tank will lead to oil leakage into the street, and then be pulled down by rainwater into ditches, polluting the surface water in the area.

This source of contamination can be well controlled by measures at site, therefore, level of impact is medium.

Wastewater from construction activities

Construction wastewater is mainly spilled water of mixing concrete and ground washing water after finishing pouring concrete. The amount of water spilled from concrete mixing is not much since it is absorbed directly into soil when falling. After pouring the concrete, water is applied to

increase cohesiveness of concrete and will be absorbed directly into the surface so it does not arise. Such wastewater from construction activities are insignificant impact sources.

Domestic wastewater

The amount of wastewater generated from the activities of workers in the construction sector is insignificant and controllable. Water demand for each worker stated in TCXDVN 33:2006 is 45 lit/person.day, including water for washing, cooking and personal hygiene. The amount of wastewater generated is calculated as 100 % of the daily amount of used water. Flow rate in each area for each category of component 1 is calculated as follows:

Table 4.8: Domestic wastewater flow in Component 1

Construction Items	Amount of workers (person)	Regulated coefficient (K)	Flow rate of wastewater (m^3/day)
LIA 1	20	2.5	2.25
LIA 2	20	2.5	2.25
LIA 3	20	2.5	2.25
LIA 5	10	2.5	1.13
LIA 6	15	2.5	1.69

Source: Hoang Hue, 2000

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

Table 4.9: Domestic Wastewater Quality

Pollutants	Concentration	QCVN 14:2008/BTNMT (Column B)
pH	5 – 9	5 - 9
BOD_5	450 – 540	50
TSS	700 – 1450	100
Nitrate (NO_3^-)	50 – 100	50
Total coliform	10^6 – 10^9	5.000

Source: Hoang Hue, 2000

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

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

- **Impact from solid waste**

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

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

Table 4.10: Solid Waste Generated from Construction – Component 1

Construction Items	Construction solid waste (m^3)	Domestic solid waste (kg/day)
LIA 1	956	10

Construction Items	Construction solid waste (m^3)	Domestic solid waste (kg/day)
LIA 2	1,264.5	10
LIA 3	892	10
LIA 5	666.5	5
LIA 6	365	7.5

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

- **Impact from hazardous waste**

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

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

The average amount of grease and oil discharged from machinery and equipment is 7 liters/each change. Oil change and maintenance of machines-equipment are scheduled every 3 months at most. The number of vehicles and construction means needing oil changes is 49 (including 14 trucks). The amount of waste grease and oil generated in the construction site therefore averages (14 x 7 liters/time)/3 months = 33 liters of oil/month. In addition, the subproject would also generate an estimated amount of 25 kg of oily rags per month.

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

- **Impacts on traffic and infrastructure from the transport**

The project construction will increase the number of vehicles, especially trucks carrying raw materials (12 trips), and waste (14 trips). This increase will affect the traffic situation of the region because Vo Thi Sau, Tran Phu, Highway 91C route are among the main roads in Bac Lieu city.

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

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

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

- **Healt and Safety Risk to the Community**

Population density in LIA 5 is the highest among LIAs. In other LIAs, population is mainly concentrated along main alleys. Therefore, risks of impacts on community's health and safety in LIA 5 is considered the highest. Risks include:

(i) 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.

(ii) 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 with 10 - 20 workers to work at the construction site, and construction would not last long, this impact is low and controllable.

- **Impacts from risks and incidents**

Labor accidents

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

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

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

Fire, explosion and leakage of fuel

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

- The temporary fuel and material warehouse (gas, DO oil, FO oil, welding gas, etc.) are the source of fire and explosion. The occurrence of such incidents can cause serious damage to people, society, economy and the environment.
- Temporary power supply system for machines and equipment during construction can cause problems of shortcircuit, fire, explosion, electric shock, etc leading to economic and labor accidents for workers.
- The subproject owner will implement the fire prevention and strictly comply with measures to prevent leakage, fire or explosion. The fire prevention shall be done regularly to minimize the possibility of incidents and the levels of impact.

B. Site-specific Impacts during Construction

Implementation of aforesaid activities will cause site-specific impacts including (i) Localized flooding; (ii) Impacts due to dredged sediment from water drainage canal in LIA 2; and (iii) social disturbance and increased traffic risks; (iv) damage to water supply and

communication systems; (v) Impacts caused by transportation activities; (vi) Impacts on PCRs and other sensitive receptors in the residential areas.

Local flooding

The construction and upgrading the alley include gathering construction materials and machinery at construction site and concreting the surface. These activities will narrow the flow and reduce the absorption of land meanwhile the existing alleys in LIAs are relatively narrow and without drainage. Thus, in rainy days, localized flooding will likely occur. According to the calculation, the rain water run off at LIA 1 through LIA 6 areas are 4.23 l/s, 5.59 l/s, 3.94 l/s, 2.95 l/s, and 1.61 l/s (equivalent to the rainfall of 10 – 15 cm), respectively. Therefore, the houses along the alleys are likely to be affected due to poor housing conditions.

However, the construction is expected to be performed successively in each alley for 03 months, divided into small packages to be carried out at different time, and implemented in the dry season. Therefore, this impact is assessed as medium due to its temporary and localized nature, and will disappear upon completion of the construction.

Impact due to dredged sediment in LIA 2

In LIA 2, there is a small 130 m long canal which is the drainage of the surroundings. The canal is heavily polluted with organic matters (i.e. BOD_5, COD), nutrients (i.e. N, P) and pathogens (E.Coli, Coliform) and emits offensive odor which contains gases such as H_2S, CH_4, NH_3 and Mercaptan. Dredging of the canal will create favorable conditions for emission of the gases with nuisance odor, affecting the surrounding inhabitants; however, the volume of the dredging is small (only 260 m^3), and the time for dredging is about a week. The dredged sediment will be stored at the site within 24-48 hours. The analysis showed that the sediment is not contaminated with heavy metals and within the permissible limit for agricultural purposes. The excavated materials therefore could be used for levelling at the low land or gardening as needed. Therefore, the impact is considered small, short term, and localized.

Social disturbance and increased traffic risks

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

Damage to water supply and communication systems

The water supply pipelines mainly run along alleys (15.9 km long). Therefore, the rehabilitation of the alleys and installation of the combined sewers and water supply pipe system under this component may potentially affect the water supply infrastructure of the area, interrupting water supply operations due to temporary shut-off of water transmission pipelines or to break water transmission pipelines. Therefore, measures to prevent pipe breakage must be devised and carried out during the construction under this subproject. The impact level is assessed to be medium.

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

impact level is assessed to be low.

Impacts caused by transportation activities

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

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

Table 4.11: Transportation routes and affected objects

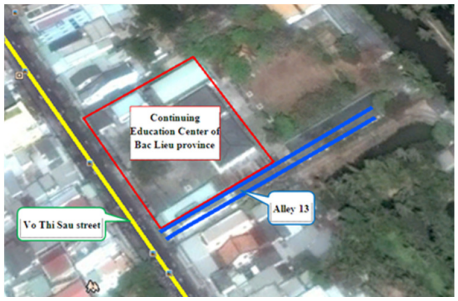
Items	Length of transportation routes	Transportation routes	Affected objects
LIA 1	9.5	Cao Van Lau Street→ Ninh Binh → Vo Thi Sau → Hoa Binh → Tran Phu → Highway 1A.	Inhabitants, passengers, PCRs and sensitive sites along the route: Le Van Tam primary school, Than Hoang temple, Le Thi Cam Le secondary school, Bac Lieu Vocational College, Chua xu Nuong Nuong temple, Chau Xuong ancient temple, Ba Van Ban temple, Church, Hiep Thanh primary school.
LIA 2	11.8	Cao Van Lau Street→ Tran Phu → Cach Mang → Highway 91C → Highway 1A	Inhabitants, passengers, PCRs and sensitive sites along the route: Le Van Tam primary school, Than Hoang temple, Le Thi Cam Le secondary school, Bac Lieu Vocational College, Chua xu Nuong Nuong temple, Chau Xuong ancient temple, Ba Van Ban temple, Church, Hiep Thanh primary school.
LIA 3	9.6	Cao Van Lau Street→ Tran Phu → Highway 1A	Inhabitants, passengers, PCRs and sensitive sites along the route: Than Hoang temple, Le Thi Cam Le secondary school, Bac Lieu Vocational College, Chua xu Nuong Nuong temple, Chau Xuong ancient temple, Ba Van Ban temple, Church, Hiep Thanh primary school.
LIA 5	12.2	Cao Van Lau Street→ Nguyen Thi Minh Khai → Highway 91C → Highway 1A.	Inhabitants, passengers, PCRs and sensitive sites along the route: Than Hoang temple, Le Thi Cam Le secondary school, Bac Lieu College, High School of Economics of Technology, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.
LIA 6	11.5	Cao Van Lau Street→ Ninh Binh → Vo Thi Sau → 23/8 → Tran Phu → Highway 1A.	Inhabitants, passengers, PCRs and sensitive sites along the route: Sao Mai nursery school Kim Dong primary school, Primary school of ward 8A, Le Thi Cam Le secondary school, Bac Lieu College, High School of Economics of Technology, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.

Impact on the PCRs and sensitives receptors

- For religious works: Vinh Phuoc An Pagoda, Phuoc An Pagoda (located on the alleys) in LIA 2; Linh Chau Pagoda (from 3 m to alley); Cemetery of Bac Lieu Buddhist Association (from 1 m to alley), Ong Chau Temple (from 2 m to alley) in LIA 5: Constructing alleys, dredging canals and transporting fuel, materials and waste will have negative impacts on aforesaid entities because: i) Hindrance to access to the pagoda, cemetery; ii) Increase in dust, exhaust gases, and noise affecting religious practices and visitors to the pagoda, especially during the religious events (1st and 15th days every month); iii) Increased construction wastes, waste water; iv) Risks of traffic accidents and safety due to construction; and v) Localized flooding becasue of construction during rainny days; vi) Conflicts between workers and visitors to the pagoda, cemetery.
- For Bac Lieu Provincial Continuing Education Center (located on alley No.13): teachers, students and guests at school will be affected by the impacts: (i) Hindrance to access to the school; (ii) Exhaust gases, dust and noise, and wastes affecting teachers and pupils' health; (iii) Increased risks of traffic accidents due to construction and transportation; (iv) Lessons affected by noise.

In addition to the aforesaid impacts, PCRs and sensitive receptors can be affected by vibration caused by excavation process for the installation of box culvert along the road and compaction activities, ect of construction equipment. This vibration can cause the structures within 5m from emission sources to sink, crack or collapse.

Continuing Education Center of Bac Lieu province (located on the alleys) in LIA 1; Vinh Phuoc An Pagoda, Phuoc An Pagoda (located on the alleys) in LIA 3; Linh Chau Pagoda (from 3 m to alley) in LIA 2; Cemetery of Bac Lieu Buddhist Association (from 1 m to alley), Ong Chau Temple (from 5 m to alley) in LIA 5 are located within the radius of 5 m, so they can be affected. The construction work are of small scale, and the alleys are narrow, which do not allow mobilization of heavy machines which could cause high level of vibrations. The equipment to be use mainly includes manual, portable equipment, so risk on structure collapse/cracking due to vibration is not significant. For precautionary, the mitigation measures to prevent, avoid or compensate for this risk on infrastructure collapse/cracking will be included in the ESMP as the requirements for the contractors during the construction process.



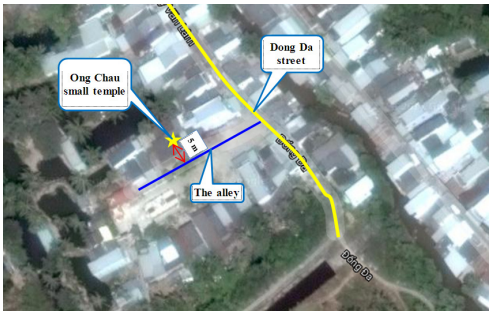
Continuing Education Center of Bac Lieu province

Vinh Phuoc An Pagoda

Phuoc An Pagoda

Linh Chau Pagoda

Cemetery of Bac Lieu Buddhist Association



Ong Chau Temple

These impacts are temporary due to short construction time of 03 months and can be mitigated by apply proper construction and management measures. Therefore the impact is assessed as medium.

4.1.3.3. Component 1- Impacts during Operation

Local flooding due to inadequate operation and maintenance (O&M)

When the alleys are completely upgraded and put into operation, the drainage system will be dredged annually to avoid clogging the flow that leads to inundation in the area. Besides, the drainage system will be timely maintained in case of damage.

The maintenance of drainage system will generate a volume of sediment from the dredging process. This waste will emit offensive odor and affect to regional landscape if it is not handled promptly. Normally, contractor will contract with a functional enterprise to collect and dispose this waste. The collection will be carried out within 24 hours, and thus so the impact level is low.

Traffic safety

After construction, traffic in LIAs will be convenient, leading to increasing traffic flow in LIAs, and thereby increasing pollutants in the environment such as dust and exhaust emission gases. Because of small area of alleys, the increasing traffic flow won't be high and can be controlled by arranging traffic signs to limit loading capacity and means of transportation. Therefore, even these impacts are long-term, they could be mitigated and are assessed at the low level.

Waste Management

In Component 1, there will be arrangements of trash bins on the alley routes. This activity aims to prevent re-occurrence of contamination because of littering. This impact is considered as positive because it improves the environmental sanitation and urban aesthetic. It is only negative when the garbage is uncollected, causing containing volume overload. Meanwhile, the problem of odor and sanitation will affect people living near these bins.

4.1.4. Impact Assessment for Investments under Component 2 - Prioritized primary and secondary infrastructure items

This component aim to improve water quality, drainage capacity and sanitation conditions around the canals of the inner area of Bac Lieu city (Cau Xang canal from Tra Kha to Tra Khua) by dredging, embankments and construction of routes on 2 sides. The component also build streets (upgrading Lo Bo Tay Street, Lo Ren Street, Huong Lo 6 Street, Hai Ba Trung Street, and the internal link of Nguyen Dinh Chieu – Ba Huyen Thanh Quan) with adequate infrastructure (drainage, light and green system) in order to connect areas and improve the urban traffic network.

The construction under component 2 has both positive and negative effects in accordance with phases of the project. These impacts are assessed in detail below.

4.1.4.1. Component 2 – Impacts during Preparation

The activities to be implemented during pre-construction phase of all items under Component 2 are UXOs identification and clearance and land acquisition.

Impact by UXOs

The entire subproject area under Component 2 has been significantly disturbed by human activities and city development. However, there is still risk of UXOs left after the war. If not detected and cleared before construction the risk may be substantial including human injury and casualties and damages to the local houses, assets, and public infrastructures. Therefore, the UXOs need to be cleared before commencement of construction.

Impacts by land acquisition

Land acquisition will affect AHs both physically and mentally, even causing social problems and prolonged litigation. The land acquisition will affect 1,760 households, including 1,541

partly affected households, 73 relocated households, and 146 households affected over 20 % of agricultural land. The detailed impact assessment for land acquisition and resettlement under this component is given in Section 4.2 – Social Assessment.

4.1.4.2. Component 2 – Impacts during Construction

A. Generic Impacts during Construction

- **Impacts on air quality**

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

a1. Dust and emission

Dust from demolition activities

Before carrying out the construction work, clearance activities will be done. Accordingly, the structure within the scope of land acquisition will be demolished. Waste arising from this activity is debris with estimated volume 12,911 m^3.

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

Dust emission coefficient is determined in accordance with guidelines of environmental assessment sourcebook (World Bank, 1991) and AP 42 for Stationary Point and Area Sources (US EPA, 1995): E=0.04656 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 4.12).

Table 4.12: Forecasts of dispersed dust from demolition

Item	Volume of demolition (m^3)	Construction stage (Quarter)	Dust load (kg/day)
Cau Xang canal	4,684	6	2.18
Lo Ren street	2,334	4	1.63
Lo Bo Tay street	1,973	4	1.38
Huong Lo 6 street	1,214	2	1.7
Internal link of Nguyen Dinh Chieu – Ba Huyen Thanh Quan	811	1	2.27
Extended Hai Ba Trung street	542	1	1.51

Note: Unit weight of debris: 1.8 tons/m^3

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 3.5 m/s and a distance of 10-150 m from generating sources, height of 1.5-12 m, the concentration of pollutants created by demolition can be calculated as follows:

- For Cau Xang canal: Dust concentrations vary between 0.19-1.62 mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3).
- For Lo Ren street: Dust concentrations vary between 0.15-1.2 mg/m^3.
- For Lo Bo Tay street: Dust concentrations vary between 0.14-1.03 mg/m^3.
- For Huong Lo 6 street: Dust concentrations vary between 0.15-1.24 mg/m^3.
- For Internal link of Nguyen Dinh Chieu – Ba Huyen Thanh Quan: Dust concentrations vary between 0.17-1.63 mg/m^3.
- For extended Hai Ba Trung street: Dust concentrations vary between 0.23-1.2 mg/m^3.

Dust concentration is 3.4-5.4 higher than allowable level at height of 1.5 m and distance of 10 m. At distance of 150 m from generating sources, the concentration is within allowable level of QCVN 05:2013/BTNMT. The affected objects are the existing households, PCRs, sensitive sites (at the distance of 1-150 m) and passengers in the area (see Table 4.17 below). These activities happen only 6 - 8 weeks at each demolition point, so the impact level is medium.

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

Dust from earthworks

According to the project schedule, project construction is expected from August, 2021 to September 2018 (5 years); Project construction will be divided into several packages and will be implemented at different timelines. Dust generated by excavation and backfilling activities under Component 2 is calculated in the same way as component 1. The loads of dispersed dust generated by earthworks can be forecasted as follows (Table 4.13).

Table 4.13: Earthwork volumes and duration of component 2

Construction Items	Earthwork volumes (m^3)	Estimated time (month)	Load of generated dust (kg/day)
Cau Xang canal	96,000	20	8.49
Lo Ren street	168,000	24	12.39
Huong Lo 6 street	32,000	10	5.66
Lo Bo Tay street	169,960	24	12.53
Nguyen Dinh Chieu street	15,400	8	3.41
Hai Ba Trung street	3,300	6	0.97

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 3.5 m/s and a distance of 10-500 m from generating sources, height of 1.5-70 m, the concentration of pollutants created by transportation operations can be calculated as follows:

- For Cau Xang canal: Dust concentrations vary between 0.18-5.8 mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3).
- For Lo Ren street: Dust concentrations vary between 0.17-8.36 mg/m^3.
- For Lo Bo Tay street: Dust concentrations vary between 0.12-8.41 mg/m^3.
- For Huong Lo 6 street: Dust concentrations vary between 0.13-3.87 mg/m^3.
- For Internal link of Nguyen Dinh Chieu – Ba Huyen Thanh Quan: Dust concentrations vary between 0.16-2.41 mg/m^3.
- For extended Hai Ba Trung street: Dust concentrations vary between 0.14-0.78 mg/m^3.

The data shows that at the distance of 10 m from construction site, dust concentration from street building is 2.6-27.8 times higher than the standard and dust concentration from canal improving is 19.3 times higher than the standard. Within these distances, the affected objects are the households along the street and canal, PCRs, sensitive sites in the area (see Table 4.17 below).

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

Impact from the transportation of materials

In the project, material is transported by 2 ways:

- ✓ *Waterway:* Material is transported to the gathering site by barges on Bac Lieu river toward Hau river with the average distance of 100 – 200 km. The material is continuously transported by 15-ton-truck to construction site with the average distance of 10 km.

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

- ✓ *Road transport:* Sand, stone is transported by 15-ton-trucks (bucket volume 12.5 m^3) to construction site with the distance of 10 km. The other raw materials are mostly from available sources in Bac Lieu city at the maximum distance of 7 km.

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

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

Construction Item	Material volume (m^3)	Transport time (months)	Number of vehicles (trip/day)	Waste disposal volume (m^3)	Transport time (month)	Number of vehicles (trip/day)	Total vehicles (trip/day)
Cau Xang canal	62.868.63	20	16	220,800	18	66	82
Lo Ren street	89,751.30	24	20	21,000	15	8	28
Huong Lo 6 street	17,100.98	10	10	4,000	8	4	14
Lo Bo Tay street	99,071.19	24	22	21,245	15	8	30
Nguyen Dinh Chieu street	11,279.08	8	10	1,925	5	4	14
Hai Ba Trung street	2,238.24	6	4	412.5	3	2	6

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 3.5 m/s, and a distance of 5-25 m from generating sources, the concentration of pollutants created by transportation operations can be calculated as follows:

- For Cau Xang canal: Dust concentrations 0.19 mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3); CO contents 5.65 mg/m^3 (compared with 30 mg/m^3); NO_x contents 0.057 mg/m^3 (compared with 0.2 mg/m^3) and SO_2 contents 0.046 mg/m^3 (compared with 0.35 mg/m^3).
- For Lo Ren street: Dust concentrations 0.164 mg/m^3; CO contents 5.04 mg/m^3; SO_2 contents between 0.03 mg/m^3; and NO_x contents 0.034 mg/m^3.
- For Huong Lo 6 street: Dust concentrations 0.13 mg/m^3; CO contents 5.01 mg/m^3; SO_2 contents 0.031 mg/m^3; and NO_x contents 0.041 mg/m^3.
- For Lo Bo Tay street: Dust concentrations 0.118 mg/m^3; CO contents 5.01 mg/m^3; SO_2 contents between 0.025 mg/m^3; and NO_x contents between 0.034 mg/m^3.
- For Internal link of Nguyen Dinh Chieu – Ba Huyen Thanh Quan: Dust concentrations vary between 0.13 mg/m^3; CO contents between 5.37 mg/m^3; SO_2 contents 0.031 mg/m^3; and NO_x contents 0.041 mg/m^3.
- For extended Hai Ba Trung street: Dust concentrations vary between 0.168 mg/m^3; CO contents 5.54 mg/m^3; SO_2 contents 0.025 mg/m^3, and NO_x contents 0.032 mg/m^3.

Dust:

In general, the loads of dust generated in the process of transporting are forecast as being not substantial and would be distributed evenly along transportation routes, between 0.11 and 0.19 mg/m^3. According to calculations, the dust concentration would not exceed the national standards on ambient air quality (QCVN 05: 2013/BTNMT) outside 25 m of distance. However, it must be noted that the amount of dust generated is large owing to the mobilization of machinery and vehicles on the construction site. At some points of time, relatively large amounts of dust may abruptly increase when a large number of machines and vehicles are mobilized for necessary construction tasks.

The main transport routes for materials transportation would be Cao Van Lau street, Tran Phu street, Vo Thi Sau street, Highway 91C, Highway 1A and some other internal transport routes to the South of the city. The results of air quality analysis in Chapter 2 shows that the air quality in these areas is currently fairly good. Therefore, the impacts of dust would be visible. However, this impact is temporary and can be mitigated. 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, especially along Vo Thi Sau street and Tran Phu street, which are often crowded with business activities. The impact level of dust during transportation is thereby assessed as being medium.

Exhaust gases:

All criteria namely CO, SO_2, NO_x caused by material and waste transportation activities of vehicles are within allowable limit of QCVN 05:2013/BTNMT.

a2. Noise

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

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

Construction facilities	Distance to noise source (m)								
	15	**50**	**150**	**250**	**350**	**450**	**550**	**650**	**750**
Truck	74-99	85-88	76-79	71-75	68-71	66-69	58-67	66-67	65
Roller	74-77	64-67	54-57	53-57	47-50	44-47	43-46	41-44	43
Compactors	76-81	66-70	59-61	52-55	52-53	49-52	48-49	46-48	45
Graders	85-88	75-78	65-70	61-64	58-61	55-58	54-57	52-55	51
Concrete mixers	85-91	78-81	68-71	64-67	62-64	58-60	58-60	52-57	56
Bulldozers	80-83	68-70	60-63	56-59	53-56	50-53	49-52	47	46
40 ton crane	87-90	77-80	67-70	66-68	63-66	57-60	56-59	54-57	56
Generator	74	64	54	50	47	44	43	41	40
Excavators	85-90	75-79	65-70	64-65	61-62	58-60	54-58	55-57	56
Pile machine	104	94	84	80	77	74	73	71	70
Plastic spreader	89-92	79-82	69-72	65-68	62-65	59-62	58-61	56-59	58
Driving machine	89	79	69	65	62	59	58	56	55
Plastic spreader	92	82	72	68	65	62	61	59	58
QCVN 26:2010/BTNMT (From 6h-21h) - normal areas	**70**								

Comments:

The noise levels of most facilities do not meet QCVN 26: 2010/BTNMT - National Technical Regulations on noise (70 dBA for normal area from 6 - 21h) at the distance less than 50 meters. The impact scope of excavator is even larger, 650 m. Within this distance, residential area along the route, PCRs, sensitive sites in the area are affected (see Table 4.16 below).

However, the calculation is performed with all equipment is operated at the same time; whereas, in fact, the construction is spliced into several packages and construction facilities operate at different

times. In addition, equipment operates 8 hours/day at most so that these noise sources are discontinuous, short-term and can be assessed at medium level.

a3. Vibration

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

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

No	Vehicle	Vibration at distance of 7.5 m (dB)	QCVN 27:2010/BTNMT, (From 6:00 - 21:00) - normal areas
1	Truck	86	**75 dB**
2	Bulldozers / brushed machine	87	
3	Excavators	94	
4	Roller	94	
5	Pile machine	93	

Source: US FTA, 2006.

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

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

No	Vehicle	Vibration at distance of D (m) (dB)									
		7.5	**12.5**	**15**	**17.5**	**20**	**22.5**	**25**	**27.5**	**30**	**32.5**
1	Truck	82	79	77	75	73	72	70	69	68	67
2	Bulldozers/brushed	83	80	78	76	74	73	71	70	69	68
3	Excavators	90	87	85	83	81	80	78	77	76	75
4	Roller	90	87	85	83	81	80	78	77	76	75
5	Pile machine	89	86	84	82	80	79	77	76	75	74
QCVN 27:2010/BTNMT, (From 6:00 to 21:00) - normal areas		**75 dB**									

Comment:

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

Impacts on surrounding environment

Vibrations generated during the operation of the pile machine and roller transmit as waves on the ground causing impacts on the surrounding area, especially on buildings, underground works on weak land. In the project area, the construction structure as following:

- Items of upgrading canal (Cau Xang canal): 90 % of construction structures are temporary or third grade houses. There is no building or underground work in the area.
- Items of building road (Lo Bo Tay, Lo Ren, Huong Lo 6, internal link Nguyen Dinh Chieu, Hai Ba Trung): 85 % of construction structures are temporary or fourth grade houses, 15 % of them are second and third grade houses.

Currently, there is no underground or high building in the project area. In terms of the project area, the impacts of vibration on the community are inevitable because there are always people living on the routes and canals. The sensitive objects affected by vibrations within the radius of 30 m are presented in Table 4.18.

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

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

Construction item	Affected object	Distance (m)
Improve Cau Xang canal to Tra Kha, Tra Khua	- In the project area: residential area along route, workers at construction site. - On transportation route: inhabitants, passengers, PCRs and sensitive sites along the route: elementary school of ward 8A, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	6 - 30
Build Lo Ren street	- In the project area: residential area along route, workers at construction site, Phap Tanh pagoda. - On transportation route: inhabitants, passengers, PCRs and sensitive sites along the route: Nguyen Thi Minh Khai Secondary School, Le Thi Cam Le secondary school, Bac Lieu College, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	4 – 30
Build Lo Bo Tay street	- In the project area: residential area along route, workers at construction site; Bac Lieu Baptist church, elementary school of ward 2B. - On transportation route: inhabitants, passengers, PCRs and sensitive sites along the route: Nguyen Thi Minh Khai Secondary School, Le Thi Cam Le secondary school, Bac Lieu College, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	4 – 30
Upgrade Huong Lo 6 street	- In the project area: residential area along route, workers at construction site; The Than temple, Thieu Quang Sung Thien Duong pagoda and cemetery of Teochew people. - On transportation route: inhabitants, passengers, PCRs and sensitive sites along the route: Le Van Tam primary school, Le Thi Cam Le secondary school, Bac Lieu College, High School of Economics of Technology, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	4 – 40
Build internal link (Nguyen Dinh Chieu; Ba Huyen Thanh Quan)	- In the project area: residential area along route, workers at construction site - On transportation route: inhabitants, passengers, PCRs and sensitive sites along the route: Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	0.5 – 25
Build prolonged Hai Ba Trung	- In the project area: residential area along route, workers at construction site - On transportation route: inhabitants, passengers, PCRs and sensitive sites along the route: Le Van Tam primary school, Le Thi Cam Le secondary school, Bac Lieu College, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	0.5 – 25

- **Impact on Water Quality**

Impact by runoff Stormwater

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

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

Item	Storm water drainage area (m^2)	Flow coefficient	Rainwater flow rate (l/s)
Lo Ren street	170,200	0.4	94.09
Huong Lo 6 street	9,000	0.4	4.98
Lo Bo Tay street	91,500	0.4	50.58
Internal link of Nguyen Dinh	14,850	0.4	8.21
Extended Hai Ba Trung street	2,900	0.4	1.60

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

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

Impact on surface water quality

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

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

The impact from leachate

Total amount of dredged sediment from Cau Xang canal is 96,000m^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.

Impact on soil and groundwater quality

Gathering sediment along the canal possibly pollute soil and groundwater environments because of sludge leachate. The mechanism causing this situation is heavy metal and organic pollutants in leachate penetrate into the surface soil layer and with time will penetrate into the groundwater stratum below. However, the sludge monitoring mentioned in Chapter 2 shows that the heavy metal concentration meets QCVN 03-MT: 2015/BTNMT - National technical regulation on the allowable limits of heavy metals in the soils. In addition, there is an HDPE layer at the bottom of sludge

gathering area and the duration for storing at site does not exceed 48 hour so the impact is unremarkable.

Waste water from construction activities

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

Domestic wastewater of construction workers

The amount of wastewater generated from the activities of workers in the construction sector is insignificant and controllable. Water demand for each worker stated in TCVN 33:2006 is 45 lit/person.day, including water for washing, cooking and personal hygiene. The amount of wastewater generated is calculated as 100% of the daily amount of used water.

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

Construction Items	No. Of workers	Irregular coefficients (K)	Flow rate of wastewater (m^3/day)
Cau Xang canal	60	2.5	6.75
Lo Ren street	40	2.5	4.5
Huong Lo 6 street	40	2.5	4.5
Lo Bo Tay street	40	2.5	4.5
Internal link of Nguyen Dinh Chieu – Ba Huyen Thanh Quan	20	2.5	2.25
Extended Hai Ba Trung street	20	2.5	2.25

Domestic wastewater contains mainly excreted substances with high concentration of organic waste. In particular, concentration of BOD_5 in urine is about 8.6 g/l and in feces is about 9.6 g/100g. Therefore, feces and urine would remarkably impact on soil and water environment of the project area if they are discharged directly into the ground. However, during the construction, contractors minimizing measures shall be applied, including:

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

➢ **Solid waste**

The solid waste generated in this period includes:

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

Table 4.21: Component 2 – Solid waste from construction stage

Construction Items	Construction waste (m^3)	Domestic solid waste (kg/day)
Cau Xang canal	220,800	30
Lo Ren street	21,000	20
Huong Lo 6 street	4,000	20
Lo Bo Tay street	21,245	20
Nguyen Dinh Chieu street	1,925	10
Hai Ba Trung street	412,5	10

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

- **The impact of hazardous waste**

The average amount of grease and oil discharged from machinery and equipment is 7 liters/each change. Oil change and maintenance of machines-equipment are scheduled every 3 months at most. The number of vehicles and construction means needing oil changes is 49 (including 30 trucks and 162 construction means). The amount of waste grease and oil generated in the construction site therefore averages (192 x 7 liters/time)/3 months = 448 liters of oil/month. In addition, the subproject would also generate an estimated amount of 100 kg of oily rags and containers per month.

- **Impacts on ecological**

For terrestrial ecosystems

Site surveys show that terrestrial ecosystems along the routes and 2 banks of Cau Xang canal are some kinds of fruit trees, creeper and shade trees (nipa palm, water spinach, cotton tree, bamboo, etc.). There are also a number of bushy plants such as phyllanthus, taro, pistia, sedge, etc. and weeds. These plants will be cut down for construction works.

This clearance also affects animals, insects, birds, etc. However, number of affected species are not many, mainly frogs, reptiles and invertebrates living along the canals to be dredged.

For aquatic ecosystems

As presented in Chapter 2, the aquatic ecosystem of Cau Xang canal is poor and there is no endangered species according to the Vietnam Red Data Book and IUCN Red List. The main species include benthic creatures such as eels, loaches; crustaceans such as snails, shrimp; and all kinds of perch, black carp... and plankton species. Dredging activities affect the aquatic species, including:

- The removal of the substrates including benthic organisms will reduces species diversity and species composition of aquatic ecosystem. Affected aquatic species at bottom layer of the canal: eels, loaches and snails.
- High concentration of suspended solids in the water due to dredging process would restrict light to the water layers, affecting the photosynthesis of algal, algae, mosses, and cause asphyxia for fish because small particles entering gills.
- Bottom disturbance will promote the decomposition of organic material by microorganisms. Accordingly, the depletion of oxygen in the water makes the invertebrates asphyxiated as well as losing their habitats.

There are also some other impacts on aquatic species related to suspended solids in the water. To fish, eggs and larvae of fish, one of the most sensitive species to levels of suspended sediment in the water, sludge particles settling down or suspending in water force them to swim out of the disturbed areas and lose the stable habitats. In locations with high turbidity, populations of underwater free-

swimming organisms like fish will likely swim out of the disturbed areas; Shellfish is virtually unaffected because the sediment levels affecting shellfish are over 10,000 mg / l (DOER 2000).

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

As reported by the USACE, if the substrate stabilizes for slow and medium speeds, the recovery time of the dredging area will be below 5 years. Meanwhile, the measurement of the USEPA on the recovery of the dredging area has pointed out that the recovery of biological diversity of invertebrate is determined to be in 1 year (A. M. Prussian et al. 1999).

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

Table 4.22: The recovery time observed in the dredging area

No.	Habitat type	Recovery time
1	The mud is often disturbed	4 weeks
2	Canals mud	6 months
3	Sand-gravel	1-2 years
4	Mud-Sand	18 months
5	Gravel	>2 years
6	Sand	3 years
7	Shell-sand	10 years

Based on the above statistics and the nature of the sediments in Cau Xang canal belongs to canals mud, the ecosystems recovery time after dredging is predicted at around 6 months.

- **Impacts on traffic infrastructure**

In the construction of items in component 2, the number of vehicles transporting waste and raw material is not much (08 trips/day). However, most of them are heavy vehicles and the project areas occupy several residential routes, impacts on traffic infrastructure are possible.

The increasing number of vehicle may affect the traffic safety and traffic jam on route. The transportation route includes Cao Van Lau, Tran Phu. This work also impacts on PCRs and sensitive receptors on route (see chapter 2, part 2.6), especially on holy days, rush hour.

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

- **Impacts on waterway traffic**

The material for construction activities is transported by both waterway and land, estimating there will be about 118 barge trips / month serving for transporting construction materials. Thus, there will be an increase in the number of barge transporting on Hau River and Bac Lieu River. This increase may cause some impact as below:

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

- **Impact on City Landscape**

The rehabilitation/construction activities would require excavation on 05 roads and pavement for the construction and rehabilitation, installation of the combined sewers, setting up of wall fences for the construction sites. These operations would temporarily change the landscapes in these areas. Besides, construction materials would also be transported and gathered at construction sites. Without proper management, indiscriminate gathering of materials would take place, especially in narrow construction sites for the tertiary culverts, stormwater, and wastewater drainage systems, affecting the area landscape..

The rehabilitation / construction of 05 roads and Cau Xang canal would cause small impacts on the general landscape of the city. Conversely, this is an opportunity to create a general harmonious and beautiful landscape in the city.

The level of impact on urban beauty and landscape in these areas is assessed to be medium.

- **Impacts from risks and incidents**

Labor accidents

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

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

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

Fire, explosion and leakage of fuel

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

- The temporary fuel and material warehouse (gas, DO oil, FO oil, welding gas, etc.) are the source of fire and explosion. The occurrence of such incidents can cause serious damage to people, society, economy and the environment.
- Temporary power supply system for machines and equipment during construction can cause problems of shortcircuit, fire, explosion, electric shock, etc leading to economic and labor accidents for workers.
- The subproject owner will implement the fire prevention and strictly comply with measures to prevent leakage, fire or explosion. The fire prevention shall be done regularly to minimize the possibility of incidents and the levels of impact.

B. Site-Specific Impacts

b1. Site – specific Impacts from the renovation of Cau Xang canal (Subcomponent 2.1)

The main function of Cau Xang canal is drainage. The canal will be dredged section by section over segments of 50 – 100m. Both ends of each segment will be prevented by a piling coffer dam, and then water will be pumped out for dredging. The canal sides will be reinforced for embankment. The total amount of dredged sediment from Cau Xang canal is about 96,000 m^3. The sediment will be transported by 1-15 ton trucks to the designated disposal site. The site-specific impacts arising from these activities would be: i) Offensive odor from dredged sediment; ii) Impacts due to transportation

of the dredged sediment; (iii) Risk of subsidence during construction; iii) Impacts on traffic caused by demolition of the temporary bridge; iv) Risk of damage of the existing infrastructure; v) Localized flooding.

Odors from the dredged material

The canal's sediment is an organic layer accumulated for long time at the bottom of water body and also a receiving source of organic pollutants. The anaerobic condition in water is the environment for organic substances to degrade and produce unpleasant odors and toxic gases such as NH_3, CH_4, H_2S, etc. It is possible that the dredging will release these gases into the atmosphere especially offensive odors, affecting the workers and the residents in the area.

Households along Cau Xang canal will be impacted. However, because dredging activities will be implemented section by section with 50-100 m for each section, odor pollution will directly affects households section by section. Specifically, the people living in the densely populated area from Km0+00 to Km2+630 and from Km4+020 to Km4+800 would be affected the most. For the remaining alignments, the households are sparsely distributed, interspersed with vacant land, and thus the impact level is less. Dredging duration for each section is relatively short. At the same time, the sediment will not be left at construction site for more than 48 hours; therefore, the odor impact is medium, localized, and temporary.

In addition, during the transportation of the sediment, bad odor, nuisance, and leakage could occur, affecting the people living and travelling along transportation routes. The impacts are short term and could be mitigated.

Impacts due to transportation of the dredged sediments

The transport of the dredged sediment by truck from the construction sites to the disposal site may cause leakage and scattering of the materials along the transport route. The level of sediment scattering depends on the amount of the sediment contained in the truck and the level of its saturation. Leakage and scattering of dredged sediment during transport would cause not only impacts on the environment, society and landscape, but also unsafe traffic for local residents and damages to the local roads. Therefore, in this process, the contractor must follow strictly the regulations on transport, construction methods, transport route which have been prescribed and must follow specific measures outlined in the ESMP of the ESIA. The impact is considered to be moderate.

Risk of subsidence during construction

The current status of the Cau Xang canal banks is natural earth banks, many sections of which have been encroached by local houses. Therefore, when carrying out the dredging and earthworks, the risk of landslides is likely to occur. The causes include: i) The soft soil along the canal; ii) Lack of bank support schemes; iii) Construction in the rainy season with risks of big flood combined with high tide peak causing river bank erosion and landslide at the construction site; and iv) Increased flow velocity and restriction of flow section due to blockage of the flow for dredging.

In case of subsidence, the residential area along Cau Xang canal, specifically from Km0+00 to Km2+630 and from Km4+020 to Km4+800 would be affected, as well as the safety for workers. The consequences could be damages to the local houses such as wall cracks, partial house subsidence, or house collapse depending on the severity of the impact.

Impacts on residential access and traffic

Field survey shows that along the two sides of Cau Xang canal there are public concrete roads of 2-3 m wide and are in good condition. However, at some segments, people have encroached the canal causing narrowing the canals and public roads. The households use temporary bridges (1.5 m wide made of concrete or wood) to connect to the other side of the canal. Totally, there are 9 temporary bridges from Km2+630 to Km4+020.

During upgrading the canal, these bridges will be removed, affecting the community access to their houses and local roads. However, demolition of the bridges will not be carried out at the same time, but by segments. Temporary bridges and pathways will be set up during the construction to provide access to the affected communities.

During construction, the traffic along the canal would be affected due to gathering and operation of the construction machines, negatively affecting the traffic flow. The construction activities also affect the traffic on 6 streets crossing Cau Xang canal, particularly at the junctions, including Huong Lo 6 (at Km0+160), Tran Huynh street (at Km0+820), Nguyen Van Linh street (at Km1+260), Nguyen Thai Hoc street (at Km1+360), Hung Vuong street (at Km2+090), and Tran Phu street (at Km2+320). These streets are the main routes of Bac Lieu city with high traffic density. The present of construction facilities will limit the traffic at these areas and may cause traffic jam and risks of traffic accidents. However, construction sites are apart from others so the impact is localized and happen in short time. Contractors shall apply proper measures to accommodate the traffic at these sites during the construction. This impact is assessed as moderate.

Risk of damage to the existing infrastructure

Cau Xang canal runs under 6 main streets of Bac Lieu city as mentioned above. At these junctions, there are reinforced concrete box culverts of 15-45 m long and 8-28 m wide. The dredging activities may damage these culverts due to the contact between dredging equipment and these structures, affecting water drainage capacity of the existing box culverts. The impact is considered small. Nevertheless, the contractors shall apply appropriate technical measure to minimize the impact. The detailed measures are presented in Chapter 5.

Localized flooding

Cau Xang canal plays an important role in drainage of the project area. Currently, the canal is deposited with sediment and encroached by local houses, and thus its drainage ability is very limited. The risk of flooding during construction is very likely to occur due to the occupancy of the construction machinery and blockage of the flow. When the flow is prevented, water will overflow to both sides causing local flooding to the surrounding. This risk will be more serious in the rainy season. Specifically, the people living in the densely populated area from Km0+00 to Km2+630 and from Km4+020 to Km4+800 would be affected the most. Contractors shall apply solutions to flow leading or local sewer to solve the local flooding in the area.

b2. Impacts from road construction

Site-specific impacts during the construction of Lo Ren road and Lo Bo Tay road

The construction of Lo Ren and Lo Bo Tay roads will include: upgrading / constructing road with infrastructure along the route, such as drainage systems, lighting and green area. The anticipated site-specific impacts are: i) Impact on water flow; ii) Impacts on water quality and flow due to construction of the bridge; iii) Impacts on aquaculture; and iv) Impacts on PCRs and other sensitive receptors.

Impact on water flow due to construction of the Lo Ren and Lo Bo Tay roads

As presented above, Lo Ren and Lo Bo Tay alignments have many intersections with hydraulic canals. The main functions of these canals is to conduct water from 30/4 canal (60-80 m from Lo Bo Tay and Lo Ren roads) to aquaculture areas along the alignment. At the same time, these canals also drain water in the area. There are 2 solutions for intersections, including bridges and box culverts. The specific solution for each works item as follows:

- Lo Ren road: There are 10 junctions along the route (Lo Ren route intersects 10 hydraulic canal). At Km3+385, 01 reinforced concrete bridge will be built with the size as 37.5 m length x 9.8 m width, span scheme 2x18.6m, 2 end supports and 1 abutment. And at the 09 remaining locations, 9 reinforced concrete box culverts with the size as 30-34m x 2.5-5 m will be arranged.

- Lo Bo Tay road: there are 10 junctions along the route (Lo Bo Tay route intersects 10 hydraulic canal). At Km4+912, 1 reinforced concrete bridge will be built with the size as 18.6 m length x 15 m width. At the 12 remaining locations, 12 reinforced concrete box culverts with the size as 21 m x 3.3-6 m will be arranged; The width of bridges and box culverts range from 2.5 to 6 m.

During the construction of the bridge, building the coffer dams around the bridge foundations, box culvet may limit the width of the flow, causing the flow velocity to increase and subsequent canal bank erosion. However, this effect is small because the wet cross-sectional area enclosure zone would only occupy an area of 52 m^2 on the canal while the canal is 367.5 m^2. Therefore, the impact on the canal flow can be expected to be low not affecting water irrigation of 30/4 canal.

Impact on water quality and water flow of Hydraulic canal (unnamed) at Km3+385 (on Lo Ren road) and Km4+912 (on Lo Bo Tay road) due to construction of the bridge

The construction of the 18 m long bridge would mainly increase the amount of suspended solids in hydraulic canal. The stormwater runoff through the construction area together with pollutants such as construction materials, dirt, oily waste, and potentially hazardous additives and drilling liquid spilled into the boreholes into the canal, affecting the water quality of canal. In addition, if domestic wastewater and wastewater from construction activities would not be managed appropriately, pollution would occur to the water environment in the canal and the surrounding, especially the water of the connecting canals due to increasing T-N, T-P and BOD concentration. However, the volume of the wastewater is anticipated to be about 9 m^3/day. Since hydraulic canal functions as provides water for the aquaculture ponds, the impact can be assessed moderate.

Impacts on aquaculture

There are 96 and 64 shrimp ponds along Lo Ren and Lo Bo Tay roads, respectively. The shrimp ponds are located about 2-100 m from the two roads. Construction and rehabilitation of the road will require land acquisition of some households, including the aquaculture land. The impacts due to land acquisition are presented in the section on social impact assessment, Section 4.2.

Water quality of the shrimp ponds could be adversely affected due to increase suspended materials, construction and domestic wastewater, and construction spoils and wastes. The main sources of pollution include:

- Wastewater caused by mixing concrete, washing tools, equipment used for construction, and wastewater from daily domestic activities of workers on construction sites can overflow into the shrimp ponds.
- Solid wastes generated during construction such as excavated soils, construction wastes, hazardous wastes, domestic wastes, as well as surface soil layer during roadbed grading can fall into the ponds and canals, affecting water quality by reducing the DO level in water and contaminate the water with other pollutants.
- Stormwater runoff washing over the road construction area can bring along pollutants including construction materials, soil, sand, grease waste directly into the shrimp ponds, or the canals affecting quality of the water for aquaculture.
- Flooding situation prevent shrimp ponds from timely water drainage, affect water quality in the ponds, worsening shrimp's health in these ponds. Shrimps are very sensitive to environmental changes.

If the waste sources would not properly be managed, they will negatively change surface water quality around the construction area, worsening the pond's environment, hampering shrimp growth, affecting aquaculture productivity, indirectly impacting income of the affected aquaculture farmers. These impacts need to be adequately managed with particular attention paid to the shrimp ponds located within 2-10 m from the roads. Given the scale and timeline of the construction activities, this impact is assessed as moderate.

Impact on water supply and communication infrastructure

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

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

Impacts on Physical Cultural Resources and sensitives receptors

Impacts from relocated graves: Construction of Lo Ren and Lo Bo Tay roads will displace 17 and 15 graves, respectively. To the Vietnamese people, household and individual graves are considered PCRs with spiritual implication and should be respected carefully. The owner and relatives of the graves will be psychologically affected because this is directly related to spiritual matters and religious beliefs. The Bank's OP/BP 4.11 applies for this subproject. The level of this impact caused by this activity is considered moderate.

Impacts on religious works: Bac Lieu Baptist Church (13 m to Lo Bo Tay) and *Phap Tanh Pagoda* (30 m to Lo Ren street) are the two PCRs to be directly affected by the construction activities, specifically by: i) Hindrance to access to the pagoda and the church; ii) Increase in dust, exhaust gases, and noise affecting religious events and practices and visitors to the pagoda and the church, especially during the religious events (1st, 15th days every month); iii) Increased construction wastes and waste water; iv) Risks of traffic accidents and safety due to construction; and v) Localized flooding because of construction during rainy days; vi) Conflicts between workers and visitors to the pagoda and the church.

*Impacts on 2B primary school (*4 m from Lo Bo Tay road): The teachers and students at the school will be affected by (i) Hindrance to access to the school; (ii) Exhaust gases, dust and noise, and wastes affecting teachers and pupils' health; (iii) Increased risks of traffic accidents due to construction and transportation; and (iv) noise and vibration affecting school children learning hours.

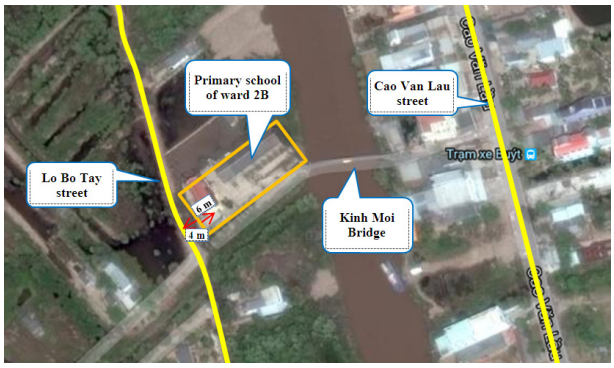
Risk on cracking/collapse to PCRs and sentivite receptors due to vibration

During construction stage, PCRs and sensitive receptors can be affected by vibration caused by excavation process for the installation of box culvert along the road and compaction activities, ect of construction equipment within radius of 30 m. Within this scope, impact level is identified by distance from the works to sources of pollution. Specifically, within a radius of 5 m from construction site, the vibration could cause risks on collapse, cracking to PCRs and sensitive receptors structures. Out of the above scope, impacts are just restricted to vibration with irregular frequency and without risk of structures subsidence, crack, collapse.

The *Bac Lieu Baptist Church* (13 m to Lo Bo Tay) and *Phap Tanh Pagoda* (30 m to Lo Ren street) are located beyond the area of influence (more than 5 m distant). Therefore, they do not encounter the risk on collapse/cracing.

*The 2B primary school (*4 m from Lo Bo Tay road) is located within the radius of 5 m, so it can be impacted. However, only its fence, gate are affected, i.e. the excavation process may encounter the foundation of the gate and fence of pagoda and cause a risk on infrastructure collapse. The main works is 10 m away from the construction scope, so the impact level is very low. These risks could

be managed by application of appropriate construction method, for example using supporting pillars or steel frame to protect the fence foundation.



2B primary school

Site-specific impacts during the construction of Huong Lo 6

Impact on water supply and communication infrastructure

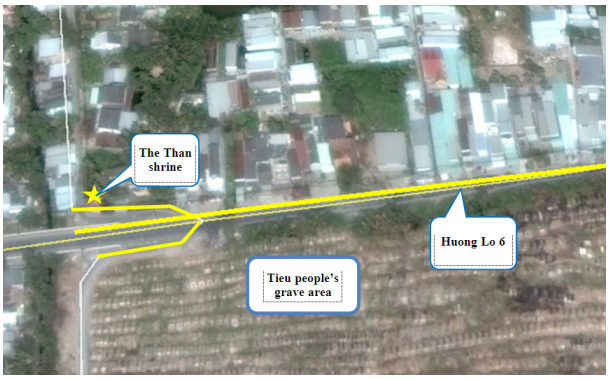
The water supply pipelines mainly run along the sidewalks of the roads. Therefore, the rehabilitation of Huong Lo 6 road which include excavation and installation of the combined sewers under this component may potentially affect the water supply infrastructure of the area, interrupting water supply operations due to temporary shut-off of water transmission pipelines or to break water transmission pipelines. Therefore, measures to prevent pipe breakage must be devised and carried out during the construction under this subproject. The impact level is assessed to be medium.

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

Site-Specific Impacts on Sensitive Receptors

The PCRs and sensitive receptors around No.6 Huong Lo road are: The Than Temple (1.5 m to the road), Thieu Quang Sung Thien Duong Pagoda (7 m to the road), and Tieu People' grave area (4 m to the road). The impacts on the temple and the pagoda include: i) Hindrance to access to the pagoda and the temple; ii) Increase in dust, exhaust gases, and noise affecting religious practices and visitors to the pagoda and the temple, especially during the religious events and practices (1^{st}, 15^{th} days every lunar month); iii) Increased construction wastes and waste water; iv) Risks of traffic accidents and safety due to construction; and v) Localized flooding because of construction during rainy days; vi) Conflicts between workers and visitors to the pagoda and the temple. The Tieu People' graves can be affected by illegal dumping of construction spoils and wastes. The impact is assessed as moderate.

Similarly, PCRs and sensitive receptors within 5 m will be also affected such as subsidence, crack and collapse by vibration. The Than Temple (1.5 m to the road) is affected. However, this is just a small temple with simple structures, so if any incidents occur, the contractor will be responsible for repair and compensation based on its initial status.



The Than Temple

Site-specific impacts during the construction of internal roads in the West of Nguyen Dinh Chieu and extended Hai Ba Trung streets

Impacts on people's activities on the two sides of Hai Ba Trung Road: Hai Ba Trung road is the main road to the city. The route has been fully invested with a width of 40 m with the technical infrastructure on the route. However, the residents are encroaching separators and sidewalk at the end of the alignment. The area on the existing road is densely populated with many small business householders along the two sides of the road. Construction activities may cause the following impacts mostly related to traffic as construction operations will occupy one part of road surface, while the other part will be used for gathering machinery and storage of construction materials during construction. These impacts include: i) Inconveniences to locals' business activities as access to business establishments may be obstructed; ii) Affecting drainage capability in the area; iii) Dust, waste, damaged landscape; iv) Risks of landslides and subsidence damages to existing works along road sides from deep excavation for the construction of pipe trench; v) Safety risks to vehicles and community, especially at night when excavation is performed. This impact is assessed as moderate.

Impact on water supply and communication infrastructure

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

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

b3. Impacts caused by material and waste transportation activities

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

Table 4.23: Component 2 - Impact objects and scope of dust, noise and vibration

Construction item	Distance (m)	Transportation routes	Affected object	Distance (m)
Rehabilitating Cau Xang canal (Subcomponent	11.8	Cao Van Lau Street → Cach Mang → Highway	Inhabitants, passengers, PCRs and sensitive sites along the route: elementary school of	6 - 30

Construction item	Distance (m)	Transportation routes	Affected object	Distance (m)
2.1) and Upgrading, widening Huong Lo 6 street (Subcomponent 2.4) and resettle ment		91C → Highway 1A	ward 8A, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	
Upgrading, widening Lo Ren street (Subcomponent 2.2)	12.2	Cao Van Lau Street → Nguyen Thi Minh Khai → Highway 91C → Highway 1A	- Inhabitants, passengers, PCRs and sensitive sites along the route: Nguyen Thi Minh Khai Secondary School, Le Thi Cam Le secondary school, Bac Lieu College, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	4 – 30
Upgrading, expanding Lo Bo Tay street (Subcomponent 2.3)	12	Cao Van Lau Street → Nguyen Thi Minh Khai → Ninh Binh → Vo Thi Sau →Hoa Binh → Tran Phu → Highway 1A	- Inhabitants, passengers, PCRs and sensitive sites along the route: Nguyen Thi Minh Khai Secondary School, Le Thi Cam Le secondary school, Bac Lieu College, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	4 – 30
Upgrade Huong Lo 6 street (Subcomponent 2.4)	12.2	Cao Van Lau Street → Cach Mang → Highway 91C → Highway 1A	- Inhabitants, passengers, PCRs and sensitive sites along the route: Le Van Tam primary school, Le Thi Cam Le secondary school, Bac Lieu College, High School of Economics of Technology, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	4 – 40
Constructing internal connection roads; in the western area of Nguyen Dinh Chieu street, extended Hai Ba Trung street.	11.8	Cao Van Lau Street→ Ninh Binh → Vo Thi Sau → 23/8 → Tran Phu → Highway 1A.	- Inhabitants, passengers, PCRs and sensitive sites along the route: Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	0.5 – 25
Build extended Hai Ba Trung	11.7	Cao Van Lau Street → Hai Ba Trung → Ngo Gia	- Inhabitants, passengers, PCRs and sensitive sites along the route: Le Van Tam	0.5 – 25

Construction item	Distance (m)	Transportation routes	Affected object	Distance (m)
		Tu → Cach Mang → Highway 91C → Highway 1A	primary school, Le Thi Cam Le secondary school, Bac Lieu College, Than Hoang temple, Chua Xu Temple, Chau Xuong temple, Ba Van Ban Ngu Hanh temple, church and Hiep Thanh primary school.	

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

4.1.4.3. Component 2 – Impacts during Operation

During the operational phase, impacts are evaluated mainly as positive impacts meeting the project objectives set out in the enhancement of water drainage; improving environmental sanitation and urban aesthetic; completing the network of transport links adapting to climate change. These impacts are already mentioned in the analysis of alternatives in both case of presence and absence of the project.

Apart from the positive impacts, when the project is in operation phase, some potential social environment impacts can still occur and have specific affect if not controlled and without specific mitigation measures. The impacts are due to maintenance of drainage systems, inundation, re-occurrence of contamination because of littering and traffic safety, as follows:

Local flooding due to inadequate O&M

When road and dike is completed and are in operation phase, annually, the drainage system will be dredged and cleared to avoid clogging the flow with prolonged stagnant garbage that may lead to floods in the area. Besides, during the usage, if the drainage system is damaged, it will be timely maintained.

The maintenance of drainage system will generate a large amount of sludge and solid waste from the dredging process. This waste causes offensive odor, inaesthetics if not handled promptly. However, the maintenance is performed periodically and the generated solid waste will be treated as regulation, thus level of impact is low.

Risk of flow clogging and contamination because of littering

During the operation, there will be risk of flow clogging and contamination due to the littering of households along canal. The causes are:

- The households cannot change their habits;
- Encroaching upon the canal;
- Lack of local authorities control over urban civilization.

However, an operation route is built along Cau Xang canal so it is hardly to be encroached. At the same time, the local authorities shall propagandize to enhance people's awareness of environment protection and penalize violations in order to minimize the impacts.

Impacts on traffic

In the operation, the items of component 2 will create positive effects on urban rehabilitation and traffic link. Thereby, activities of business, trading, commodity exchange will be more positive in

this area and roads link with main routes of Bac Lieu city: Lo Bo Tay street and Lo Ren street connect with Nguyen Thi Minh Khai street, Huong Lo 6 connects with Highway 91C street, internal road Nguyen Dinh Chieu connects with Tran Huynh street and 23-8 street. The rising of traffic density will increase traffic jam, traffic accidents. This impact shall be mitigated by dividing traffic, setting traffic signs and signals.

4.1.5. Impact Assessment for Investments under Component 3 - Resettlement Area

The settlement area locates in Ward 1 of Bac Lieu City with total area of 3,04 ha. This component constructs resettlement area for the affected and relocated objects, including technical infrastructure: traffic roads, electricity, water supply and drainage… and social infrastructure: culture house, health station, kindergarten, helping affected households immediately stabilize their lives, activities and have good living conditions.

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

4.1.5.1. Component 3 - Impacts during Perparation

The pre-construction phase of component 3 is the same as components 1 and 2, and includes the following works:

- Risk of UXO.
- Land Acquisition.

Risk due to Unexploded Ordnance

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

Impacts of land acquisition

Fully or partially land acquisition will impact AHs both physically and mentally, even causing social problems and prolonged litigation. The construction of resettlement area will affect 559 households, including 151 partly affected households, 15 fully affected households, and 11graves to be relocated. Impacts due to land acquisition are assessed in part 4.2.

4.1.5.2. Component 3 - Impacts during Construction

- **Impacts on air quality**

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

a1. Dust and emission

Dust from earthworks activities

According to the project schedule, project construction period is expected to begin from September, 2018 to August, 2013 (5 years); the construction will be divided into several bidding packages that will be implemented at different timelines. According to the feasibility report of the project, the total volume of earthwork soil in component 3 is 29,000 m^3. Dust generated by excavation and backfilling activities under Component 3 is calculated in the same way as Components 1 and 2.

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

Table 4.24: Concentration of dust generated from Excavation of road and sewerage construction

L (m)	W (m)	Concentration (mg/m^3)						QCVN 05:2013/BTNMT (Average in hour) (mg/m^3)
		H=1.5	H=3	H=6	H=9	H=12	H=15	
10	10	2.00	1.06	0.59	0.43	0.35	0.30	0.3
20	20	1.06	0.59	0.35	0.27	0.23	0.21	
40	40	0.59	0.35	0.23	0.19	0.17	0.16	
60	60	0.43	0.27	0.19	0.17	0.15	0.15	
80	80	0.35	0.23	0.17	0.15	0.14	0.14	
100	100	0.30	0.21	0.16	0.15	0.14	0.13	

Comment: The above results shows that dust concentration from street building is 1.17 – 6.67 times higher than QCVN 05:2013/BTNMT but particles settle quickly and occur in short time. Besides, the construction scale of component 3 is large, construction items will be divided into different timelines and a few households living at the distance of 100 m from the project area. Therefore, this impact is assessed as low impact.

Dust and emission generated from transportation

The activities of transporting materials and waste disposal will generate exhausted gas from fuel combustion process of the internal combustion engine, such as dust, NO_2, SO_2, CO, VOC. These emissions will reduce ambient air quality.

Total amount of materials for construction of the resettlement area is approximately 39,441.64 tons. The material will be transported from material mines to the construction area by 15T trucks within 8 months. Hence, there are about 11 trips per day. Dust concentration and emission is calculated in the same way as components 1 and 2. The results show that:

Dust concentrations vary between 0.13-0.14 mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3); CO contents 5.37 mg/m^3 (compared with 30 mg/m^3); SO_2 contents 0.03 mg/m^3 (compared with 0.35 mg/m^3); and NO_x contents 0.04 mg/m^3 (compared with 5 mg/m^3).

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

a2. Noise

Noise generates from:

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

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

Table 4.25: Maximum noise levels from transportation and construction activities

No.	Equipment/Vehicles	Distance to noise source (m)						
		15	50	100	200	300	400	500
1	Truck	99	88	82	76	73	70	68
2	Roller	74	64	58	52	48	45	44
3	Compactors	85	75	69	63	59	56	55
4	Graders	88	78	72	66	62	59	58
5	Concrete mixers	83	73	67	61	57	54	53

No.	Equipment/Vehicles	Distance to noise source (m)						
		15	50	100	200	300	400	500
6	Bulldozers	87	77	71	65	61	58	57
7	25 ton crane	74	64	58	52	48	45	44
8	Generator	90	79	73	67	64	61	59
9	Excavators	99	88	82	76	73	70	68

Comments:

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

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

a3. Vibration

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

The transmission of vibration in space and the result is presented in Table 4.26.

Table 4.26: Vibration level according to the distance of vehicles

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

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

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

- **Impact on Water Quality**

Impact by storm water runoff

The flow of rainwater in the construction area depends on climate condition in the region. In principle, the rainwater is lightly polluted waste water (consider as clean). However, it may be contaminated by oil and grease, waste and raw material... Therefore, contractor shall apply proper measures to mitigate this impact source. The estimated flow rate of rainwater is 19.9 l/s.

Wastewater from construction activities

Construction wastewater is mainly spilled water of mixing concrete and ground washing water after finishing pouring concrete. In fact, the amount of water spilled from concrete mixing is not much since it is absorbed directly into soil when falling. After pouring the concrete, water is applied to

increase cohesiveness of concrete and will be absorbed directly into the surface so it does not arise. Such wastewater from construction activities are insignificant impact sources.

Domestic wastewater from activities of workers

Number of worker is maximum 50 people. Water demand for each worker stated in TCVN 33:2006 is 45 lit/person.day, including water for washing, cooking and personal hygiene. Since they work 1 shift/day, the demand of each worker is 45 lit of water per day with the irregular factor K = 2.5. The amount of wastewater is calculated as 100% of the amount of supply water, thus, the flow rate of generated wastewater is 5.6 m^3/day.

- **Solid waste**

The activities on construction site generate types of solid waste as below:

- Domestic solid waste
- Construction waste includes debris, soil…

Domestic waste

Domestic solid waste generated in this period is about 0.5 kg/person/day and mainly are plastics bags, food boxes, food residues, vegetable, can, etc. In component 3, if there are 50 workers on construction site, the generated solid waste is calculated as following:

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

Where: k: generating rate of solid waste (kg/person/day), k = 0.5 – 0.7, select k = 0.5.

N: number of worker on construction site.

Although the amount of waste is not much, it will impact on surface water quality and the area landscape if it is disposed directly to canal and surrounding area. Therefore, project owner and contractor shall apply proper mitigation measures to collect and dispose as regulation.

Construction waste

Construction waste of component 3 includes:

- Flora biomass: generating from the space clearance, 18,000 m^3.
- Debris from the demolition: 2,900 m^3.
- Dredged sediment and excavated soil: 3,625 m^3.
- Bags containing construction material, steel, waste. According to similar project, the generating amount is around 1 ton/project.
- Soil, stone, cement falling, the estimated amount is 2 – 5 ton/project. However, this amount of solid waste is usually reused to level the ground so they are hardly disposed.

Impacts from hazardous solid waste

The amount of waste grease and oil generated in the construction site therefore averages (27 x 7 liters/time)/3 months = 63 liters of oil/month. In addition, the subproject would also generate an estimated amount of 15 kg of oily rags per month.

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

- **Local flooding**

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

- **Impacts on traffic infrastructure**

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

The increasing number of vehicle may affect the traffic safety and traffic jam on route. The transportation route includes Cao Van Lau, Tran Phu. This task also impacts on PCRs and sensitive sites on route (see chapter 2, part 2.6), especially on holy days, rush hour…

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

4.1.5.3. Component 3 – Impacts during Operation

In operation phase, sources of impacts on environment quality includes wastewater, solid waste from daily activities and local flooding.

Impacts from wastewater

Domestic wastewater generated by workers are water from toilets, water from the washbasin, water from the shower, the water from the kitchen and the floor washing faucet. The amount of wastewater equal to 100 % of supply water. The estimated volume of wastewater arising from the resettlement area is about 270 m^3.

Wastewater discharged from households, school, and health station is connected to the general drainage of the city.

Impacts from solid waste

Solid wastes arising from different sources in the project area, they are:

- Non-hazardous solid waste:

- Domestic waste from household composes residual food (rice, vegetable, fruit shells, bones of all kinds, etc.), plastic bag, paper, PET bottles, glass bottles, etc. if the generating factor is 0.5 – 0.8 kg/person/day, the estimated amount per day is 1,811 kg/day.
- Solid waste arising from the streets is approximately 1,632 kg/day (generating factor is 0.05 $kg/m^2/day$

- Hazardous waste: batteries, fluorescent light bulbs, ants & mosquitoes spray bottles, waste oil, etc.

These wastes without being gathered, collected and treated in accordance with regulations will cause odor, air pollution, soil pollution, affecting the aesthetic and environmental sanitation. Management method follows decree No. 38/2015/NĐ-CP to mitigate impacts, level of Impact is medium

Local inundation

The new constructed streets if not well maintained will be subject to negative impacts such as local flooding, due to inadequate maintenance. Solid waste management i.e. domestic waste from local people blocking the drains may also lead to congestion of the sewer system, which in turn may easily cause flooding during the rainy season, and affect the urban landscape.

4.2. CUMULATIVE IMPACT ASSESSMENT

Cumulative impact under consideration is defined as two or more individual effects that, when considered together, are considerable or which compound or increase other environmental impacts. The cumulative impact from several projects result from the incremental impacts of the proposed

subproject when added to other closely related, and reasonably foreseeable, future projects. The impacts that do not result in part from the subproject will not be discussed.

The discussion of impact severity and likelihood of occurrence need not be as detailed as for effects attributable to the subproject alone. The analysis of cumulative effects in this ESIA focuses on the effects of concurrent construction and operation of the proposed subproject with other spatially and temporally proximate projects. As such, this cumulative analysis relies on a list of related projects that have the potential to contribute to cumulative impacts in the subproject area.

Geographic Scope

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

Project Timing

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

Therefore, it can be concluded that there would be no cumulative impacts resulted from implementation of the subproject.

4.3. SOCIAL ASSESEMENT

The project is expected to have significant positive social impacts in Bac Lieu City for people living in the project area by upgrading urban infrastructure (roads, drainage, water supply and sanitation, public facilities, and power supply) based on community priorities. The project covers 8 wards/commune of Bac Lieu city and will bring benefits to 111,807 people.

Upgrading tertiary infrastructures will bring many benefits to residents in LIAs like: improving environmental condition, living condition, bringing access to social service and raising land value. 8.103 households living in the LIAs will in particular directly benefit from the upgrading of infrastructures are, especially poor and social policy households.

There are 118 Khmer households (ethnic minority households) in the project area. Besides positive impacts, the project also brings negative impacts like: land acquisition, resettlement, loss of livelihood, social problems…

Adverse impacts of the project will be caused by unavoidable land acquisition, by loss of livelihoods, health issues etc.,.

4.3.1. Positive Impacts and measures to maximize project benefits

Viet Nam Scaling-up Urban Upgrading project – Bac Lieu subproject, Bac Lieu province aims to upgrade infrastructure in the low income areas to reduce poverty, improve environmental sanitation, enhancing transportation connectivity, reduce traffic capacity in the main roads, improve water drainage and sanitation condition for canals in the city, promite construction and improvement of infrastructure system in responding with climate change as well as enhance city's capacity in urban planning and responding with climate change. Positive impacts and measures to maximize project benefits are presented in following table:

Table 4.27: Positive Social Impacts in the Project Area

Component	Description of Impacts	Beneficiaries
General Impacts for all Components		
All components	Employment opportunities during the construction phase for unskilled workers	For all unskilled workers in project area
Specific impacts for each Component		
Component 1 Upgrading tertiary infrastructure in LIAs 1, 2 etc.	- Infrastructure upgrading in LIAs will improve living conditions for all HH in LIAs. Especially: (1) wastewater will be treated, (2) Flooding will be significantly improved, the environment and people health therefore enhanced.	8.103 Households (34.842 persons) including 96 poor HH and 654 Khmer HH
	Alleys and lanes are expanded and equipped with lightning system; transport conditions are improved (so that ambulances and fire trucks can access to residential areas). Security of persons and assets are enhanced. Mobility will also be enhanced.	8.103 Households (34.842 persons) including 67 poor HH and 654 Khmer HH
	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.
Component 2	Canal: - River embankments from Cau Xang canal to Rach Tra canal, Tra Khua : Upgrading and protection of river banks, flood erosion protection, channel expansion to ensure flow, improving the living environment of the people in Ward 1,7,8, prevention of flooding and storm surges to residents in Ward 1,7,8.	5.966 Households (25.654 persons) including 32 poor HH and 220 Khmer HH
	Road: - Constructing Lo Ren road: expanding the inter-regional transportation network, improving connectivity and developing coastal economic zones, developing tourism, forming exvacuation path for rescuing and migrating people from the sea to inner land in diaster circumstance; improving living condition for people in ward 5 and Hiep Thanh ward. - Constructing Lo Bo Tay road: expanding the inter-regional transportation network, improving connectivity and developing coastal economic zones, developing tourism, forming exvacuation path for rescuing and migrating people from the sea to inner land in diaster circumstance; improving living condition for people in ward 2 and Nha Mat ward. - Upgrading district road: Upgrading the existing road which has been degraded to facility transportation and connectivity between city central area with Vinh Loi district. - Constructing internal pathes: in the west of Nguyen Dinh Chieu, expanded Hai Ba Trung street: to complete the road as planning by the city. To utilize land bank of the city in ward 3 area.	11.933 Households (51.311 persons) including 2 poor HH and 109 Khmer HH

4.3.2. Negative Impacts and Measures to minimize project disadvantage

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 8 project wards. The total area of the land recovered components: 344,001 m^2, in which: residential land is 25,911m^2, agricultural land is 131,549 m^2, land under management of organization: 53,304m^2, public land: 133,237 m^2. Based on the Inventory of Losses (IOL) conducted in October 2016, 1,304 households in 8 project wards are affected by land acquisition. Of 2,090 HH, 1,994 households are partially affected and 90 households have to be relocated. In the relocated HHs, 5 household are vulnerable.

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...). 40 households are business and trading establishments.

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.

Ethnic minorities-related issues

Living and earning activities of Khmer people are affected by land acquisition: For upgrading secondary and tertiary infrastructure upgrading land acquisition is needed and will affect living and earning activities of Khmer people. 189 Khmer households will be affected and 05 will need to be relocated .

Impacts from relocation of Khmer people: Resettlement in new area, for the 5 Khmer HH to be relocated, may cause difficulties at the beginning for traders, especially those selling near or at their house

Impacts on transport during construction period. The construction affects the travel need of people, especially students go to schools. Beneficiaries: Households in project area

Upgraded lanes is higher than others. After upgrading lanes, the new road suface will be 20-60cm higher than the ground of households along sides. In rainy season, the flooding may occur and could affect households living along the alleys which have been raised.

HIV/AIDs, drug use, infectious diseases, environmental pollution, violence may increase due to conflicts of workers during construction. During construction time, many workers come and stay in LIAs, thus the social problems may occur, affecting local security. Khmer young people are particularly at risk.

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.

Impact 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.

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.

4.4. INDUCE IMPACTS

The existing land use along the 05 road alignments under Component 2 residential, agricultural, and garden land. When these new roads are built and operated, land use along the total road alignments of 13.75 km will be changed in the tendency that residential houses will be built along the road alignments. As the result, agricultural land will be changed to urban residential area. In the future, the area along the road alignments will be change to urban residential area in accordance with the city's Masterplan. The existing houses that are closest to the alignments will remained to be several rows back from the new road after new houses are built on existing agricultural land along the alignments thus land price of these existing residential houses are not expected to increase abruptly. Therefore, the potential induced impacts would be under control. Therefore, there are no foreseeable induced adverse potential environmental impacts that could happen in the areas along the roads after it is built.

CHAPTER 5. PROPOSED MITIGATION MEASURES

5.1. ENVIRONMENT

5.1.1. General principal

In order to minimize adverse environmental impacts, many measures 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 5 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.
- Detailed design will consider adequate temporary drainage to avoid potential flooding during construction.

Component 2: Upgrading primary and secondary infrastructure priorities

(i) Upgrading/Constructing 05 routes *(Lo Bo Tay road – Subcomponent 2.2, Lo Ren Road – Subcomponent 2.3, Huong Lo 6 road – Subcomponent 2.3, constructing internal roads for connecting Nguyen Dinh Chieu road with Ba Huyen Thanh Quan road, constructing extended Hai Ba Trung road)*

- 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.
- Detailed design will consider adequate temporary drainage to avoid potential flooding during construction.

(ii) Rehabilitating Cau Xang canal (Subcomponent 2.1)

- The detailed design for canal dredging shall include the update of Dredged Material Management Plan (DMMP) with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor's dredging method, transportation and disposal that are appropriate and cost-effective.
- Detailed design will consider adequate temporary drainage to avoid potential flooding during construction.
- The design of the embankment has been calculated on the basis of surveys on hydrologic regimes (flood levels, flow regimes, etc.), topography and geology of the area to ensure the safety and effective operation of the embankment.
- The sewer system would be proposed to be designed with box culverts, CSO and anti-odor manholes where it comes across residential areas.
- The technical design must include the position for temporary gathering of sludge. This position must be well distant from residential areas and to the tail end of the wind.
- Positions of placing public waste bins along the embankments are to be included in the design so that residents could dispose of garbage properly.
- Trees would be planted along Cau Xang canal to improve the landscape.

Component 3: Resetlement Area

The Subproject will build a green space within the Resettlement Site. The plant species to be planted shall be consulted with URENCO, prioritising native species and avoid invasive plants. Inside the park, there will be open spaces, leisure paths, green trees, decorative electrical lights and stone benches along the walkway.

Internal roads with drainage and sewers will also be built within the Resettlement Site. Trees are planted at every 10 m on sidewalks along the roads. 90W LED lamps will be used for lighting.

5.1.3. Mitigation Measures during Preparation

Mitigation Measures for Land Acquisition

During detailed design, the PMU will study carefully the scale and scope of the subproject implementation to minimize land acquisition impacts. At the same time, the PMU will closely coordinate with the local authorities to carry out dissemination activities so that the local communities understand the roles and significance of the subproject thus cooperate and supervise the contractors' performance during the subproject implementation process.

The subproject is expected to affect on **344,000 m^2** land owned by **2,046** households and 46 units as the People's Committees/ management organizations, including **25,911.3 m^2** of residential land; **131,549 m^2** of agricultural land; **53,304 m^2** of land managed by the organization; **133,237 m^2** of public land owned by the Commune/ward PCs as specialized land, rivers and streams, and transport land. There are 2,092 households impacted with land and fixed assets by the subproject, of which 1,994 households are partly affected and 98 households are totally affected and have to relocate. Among the affected households, there are 163 vulnerable households (policy beneficiary HHs, poor HHs, ethnic minority HHs, etc.) as well as 40 affected business households. And 43 graves relocated. 01 resettlement sites have been built for site clearance for Bac Lieu city subprojects in Ward 1.

For relocation of 43 graves

- There are 43 graves of Catholics will need to be relocated for construction.
- Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation, reburial and other related costs which are necessary to satisfy customary religious requirements. Compensation in cash will be paid to each affected family or to the affected group as a whole as is determined through a process of consultation with the affected community. The level of compensation will be decided in consultation with the affected families/communities. All costs of excavation, relocation and reburial (7,500,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways.
- During implementation PMU will make early announce to the households whose graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to the affected household as required in the subproject RP and ESMP.

The estimated cost for the Resettlement Action Plan of the subproject is approximately 209,563,500,000 VND (equivalent to 9,472,224 USD at the exchange rate of 22,124 VND = 1 USD).

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

Mitigation of UXO Risks

The subproject owner (the subproject PMU) will sign a contract with the military civil engineering agency or Bac Lieu Provincial Military Base for UXO detection and clearance at the construction sites. UXO clearance will be executed right after the completion of site compensation and before the implementation of demolition and ground leveling. No construction activity will be allowed until the UXO clearance is compeletd.

5.1.4. Mitigation Measures during Construction

5.1.4.1. Mitigation Measures for Generic Impacts during Construction

As part of the Environmental and Social Management Plan (ESMP) for the subproject these generic measures have been translated into a standard environmental specifications to be incorporated into the bidding and contract documents. These are referred to as Environmental Codes of Practice (ECOPs), and they will be applied to mitigate typical impacts of the subproject's civil works under Component 1, 2 and 3. Section 6.1 briefly explains the scope and content of the ECOPs, which are presented in the next Chapter 6.

The ECOPs describe typical requirements to be undertaken by contractors and supervised by the construction supervision consultant during construction. The ECOPs will be incorporated into the bidding and contractual documents (BD/CD). The scope and content of the ECOPs is as follows:

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

The measures identify typical mitigation measures for the following aspects:

- Dust generation, emission, noise and vibration
- Wastewater management
- Solid waste management
- Hazardous waste management
- Water pollution
- Plants and aquatic species
- Urban landscape and beauty
- Sedimentation, erosion, flooding subsidence and landslide
- Traffic management
- Existing infrastructure and services
- Social impacts
- Community's safety and health
- Workers' health safety
- Management of warehouses and borrow pits
- Communication to local community
- Chance finds procedure

5.1.4.2. Site-Specific Mitigation Measures during Construction

Table 5.1: Site-specific mitigation measures

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
1.	**COMPONENT 1: UPGRADING TERTIARY INFRASTRUCTURE IN LOW-INCOME AREAS IN LIAS (LIA 1, LIA 2, LIA 3, LIA 5, LIA 6)**	
a.	Localized flooding - Residents within LIAs 1,2,3,5,6.	- 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. - 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. - The contractors must set up temporary drainage at the construction site and ensure that they are cleared of mud and other obstructions, such as: • Building drainage works along/across the site during backfilling and ground leveling. • Digging drainage ditches/drains suiting practical conditions of the streets. - Building drainage works along/across the site during backfilling and ground leveling. - Provide drainage ditches/drains suiting practical conditions of the streets. - Deploying standby pumps and other equipment items in case of needed drainage. - Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations. - Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area.
b.	Impact due to dredged sediment in LIA 2 - Odor and management of 260 m^3 sediments generated from small canal dredging in LIA 2. - Residents in Ward 1. - People commuting along transportation route.	*At the sites* - On-site location for temporary gathering of sludge must be to the tail end of the wind, far from residential areas and sensitive works. - Sediment dredged from channels would give off stinking odors of such gases as CH_4, H_2S, and mercaptans. To mitigate the impact from malodor of dredged sediment, it is therefore imperative to provide face masks, boots and gloves for workers who will work directly with this source of waste. - Dredged sediment will be collected and gathered along the construction site which is lined with geotextiles to prevent sludge leachate from infiltrating into the soil. This gathered sludge is to be transported and disposed of within 48 hours. - In no case should dredged sediment be indiscriminately disposed of. This waste must be appropriately

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
		managed under the PMU's supervision and construction supervision consultant. - EM (Effective Microorganisms) deodorants are to be sprayed every day. These deodorants are able to remove offensive odors from H_2S and mercaptans. - According to the analyses, the sediments from the canal dredging work are not hazardous, with heavy metals lower than the acceptable limits. However, the dredging soils and sediments have high amount of organic compounds and pathogenic microorganisms (e.g. *Ecoli*) thus should not be used directly for agricultural purpose. It is recommended that the sediments could be dewatered and kept at least 03 months to allow partial biodegradation of organic substances and removal of microbial organisms. The sediments could then be used for perennial crops or planting tree for urban landscape purpose, based on the actual needs of local people. Otherwise, it will be transported and disposed at No 4 Trang An landfill. <u>*For the transportation*</u> - 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 the sediment onto roads, giving rise to offensive odor, 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. - Preriodically 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.
c.	Social disturbance and increased traffic risks - Impacts on traffic within LIAs by narrow alleys - Impacts on traffic along connecting streets - Social disturbance in Ward 1 (LIA 2), Ward 2 (LIA 3), Ward 5 (LIA 5), Ward 8 (LIA 6), Ward 7 (LIA 1)	<u>*For impacts on traffic within LIAs*</u> - Ensure that the contract requires the contractor, before commencing work, to provides a construction plan with a detailed health, safety, environment and traffic management plan - Inform local residents in advanced (at least 07 days) about construction and work schedules, interruption of services, traffic routes. - Construction operations are to be successively performed by alley segment. Extensive construction operations on the entire route should be avoided. - For major alleys with a width of over 4 m, construction should be carried out on one half of the road surface, leaving the other half for traffic traveling. - Contractors should provide lighting a construction sites at night; security guard staff at construction sites to

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
		moderate vehicles entering and exiting the construction site; - Put the road construction warning signs at the site all the time. - Avoiding the waste/material transportation during rush hours; - Construction during night time is not allowed *For impacts on traffic along connecting streets* - Do not park vehicles in the roads longer than necessary. Maintain the required speed limit and do not overuse horn. - 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. - So as to minimize adverse impacts on the traffic along the streets linked to LIAs, a traffic management plan will be carried out, in which construction operations will be performed in some streets, some others will serve as temporary by pass roads and others will be used as transportation routes. This plan will be publicly announced to residents in the affected areas and to related agencies. The planned routes for material and waste transportation see Table 5.2 below. *For impacts on social disturbance* - Prioritized recruitment and employment of the workforce available in the locality; - Carrying out procedures on declaring the personnel present at construction sites; - Setting up workshops on construction site rules & regulations for officers and workers; - Contractors' sanction measures against violations of construction site rules & regulations.
d.	Damage to water supply and communication systems (along alleys in LIAs (15.9 km)	- Inform the water supply management and communication companies of the construction activities and their potential impacts such the risks of breakage other damages to the water supply pipelineat least 01 month before start of the construction. - Set up barriers around the construction area of water supply pipeline. - Use smaller excavation machine and Larsen pile driving method of construction to avoid breaking or disposition the water pipeline. - Deploy a qualified technical staff to supervise construction activities near the pipeline and communication cables. - In the case of breaking the pipeline or the communication information system cables, it is necessary to suspend the construction activities and immediately inform the water supply and communication companies and the local authority of the incident.

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
e.	Impact on PCRs and other sensitives receptor: Vinh Phuoc An Pagoda, Phuoc An Pagoda (located on the alleys) in LIA 2; Linh Chau Pagoda (3 m to alley); Cemetery of Bac Lieu Buddhist Association (1 m to alley); Ong Chau Temple (2 m to alley) in LIA 5; Bac Lieu Provincial Continuing Education Center (located on alley No.13)	*For the religious works (Vinh Phuoc An Pagoda, Phuoc An Pagoda, Linh Chau Pagoda, Cemetery of Bac Lieu Buddhist Association, Ong Chau Temple)* - Inform the temple 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 100 m 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. - The construction method shall include the measures to protect the foundation of the fence/gate/main building of the pagoda/temple and other sensitive receptors, such as using supporting pillars or steel frame to prevent the risk on structure collapse/cracking. - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the pagoda/temple. *For Bac Lieu Provincial Continuing Education Center:* - 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. If possible, implement the construction activities during the school summer vacation. - 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. - Cooperate with the school in management of school students, security, and safety during construction, such as teachers to be informed of construction operations to keep pupils off the site during their break time. - Assign security guards around the construction sites so as to warn pupils in due time against approaching

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
		the construction site. - Put fences warding off the site and warning signs. - Deploy staff to guide the traffic during construction, transportation, loading and unloading of construction materials and wastes, and to guard high risk operations, especially when school children go to and leave the school around construction area. - Prohibit gathering of construction materials within 100m in front of the school. If possible, provide separate entrances and exits for waste and material trucks. - Avoid activities generating great noise or vibration such as demolition of concrete structures or driving of piles during class hours. - Provide environmental training for the workers includes codes of conducts when working in pubic areas and sensitive receptors such as school. - Collect any wastewater generated by the construction to a setting tanks before discharging to the outside of the school. - Cover the incomplete trenches under construction at end of the working day. - Provide night lighting system with luminously painted fence and night lamp. - Schedule trucks transporting waste and materials not to enter and exit the school before the start of class hours, during school time, or just after class hours. - Gather materials and wastes neatly during construction and dispose the wastes at the designated site within the soonest possible time and within less than 24 hours. - Immediately addess any issue/problem caused by the construction activities and raised by the school management. - The construction method shall include the measures to protect the foundation of the fence/gate, main building of the center, such as using supporting pillars or steel frame to prevent the risk on structure collapse/cracking - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the center.

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
2.	**COMPONENT 2: UPGRADING PRIMARY AND SECONDARY INFRASTRUCTURE PRIORITIES**	
2.1	**Subcomponent 2.1: Rehabilitating Cau Xang canal**	
a.	Odors from the 96.000 m^3 dredged sediment of Cau Xang canal - People living in the densely populated area from Km0+00 to Km2+630. - People living in the densely populated area from Km4+020 to Km4+800.	*To control impacts by dredged sediment:* - The Dredged Materials Management Plan (DMMPs) for have for the dredged works has been prepared. The DMMP is described in detailes in Annex 1. - According to the analyses, the sediments from the canal dredging work are not hazardous, with heavy metals lower than the acceptable limits. However, the dredging soils and sediments have high amount of organic compounds and pathogenic microorganisms (e.g. *Ecoli*) thus should not be used directly for agricultural purpose. It is recommended that the sediments could be dewatered and kept at least 03 months to allow partial biodegradation of organic substances and removal of microbial organisms. The sediments could then be used for perennial crops or planting tree for urban landscape purpose, based on the actual needs of local people. Otherwise, it will be transported and disposed at No 4 Trang An landfill. - Ensure that detailed design scope for the chanel dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor's dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts - Prior to construction, the contractors shall a specific DMMP based on the updated DMMP. The contractor's DMMPs shall be submit by Construction Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary gathering of dredged materials, and control of polluting material during temporary gathering and transportation, pollution control, and risks at disposal sites. *To control impacts by odors from dredging process:* - On-site location for temporary gathering of the deredged sediment must be to the tail end of the wind, far from residential areas and sensitive works. - Malodor in the dredged sediment is odors of the various gases as CH_4, H_2S, mecaptan. Therefore, in order to limit the impacts of odor of the dredged sediment, the workers shall be equipped with the masks, boots and gloves when working in/exposing to these waste sources. - The dredged sediment to be collected along the work sites which is lined with geotextiles to prevent sludge leachate from infiltrating into the soil. This gathered sludge is to be transported and disposed of within 48 hours. A management plan for dredged material will be prepared to instruct contractors on managing this waste (see Annex 1) will be prepared to instruct the contractors to manage the waste source.

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
		- Uncontrolled disposal of the dredged sediment is prohibited. The waste source must be managed properly under the supervision of PMU and construction supervision consultant. - Spraying EM (Effective Microorganisms) every day. The deodorant can eleminate malodors from H_2S and Mercaptan.
b.	Impacts due to transportation of the dredged sediments: Residences along the transportation route	- Clean up the transport vehicles before leaving construction site. Do not load to a height of 10 cm higher than the truck body so as not to spill out and scatter the dredged sediment onto roads, giving rise to offensive odor, dust, and endangering road users. - Do not park vehicles on 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. - Preriodically 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.
c.	Risk of subsidence during construction (from Km0+00 to Km2+630 and from Km4+020 to Km4+800)	- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure sustainability and stability of the embankment; - Inform the local households of the construction activities and their potential risks of land subsidence due to construction activities in the canal at least 01 month before start of the construction. - 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. - Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to CSC and the authorities concerned for approval by the construction contractors. - Heavy-duty machinery and equipment must not be gathered near canal banks. - Regularly check and monitor the risk of landslides to plan for possible reinforcement. - Avoid or limit dredging in the rainy season. - Construction of side slope is made in accordance with the design - In case dredging causes landslides and affects the households and homes along the canal, the contractor is liable for damages or compensation of construction as the original status. - Immediately addess any issue/problem caused by the construction activities and raised by the affected households or the local communities.

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
d.	Affecting residential access and traffic - 9 temporary bridges from Km2+630 to Km4+020. - At the junctions, including Huong Lo 6 (at Km0+160), Tran Huynh street (at Km0+820), Nguyen Van Linh street (at Km1+260), Nguyen Thai Hoc street (at Km1+360), Hung Vuong street (at Km2+90), and Tran Phu street (at Km2+320).	- Inform the local communities of the construction activities and their potential impacts of limited access due to demolition of the temporary bridges across the canal at least 01 month before start of the demolition. - 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. - Local communities are to be consulted on measures to make arrangements for temporary bridges and roads during construction. Locals must be notified of these temporary inconveniences during construction. - Temporary roads and bridges need to be constructed at the positions with no local roads and bridges. Put the road sign direction to the temporary bridges. - Temporary bridges are to be dismantled with the successive method; simultaneous dismantling or demolition must be avoided. - Cover the incomplete trenches under construction at end of the working day. - Provide night lighting system with luminously painted fence and night lamp. - Machinery and equipment can be gathered only on one canal side. - Traffic instruction signs are to be erected to direct road-users into replacement traffic roads. - Deploy staff to guide the traffic during rush hours. - Immediately addess any issue/problem related to the temporary bridges and roads caused by the construction activities and raised by the affected households or the local communities.
e.	Damaged existing infrastructure facilities at intersections - At the junctions, including Huong Lo 6 (at Km0+160), Tran Huynh street (at Km0+820), Nguyen Van Linh street (at Km1+260), Nguyen Thai Hoc street (at Km1+360), Hung Vuong street (at Km2+090), and Tran Phu street (at Km2+320)	- Dredging inside the box culverts must not be performed with heavy-duty motorized equipment such as excavators, scoops, etc. - In case of high water level inside the culverts, they must be cleared by specialized sewage trucks. And if the water level inside the culverts is low, tidying up is to be manually performed. - It will be strictly prohibited to place equipment, machines or materials inside the existing box culverts. - In case of box culvert break, construction contractor needs to immediately implement proper flow diversion to ensure flow smoothness, and report to operation management unit for timely repairing, fixing. - Workers need to quickly clear dropped debris inside the culvert.
e.	Local flooding during the dredging process (from Km0+00 to Km2+630 and from Km4+020 to Km4+800)	- 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. - The contractors must set up temporary drainage at the construction site and ensure that they are cleared of

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
		mud and other obstructions, such as: (i) building drainage works along/across the site prior to dredging operations; (ii) Digging drainage ditches/drains suiting practical conditions. - Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area. - Deploying standby pumps and other equipment items in case of extreme weather events - Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations.
2.2	**Subcomponent 2.2, 2.3: Upgrading, widening Lo Ren and Lo Bo Tay street**	
a.	Impact on water flow due to construction of the Lo Ren and Lo Bo Tay roads. - Lo Ren road: There are 10 junctions along the route (Lo Ren route intersects 10 hydraulic canal). - Lo Bo Tay road: There are 10 junctions along the route (Lo Bo Tay route intersects 10 hydraulic canal)	- Building materials and waste must not be gathered at positions close to hydraulic canals. - At the close of each working day, building materials must be carefully covered to prevent rainwater from washing away materials into the canals. - In case of materials and waste falling into the canals during construction, contractors are to promptly have workers tidy them up. - Contractor will enter into contracts with URENCO for collecting waste every day. - The construction of sewers and bridges on hydraulic canals must be sped up compared with the normal progress and contractors must carry out construction operations in line with the planned progress schedule.
b.	Impact on water quality and water flow of hydraulic canal (unname) due to construction of the bridge at Km3+385 (on Lo Ren road) and Km4+912 (on Lo Bo Tay road)	- A construction plan of detailed measures and schedule is to be worked out for the building/laying of sewers and bridges at the intersections with the hydraulic canal. This plan must be informed 30 days in advance to local government authorities and residents in the affected areas of Lo Ren Street and Lo Bo Tay Street so that locals could work out reasonable plans for storing clean water or domestic use. - In the final segment of the drainage ditch temporarily connected to the canal, there will be a settlement pit for suspended matter to retain sludge, pollutants and waste in the water before it is discharged into the canal. This settlement pit will be emptied and tidied up every day by workers. - Before operation, all construction means and machines will be carefully checked in terms of technical parameters as well as operational performance to limit possible spills of oil, grease or fuel. - Construction operations during high tides should be limited. - Construction supervision staff at site must carry out strict management of workers during construction processes in order to limit materials and waste from spilling into the canal. - No machine & equipment maintenance is to be carried out in areas close to the hydraulic canal. - Construction operations for bridge foundations and piers will be bound to increase the turbidity of surface

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
		water. The construction unit should speed up the progress to cut down the radius of pollution transmission.
c.	Impacts on aquaculture (at 96 and 64 shrimp ponds along Lo Ren and Lo Bo Tay roads)	- Inform the shrimp farm owners of the construction schedule, activities and their potential impacts of construction activities such as increased suspended solids in the water, wastewater, domestic wates and construction spoils two month before start of the construction. Put in place notice boards provided in the cosntruction areas. Conduct monthly meetings with shrimp farmers on issues related to construciton. - Consult with the shrimp farmers on the water taking time: Construction contractor needs to clearly inform the residents of the detailed construction schedule and recommend the residents to take and store water in settlement ponds to minimize possibility of using water affected by construction activities during construction time. - Construction contractor needs to well separate construction areas near the shrimp ponds by hard close fencing before construction to minimize impacts of construction activities on these ponds, especially to avoid run off from construction sites to the shrimp ponds. - Provide drainage at the construction site to ensure no soil erosion and sedimentation to the shrimp farming area. - If possible, the civil works items nearby/related to water surfacce sources should be implemented after the shrimp crop has finished. There's need for application of "successive construction" method, with completion of section by section followed by quick reinstatement. - Minimize dropping of debris into surface water sources and raising ponds increasing turbidity during construction by using proper equipments and applying sanitational safety measures. - Strictly prohibit indiscriminate or illigal dumping of construction spoils or waste to the shrimp ponds. - Do not gather construction materials, waste and machineries within 100m from the shrimp ponds ponds. - Arrange trash containers on the site for containing oil rags and other solid wastes. Waste materials and other types of waste need to be collected on daily basis. - Site supervisors need to closely supervise the workers to collect and dispose waste at proper place as required during construction course. - ConcentrationConstruction should be quickly completed at the water inputs points to ensure high water quality for the shrimp ponds. - Cooperate with local aquaculture technical staff to instruct and help people well cope with possible troubles. - Spray sufficient water during dry days to avoid dust to the around area. - Immediately address any related problem raised by the shrimp farm owners.
d.	Impact on water supply and	- Inform the water supply management and communication companies of the construction activities and their

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
	communication infrastructure Residents living along the roads	potential impacts such the risks of breakage other damages to the water supply pipelineat least 01 month before start of the construction. - Set up barriers around the construction area of water supply pipeline. - Use smaller excavation machine and Larsen pile driving method of construction to avoid breaking or disposition the water pipeline. - Deploy a qualified technical staff to supervise construction activities near the pipeline and communication cables. - In the case of breaking the pipeline or the communication information system cables, it is necessary to suspend the construction activities and immediately inform the water supply and communication companies and the local authority of the incident.
e.	Impacts on PCRs and sensitives receptors: Relocated 32 graves, Bac Lieu Baptist Church (13 m to Lo Bo Tay) và Phap Tanh Pagoda (30 m to Lo Ren street), 2B primary school (4 m to Lo Bo Tay road)	*Relocation of graves:* - Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation, reburial and other related costs which are necessary to satisfy customary religious requirements. Compensation in cash will be paid to each affected family or to the affected group as a whole as is determined through a process of consultation with the affected community. The level of compensation will be decided in consultation with the affected families/communities. All costs of excavation, relocation and reburial (7,500,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways. - During implementation the Subproject Owner will make early announce to the households whose graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to the affected household as required in the subproject RP and ESMP. *For Bac Lieu Baptist Church (13 m to Lo Bo Tay) and Phap Tanh Pagoda (30 m to Lo Ren street):* - Inform the church/pagoda of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction. - The contractor shall coordinate with local authorities (leaders of local wards or communes) for agreed schedules of construction 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.

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
		- 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. - The construction method shall include the measures to protect the foundation of the fence/gate, main building of the church, pagodas, such as using supporting pillars or steel frame to prevent the risk on structure collapse/cracking - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the church/pagodas. *For 2B primary school (4 m from Lo Bo Tay road):* - Inform the school boards of directors 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. If possible, implement the construction activities during the school summer vacation. - Supervision Consultants and Subproject Owner, duration and scope of work. - Cooperate with the school boards of directors in management of school students, security, and safety during construction, such as teachers to be informed of construction operations to keep pupils off the site during their break time. - Assign security guards around the construction sites so as to warn pupils in due time against approaching the construction site. - Put fences warding off the site and warning signs. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes, and to guard high risk operations, especially when school children go to and leave the school around construction area. - Prohibit gathering of construction materials within 100m in front of the school. If possible, provide separate entrances and exits for waste and material trucks. - Avoid activities generating great noise or vibration such as demolition of concrete structures or driving of piles during class hours. - Environmental training for the workers includes codes of conducts when working in pubic areas and sensitive receptors such as school.

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
		- Collect any wastewater generated by the construction to a setting tanks before discharging to the outside of the school. - Cover the incomplete trenches under construction at end of the working day. - Provide night lighting system with luminously painted fence and night lamp. - Schedule trucks transporting waste and materials not to enter and exit the school before the start of class hours, during school time, or just after class hours. - Gather materials and wastes neatly during construction and dispose the wastes at the designated site within the soonest possible time and within less than 24hours. - The scope of application should not occupy half the area of the road in order to limit surface water drainage. - The contractor should create temporary ditches / drains which led to the sewer / canal area to ensure the drainage of the area. - Arranging backup pumps to drain water quickly in the event of heavy rain or extreme weather. - Immediately addess any issue/problem caused by the construction activities and raised by the school. - The construction method shall include the measures to protect the foundation of the fence/gate of the school, such as using supporting pillars or steel frame to prevent the risk on structure collapse/cracking - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the school.
2.3	**Subcomponent 2.4: Upgrading, widening Huong Lo 6 street**	
a.	Impact on water supply and communication infrastructure - Residents living along the roads	- The same Subcomponent 2.2, 2.3
b.	Impact on PCR and sensitives receptors: The Than Temple (from 1.5 m), Thieu Quang Sung Thien Duong Pagoda (from 7 m) and people's Tieu graves (from 4 m)	- Inform the church/pagoda of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction. - The contractor shall coordinate with local authorities (leaders of local wards or communes) for agreed schedules of construction 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.

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
		- 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. - The construction method shall include the measures to protect the foundation of the fence/gate of the temple, such as using supporting pillars or steel frame. - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the temple.
2.4	**Subcomponent 2.4: Constructing internal connection roads; in the western area of Nguyen Dinh Chieu street, extended Hai Ba Trung street**	
a.	Affect business of the HHs on two sides of Hai Ba Trung road	- 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.

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
b.	Impact on water supply and communication infrastructure - Residents living along the roads	- The same Subcomponent 2.2, 2.3

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

During construction, under component 1,2,3: a number of 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 area	Expected length (km)	Planned transportation route
Component 1		
LIA 1	9.5	Cao Van Lau Street→ Ninh Binh → Vo Thi Sau → Hoa Binh → Tran Phu → Highway 1A.
LIA 2	11.8	Cao Van Lau Street→ Tran Phu → Cach Mang → Highway 91C → Highway 1A
LIA 3	9.6	Cao Van Lau Street→ Tran Phu → Highway 1A
LIA 5	12.2	Cao Van Lau Street→ Nguyen Thi Minh Khai → Highway 91C → Highway 1A.
LIA 6	11.5	Cao Van Lau Street→ Ninh Bình → Vo Thi Sau → 23/8 → Tran Phu → Highway 1A.
Component 2, 3		
Rehabilitating Cau Xang canal (Subcomponent 2.1) Upgrading, widening Huong Lo 6 street (Subcomponent 2.4) and resettle ment	12.2	Cao Van Lau Street → Cach Mang → Highway 91C → Highway 1A
Upgrading, widening Lo Ren street (Subcomponent 2.2)	12.2	Cao Van Lau Street → Nguyen Thi Minh Khai → Highway 91C → Highway 1A
Upgrading, expanding Lo Bo Tay street (Subcomponent 2.3)	12	Cao Van Lau Street → Nguyen Thi Minh Khai → Ninh Binh → Vo Thi Sau →Hoa Binh → Tran Phu → Highway 1A

Construction area	Expected length (km)	Planned transportation route
Constructing internal connection roads; in the western area of Nguyen Dinh Chieu street, extended Hai Ba Trung street.	11.8	*For internal connection roads; in the western area of Nguyen Dinh Chieu street:* Cao Van Lau Street→ Ninh Binh → Vo Thi Sau → 23/8 → Tran Phu → Highway 1A. *For extended Hai Ba Trung street:* Cao Van Lau Street → Hai Ba Trung → Ngo Gia Tu → Cach Mang → Highway 91C → Highway 1A

Mitigation measures for impacts include:

- Clean up the transport vehicles before leaving construction site. Do not load to a height of 10cm higher than the truck body so as not to spill out and scatter materials onto roads, giving rise to dust and endangering road users.
- Do not park vehicles in the roads longer than necessary. Do not allow construction vehicles and materials to encroach upon the pavements.
- Maintain the required speed limit and do not overuse horn.
- Periodically registry and supervise the quality of transport vehicles as required by the government regulations.
- Comply with the traffic safety regulations while participating traffic.
- Clean up wastes dropped off on road.
- Assign staff to guide the traffic during transportation, unloading, and loading of construction materials, equipment, and wastes.
- Place stockpile materials at a designated place tidily and successively according to construction schedule.
- Spray water three times per day to reduce dust during dry days if required.
- Reinstall the road surface if occurring the damages during construction.

5.1.5. Specific Mitigation Measures during Operation

Measures to Mitigate Impacts Under Component 1

The specific impacts occurred in the stage are mainly from the operation and maintenance (O & M) of the drainage system. At the same time, the effects on traffic safety must be controlled when the number of vehicles running through alleys highly increases. The mitigation measures for these particular effects are proposed as follows:

Measures to mitigate local flooding due to blockage of the drainage system along alleys

- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the sewer pipes;
- Carrying out periodical dredging and clearing works of the sewer pipes;
- Sweeping and cleansing pavements must include clearing the rubbish and obstructing objects on the flow/sewer inlets/heads;
- Signing contracts with the responsible agencies on collecting dredged sludge.

Traffic safety

- Placing traffic signs, signals regulating speeds and types of vehicles allowed to circulate in main alleys.
- Cooperating with the local government to appoint the staff for traffic regulation at peak hours;
- Timely carrying out O & M when the structures become downgraded, damaged. maintain works with signs of deterioration or damages.

Waste management

- Limit the trash can arranged in positions of high population density, they should be located in the vacant area and downwind direction;
- Specification of trash can must meet the provisions of the construction according to the QCVN 07: 2010/BXD particular: i) the capacity of the trash can will be 100 liters and not exceeding 1 m^3; ii) the trash can must be covered; iii) 1 trash can every 100m; iv) rubbish in bins will not be left for than 24 hours; v) require daily emptying.
- The waste collecting unit must tidy up the areas around waste gathering spots, ensuring these spots are free from littering waste and stinking leachate.

Measures to Mitigate Impact under Component 2

The specific impacts occurred in the stage are mainly from the operation and maintenance (O & M) of the drainage system (dredged sludge from the manholes), traffic safety issues and the risk of re-contamination of Cau Xang Canal owing to indiscriminate disposal of waste by local residents along the Canal.

Mitigating impacts from maintenance of the drainage system

Carry out measures mentioned in Component 1.

Traffic safety issue

- During the detailed design phase, the design consultant must pay attention to the estimated increase of traffic vehicles at a future point of time and to the connectivity to the local traffic network;
- The detailed design must include the setting up of warning signs and traffic instruction signs at positions readily visible to the road-users.

- Local government authorities must be coordinated in deploying traffic guiding staff during rush hours;

Timely maintenance must be carried out upon signs of degradation or damage in the works.

Mitigating the risk of re-contamination of Cau Xang canal owing to indiscriminate disposal of waste into the Canal

- Campaigns are to be launched by local government authorities among local communities to raise their awareness of environmental sanitation and civilized urban lifestyle.
- The operation management unit is to erect warning signs and regulations on banning waste disposal into canals and channels.
- Public waste bins will be placed on operational roads along the Canal and waste will be periodically collected.
- Punitive measures are to be applied to individuals who littering waste indiscriminately.

Measures to mitigate impacts under Component 3

Management of generated wastewater

- Households in the resettlement sites have to build the toilets with septic tank in accordance with regulations of the Government, the wastes from the toilets must be primarilytreated in the septic tanks of each household before discharging into the public drainage system. In this case, the pollutant load has to be reduced by additional 30-40% BOD_5/COD after treatment in the septic tank. The wastewater will be then connected to the wastewater collection of city.
- Sewer systems should be designed as closed sewer system.
- Daily cleaning and scrapping are required at the drainage manhole to avoid clog.
- Regularly carry out the dredging to limit the accumulation and deposition of organic compounds.

Management of generated solid waste

- Management Board of the resettlement areas must sign a contract for collection and transportation of municipal waste with URENCO or private waste collectors to transfer garbage emissions from resettlement areas;
- Disposition of garbage cans along the internal transport line in resettlement areas. - Specification of trash can must meet the provisions of the construction according to the QCVN 07: 2010/BXD particular: i) the capacity of the trash can will be 100 liters and not exceeding 1 m^3; ii) the trash can must be covered; iii) 1 trash can every 100 m; iv) rubbish in bins will not be left for than 24 hours; v) require daily emptying.
- Management Board of the resettlement areas must coordinate with local government to encourage residents to do garbage categorization program.

5.2. 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.

5.3. MITIGATION MEASURES FOR SOCIAL IMPACTS

5.3.1. 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.

5.3.2. Measure to minize impact on livehood

- 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.

5.3.3. 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.

5.3.4. 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.

5.3.5. Involuntary Resettlement

Potential adverse social impacts due to acquisition of land and other assets trigger World Bank's OP 4.12. In compliance with the provisions of the policy, the project requires the preparation of RPF and a RP for Bac Lieu City to address impacts caused by land acquisition. The RP addresses the relocation and livelihood impact of the Project on directly impacted communities and households. The Bac Lieu PPC and authorized PMU ensured that any involuntary resettlement will be carried out in accordance with the agreed RPF/RP.

To meet the World Bank Policy requirements, payment for all assets (including land, structures, crops, and other assets) at replacement cost. Displaced people's living should be restored to at least the pre-project level. In the community meetings, local authorities expressed their appreciation with regards to the World Bank's policy to restore livelihood of the affected people and to assist poor and vulnerable households.

The Resettlement Plan for Bac Lieu 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.

Resetllement Sites are available close to former relocated HH location to reduce risk of social and economic disruption.Security of tenure for landless HH will be esured by allocation of a plot of land in a serviced RS affordable to landless HH.

5.3.6. Loss of Livelihood

Bac Lieu PMU has been building 01 resettlement site in Ward 1, Bac Lieu city for the relocation of households affected by the project. The resettlement areas are located far from affected areas approximately 3-4 km. The total construction areas of resettlement area is 3.04 hectares with a total of 351 plots in serve for resettlement. The layout of plots in resettlement areas has different areas, 100 m^2 for small plot and 150 m^2 for the largest lot.

5.3.7. Preparation of action plans

Action plans are prepared for project include:

Resettlement action plan (see section on involuntary resettlement above)

Public health management plan

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.

Gender action plan

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

Communication and community consultation.

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.

Ethnic minority development plan

A ethnic minority development plan is needed to minimize and Mitigate project impacts on the live of EM in the affected areas by the Vietnam scaling-up upgrading urban – Bac Lieu city subproject. Ensure that development of the project will enhance the respect for people's qualities, human right and cultural features of ethnic minorities living in the affected area, taking into account their demand and wishes.

5.3.8. Information disclosure and accountability

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.

5.3.9. Hiring experts

To hire experienced experts cooperating with PMU to implement the resettlement plan and the livelihood restoration for people.

CHAPTER 6. ENVIROMENTAL AND SOCIAL MANAGEMENT PLAN

On the basis of the assessment of negative impacts presented in Chapter 4 and the measures of impact mitigation recommended in Chapter 5, this Chapter will present the Environmental and Social Management Plan (ESMP) for Bac Lieu Sub-project. The Environmental Management Program will identify the activities/actions to be implemented in the city of Bac Lieu Sub-project, including the environmental monitoring program and its implementation schedule, taking into account the compliance with the provisions of the Government's ESIA and safety policies of the World Bank (WB).

6.1. BASIS PRINCIPLES

To ensure that all sources of pollution arising from the subproject activities during the preparation stage and the construction stage as well as in the operation period will not cause any negative impacts on the environment and public health, it is compulsory that the management, monitoring and supervision of environmental quality be executed in a scientific, systematic and regular manner. Below is a summary of environmental impacts, mitigation measures and responsibilities of stakeholders.

ESMP's mitigation measures are divided into 3 basic parts: (1) ECOP, (2) Specific mitigation measures for the specific types of works.

(1) All of the potential negative impacts on physical, biological, and social environment could be mitigated through a set of general measures that are typically applied to most of construction projects to minimize impacts such as noise, dust, vibration, waste generation, traffic hindrance, public safety, etc. In this context, an ECOP has been prepared describing specific requirements to be carried out by contractor to mitigate the subproject potential impacts considered to be general impacts (Section 6.1). The contractor will also be required to mitigate site-specific impacts which will be identified to address issues specific to the subproject.

(2) In addition to adopting the ECOPs, the specific mitigation measures have been identified (Section 6.2.2) for addressing the impacts associated with the specific types of works under the subproject such as canals, bridges, roads. These measures will be included in the contracts for corresponding packages.

Measures to mitigate impacts from land acquisition and resettlement are mentioned separately in the Resettlement Plan (RP) and those measures will be carried out and supervised separately.

6.2. KEY IMPACT MITIGATION MEASURES

6.2.1. Mitigation Measures for General Preparation Impacts (ECOPs)

Typical common impacts which will be minimized by mitigation measures defined in ECOP include: (1) Dust, exhaust gases, noise and vibration; (2) Wastewater management; (3) Solid waste management; (4) Hazardous waste; (5) Water pollution control; (6) Impacts on aquatic species and terrestrial ecology; (7) Management of impacts on urban landscape and beauty; (8) Management measures of sedimentation, erosion and flooding; (9) Traffic safety management; (10) Influence to existing infrastructure and services,(11) Management of impacts on social activities; (12) Management of impacts on cultural and religious works; (13) Measures to secure community health and safety; (14) Measures to secure worker's health and safety, (15) Management of warehouses and borrow pits, (16) Communication to local community.

Table 6.1: Mitigation measures in accordance with ECOPs

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
1. Generated dust, noise, vibration, 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 2 times a day: in the morning 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 material stockpiles shall be protected against wind erosion and the location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors. • 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 20 m^3within 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.	• QCVN 05: 2013/BTNMT: 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 environmental protection;	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	• 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 construction of component 1. • 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. • Installing picket fence with height of 2.5m at construction locations. • 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)			
2. Wastewater management	• The Contractor must be responsible for compliance with Vietnamese legislation relevant to wastewater discharges into watercourses. • 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 traffic roads and canal. Wastewater from toilets as well as kitchens, showers, sinks, etc. shall be discharged into a conservancy tank for removal from the site or discharged into municipal sewerage systems; there should be no direct discharges to any waterbody • Wastewater containing pollutants over standards set by relevant Vietnamese technical standards/regulations must be collected in a	• QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater; • QCVN 40:2011/ BTNMT: National technical regulation on industrial wastewater	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	conservancy tank and removed from site by licensed waste collectors. • Clear ditches around the workers' camps every week. • Creating ditches for rain water collection and diversion. • 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.			
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 obtained. • Solid waste may be temporarily stored on site in a designated area approved by the CSC and relevant local authorities prior to collection and disposal through a licensed waste collector. • 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 CSC and included in the solid waste plan. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas, such as in areas of natural habitat or in watercourses. • 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.	• Decision No, 59/2007/NĐ-CP on garbage 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
	• 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 treatment 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 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 Bac Lieu URENCO to collect solid waste, conforming to 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. • At each site or worker camp and maintenance area, the Contractor must arrange storage area or containers for hazardous waste (drum/plastic/composite containers can be used). These containers are only used to store hazardous waste and must be covered and labelled outside as "HAZARDOUS WASTE CONTAINER". • 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	• 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
	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 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 storm water runoff at the construction sites. • Provide construction workers on site with mobile toilets. • Avoid excavation and backfilling during rains.	• QCVN 08-MT:2015/BTNMT – National Technical Regulation on surface water quality • QCVN 09-MT:2015/BTNMT: National Technical Regulation on Underground Water	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	• 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. • 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 rivers/canals. • 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	Quality • QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater; • QCVN 40: 2011/ BTNMT: National technical regulation on 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, 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
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	• TCVN 4447:1987: Construction regulation • Circular No. 22/2010/TT-BXD:	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	by storm water. • Carry out ground leveling and rolling after discarding materials at disposal sites.	Regulation on construction safety • QCVN 08-MT:2015/BTNMT – National technical regulation on surface water quality		
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 200 m 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 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.	• 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 investment • Circular No. 22/2010/TT-BXD on regulation on construction safety	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	• 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.			
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 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.	• Decree No. 73/2010/ND-CP on administrative penalization of violations related to security and social affairs	Contractor	PMU, CSC, IEMC
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	• Decree No. 73/2010/ND-CP on administrative penalization of violations against security and social	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	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 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.	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: 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. Spray water 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:	• Law on cultural heritage No. 28/2001/QH10; • Amended and supplemented Law on cultural heritage No. 32/2009/QH12; • Amended and	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	+ 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 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	supplemented Decree No. 98/2010/ND-CP		

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	safeguarding such relics.			
13. Community 's safety and health	• The Contractor will have to conform to regulations in Circular No. 22/2010/TT-BXD by the Ministry of Construction on safety in construction. • 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. • Fence of excavation pits and open channels and make off with luminous cordon and warning signs. Provide sufficient lighting when carry out construction at night. • Limit the speed of transport means to 20km/h within 200m from the construction site so as to minimize dust and noise. • Keep noise-generating machines and vehicles at such suitable distances that noise transmitted to residential areas will not be higher than 70dBA. • Use static compacting when the road base is constructed near areas with many households and weak temporary works to restrict vibration. • The subproject will cooperate with the local health agency in developing and implementing plans for control of diseases among workers.	• 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: Technical regulation on construction safety • Decision No. 96/2008/QD-TTg on clearance of UXOs	Contractor	PMU, CSC, IEMC
14. Workers' health safety	• Train workers on issues related to environment, safety and health, thus enhancing their awareness of HIV/AIDS and infectious diseases within 2 weeks prior to the commencement of packages with construction items lasting at least 6 months. • Provide workers with and request them to use adequate safety gear such as masks, helmets, shoes/boots, goggles, etc. depending on job characteristics. • Safely install power lines at offices and in construction sites and do not lay connectors on the ground or water surface. Electric wires must be with plugs. Place outdoor electric panels in protection cabinets.	• Decree No. 22/2010/TT-BXD on regulation of 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
	• Limit the speeds of vehicles traveling inside construction sites to be 5km/hour. • Provide fire-extinguishers, first-aid bags, and medical cabinets with sufficient medicines for treating general diseases in the locality must be provided at construction sites. • Safely store fuels and chemicals in areas with impermeable ground with roofs and surrounding banks, equipped with safety warning signs located at least 20m from the camps and at the end of prevailing winds. • In case of chemical and fuel leakage, the following steps will have to be taken: + Immediate check must be carried out to detect any possible case of injury. In case of injury, first-aid must be given and the injured person must be rushed to the nearest medical station for healthcare, and at the same time the case must be informed to the Supervision Engineer and the PMU; + Carry assessment to determine the kind of leaking/overflowing fuel/chemical; + Do not flush overflowing chemicals into drainage systems. Send staff with suitable safety gear to the site to handle the leakage by scattering sawdust (in case of small volumes of leaks/overflow) or sand (for high volumes of leaks/overflow). Use shovels to remove the surface soil layer if the leakage/overflow takes place on vacant land; and + Subsequent to the occurrence of such incident or accident, the Contractor will have to prepare a detailed report describing the incident and performed activities and submit the same to the Supervision Engineer and the PMU for consideration and filing. Such report will also be presented to the Department of Natural Resources and Environment or functional agencies at their request.. • Set up the camps with sufficient supplies of clean water, power, and sanitation facilities. There must be at least one toilet compartment for every 25 workers, with separate toilets for males and females. Workers' beds must be provided with mosquito nets so as to prevent dengue fever. Temporary tents will be unacceptable.	Technical regulation on safety in construction; • Decision No. 96/2008/QD-TTg on clearance of UXOs.		

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	• Clean camps, kitchens, baths, and toilets and sanitize regularly, and keep in good sanitation conditions. Provide dustbins and collect wastes daily from the camps. Clear drainage ditches around the camps periodically. • Stop all construction activities during rains and storms, or upon accidents or serious incidents			
15. 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 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.		Contractor	PMU, CSC, IEMC
16. 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	• 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
	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, 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.			

6.2.2. Site-Specific ESMP

The following table presents site-specific impacts and mitigation measures that are not fully addressed through the application of ECOPs. This may be because the impact is not a typical one and is not included in the ECOPs, because the severity of the impact goes beyond the scope of the mitigation measures in the ECOPs, or because simply of the very specific nature of the mitigation measure that is needed.

Table 6.2: Site Specific Impacts and Mitigation Measures

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
1.	**COMPONENT 1: TERTIARY INFRASTRUCTURE UPGRADING IN LIAs (LIA 1, LIA 2, LIA 3, LIA 5, LIA 6)**				
Preparation phase					
	UXO clearance	The subproject owner (the subproject PMU) will sign a contract with the military civil engineering agency or Bac Lieu Provincial Military	Competent Military Unit	PMU	- Counterpart fund

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		Base for UXO detection and clearance at the construction sites. No construction activity will be allowed until the UXO clearance is completed.			- IM: Contract
	Land acquisition and resettlement, grave relocation	Implementation of approved RP in accordance with its provision.	PMU, City People's Committee	ISMC	- Counterpart fund - IM: approved RP
Construction phase					
	Localized flooding - Residents within LIAs 1,2,3,5,6.	- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction.	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work. - 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. - The contractors must set up temporary drainage at the construction site and ensure that they are cleared of mud and other obstructions, such as: • Building drainage works along/across the site during backfilling and ground leveling. • Digging drainage ditches/drains suiting practical conditions of the streets. - Building drainage works along/across the site during backfilling and ground leveling.	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		- Provide drainage ditches/drains suiting practical conditions of the streets. - Deploying standby pumps and other equipment items in case of needed drainage. - Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations. - Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area.			
	Impact due to dredged sediment in LIA 2 - Odor and management of 260 m^3 sediments generated from small canal dredging in LIA 2. - Residents in Ward 1. - People commuting along transportation route.	- PMU will ensure that detailed design dredged sediment will consider collected and gathered along the construction site which is lined with geotextiles	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		<u>*At the sites*</u> - On-site location for temporary gathering of sludge must be to the tail end of the wind, far from residential areas and sensitive works. - Sediment dredged from channels would give off stinking odors of such gases as CH_4, H_2S, and mercaptans. To mitigate the impact from malodor of dredged sediment, it is therefore imperative to provide face masks, boots and gloves for workers who will work directly with this source of waste. - Dredged sediment will be collected and gathered along the construction site which is lined with geotextiles to prevent sludge leachate from infiltrating into the soil. This gathered sludge is to be transported and disposed of within 48 hours. - In no case should dredged sediment be indiscriminately disposed of. This waste must be appropriately managed under the PMU's supervision and construction supervision consultant. - EM (Effective Microorganisms) deodorants are to be sprayed every day. These deodorants are able to remove offensive odors from H_2S and mercaptans.	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		- According to the analyses, the sediments from the canal dredging work are not hazardous, with heavy metals lower than the acceptable limits. However, the dredging soils and sediments have high amount of organic compounds and pathogenic microorganisms (e.g. *Ecoli*) thus should not be used directly for agricultural purpose. It is recommended that the sediments could be dewatered and kept at least 03 months to allow partial biodegradation of organic substances and removal of microbial organisms. The sediments could then be used for perennial crops or planting tree for urban landscape purpose, based on the actual needs of local people. Otherwise, it will be transported and disposed at No 4 Trang An landfill. *For the transportation* - Clean up the transport vehicles before leaving construction site. Do not load to a height of 10 cm higher than the truck body so as not to spill out and scatter the sediment onto roads, giving rise to offensive odor, 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. - Preriodically 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.			
	Social disturbance and increased traffic risks	- PMU will ensure that detailed design will consider the plan and the time of construction for travel and circulation advantage	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	- Impacts on traffic within LIAs by narrow alleys - Impacts on traffic along connecting streets Social disturbance in Ward 1 (LIA 2), Ward 2 (LIA 3), Ward 5 (LIA 5), Ward 8 (LIA 6), Ward 7 (LIA 1)	*For impacts on traffic within LIAs* - Locals residing at the site for constructing the alleys are to be notified 15 days in advance on the plan and the time of construction so that they could work out their own options for travel and circulation. - Construction operations are to be successively performed by alley segment. Extensive construction operations on the entire route should be avoided. - For major alleys with a width of over 4m, construction should be carried out on one half of the road surface, leaving the other half for traffic traveling. - Construction operations are to be limited during rush hours. - For major alleys with a width of over 4m, construction should be carried out on one half of the road surface, leaving the other half for traffic traveling. - 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. 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. - Reinstall the road surface if occurring the damages during construction. *For impacts on traffic along connecting streets*	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		- Do not park vehicles in the roads longer than necessary. Maintain the required speed limit and do not overuse horn. - 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. - So as to minimize adverse impacts on the traffic along the streets linked to LIAs, a traffic management plan will be carried out, in which construction operations will be performed in some streets, some others will serve as temporary by pass roads and others will be used as transportation routes. This plan will be publicly announced to residents in the affected areas and to related agencies. The planned routes for material and waste transportation see Table 5.2 below. *For impacts on social disturbance* - Prioritized recruitment and employment of the workforce available in the locality; - Carrying out procedures on declaring the personnel present at construction sites; - Setting up workshops on construction site rules & regulations for officers and workers; - Contractors' sanction measures against violations of construction site rules & regulations.			
	Damage to water supply and communication systems (along alleys in LIAs (15.9 km)	- PMU will ensure that detailed design will consider set up barriers around the construction area of water supply pipeline and limit breaking the pipeline or the communication information system cables	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- Inform the water supply management and communication companies of the construction activities and their potential impacts such the risks of breakage other damages to the water supply pipelineat least 01 month before start of the construction.	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		- Set up barriers around the construction area of water supply pipeline. - Use smaller excavation machine and Larsen pile driving method of construction to avoid breaking or disposition the water pipeline. - Deploy a qualified technical staff to supervise construction activities near the pipeline and communication cables. - In the case of breaking the pipeline or the communication information system cables, it is necessary to suspend the construction activities and immediately inform the water supply and communication companies and the local authority of the incident.			
	Impact on PCRs and other sensitives receptor: Vinh Phuoc An Pagoda, Phuoc An Pagoda (located on the alleys) in LIA 2; Linh Chau Pagoda (3 m to alley); Cemetery of Bac Lieu Buddhist Association (1 m to alley); Ong Chau Temple (2 m to alley) in LIA 5; Bac Lieu Provincial Continuing Education Center (located on alley No.13)	- PMU will ensure that detailed design will consider arrange temporary walkways to ensure safety for those working or living on construction sites	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		For the religious works (Vinh Phuoc An Pagoda, Phuoc An Pagoda, Linh Chau Pagoda Cemetery of Bac Lieu Buddhist Association, Ong Chau Temple) - Inform the Pagodda/temple/church of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction. - 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 100 m 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	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		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. - The construction method shall include the measures to protect the foundation of the fence/gate/main building of the pagoda/temples, such as using supporting pillars or steel frame to prevent the risk on structure collapse/cracking. - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the pagoda/temple. *For Bac Lieu Provincial Continuing Education Center:* - 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. If possible, implement the construction activities during the school summer vacation. - 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. - Cooperate with the school in management of school students, security, and safety during construction, such as teachers to be informed of construction operations to keep pupils off the site during their break time. - Assign security guards around the construction sites so as to warn pupils in due time against approaching the construction site. - Put fences warding off the site and warning signs.			

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		- Deploy staff to guide the traffic during construction, transportation, loading and unloading of construction materials and wastes, and to guard high risk operations, especially when school children go to and leave the school around construction area. - Prohibit gathering of construction materials within 100 m in front of the school. If possible, provide separate entrances and exits for waste and material trucks. - Avoid activities generating great noise or vibration such as demolition of concrete structures or driving of piles during class hours. - Provide environmental training for the workers includes codes of conducts when working in pubic areas and sensitive receptors such as school. - Collect any wastewater generated by the construction to a setting tanks before discharging to the outside of the school. - Cover the incomplete trenches under construction at end of the working day. - Provide night lighting system with luminously painted fence and night lamp. - Schedule trucks transporting waste and materials not to enter and exit the school before the start of class hours, during school time, or just after class hours. - Gather materials and wastes neatly during construction and dispose the wastes at the designated site within the soonest possible time and within less than 24 hours. - Immediately addess any issue/problem caused by the construction activities and raised by the school management. - The construction method shall include the measures to protect the foundation of the fence/gate of the school, such as using supporting pillars or steel frame to prevent the risk on structure collapse/cracking. - In case damages happen, the contractor should take full			

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		responsibility in compensating or reconstructing the broken facilities as agreed with the school.			
Operation phase					
	Maintenance of the drainage system	- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the sewer pipes; - Carrying out periodical dredging and clearing works of the sewer pipes; - Sweeping and cleansing pavements must include clearing the rubbish and obstructing objects on the flow/sewer inlets/heads; - Signing contracts with the responsible agencies on collecting dredged sludge	Ward People's Committee	City	- City Budget - IM: City Operation and Maintenance Plan
	Traffic safety	- Placing traffic signs, signals regulating speeds and types of vehicles allowed to circulate in main alleys. - Cooperating with the local government to appoint the staff for traffic regulation at peak hours; - Timely carrying out O & M when the structures become downgraded, damaged. maintain works with signs of deterioration or damages.	Ward People's Committee	City	- City Budget - IM: City Operation and Maintenance Plan
	Waste management	- Limit the trash can arranged in positions of high population density, they should be located in the vacant area and downwind direction; - Specification of trash can must meet the provisions of the construction according to the QCVN 07: 2010/BXD particular: i) the capacity of the trash can will be 100 liters and not exceeding 1 m^3; ii) the trash can must be covered; iii) 1 trash can every 100 m; iv) rubbish in bins will not be left for than 24 hours; v) require daily emptying. - The waste collecting unit must tidy up the areas around waste gathering spots, ensuring these spots are free from littering waste and stinking leachate.	Ward People's Committee	City	- City Budget - IM: City Operation and Maintenance Plan

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
2	**COMPONENT 2: PRIORITY PRIMARY AND SECONDARY INFRASTRUCTURE** **(i)** Rehabilitating Cau Xang canal, the section from Xang bridge to Tra Kha Tra Khua canal**; (ii)** Upgrading, widening Lo Ren street **(iii)** Upgrading, expanding Lo Bo Tay street **(iv)** Upgrading, widening Huong Lo 6 street **(v)** Constructing internal connection roads; in the western area of Nguyen Dinh Chieu street, extended Hai Ba Trung street				
Preparation phase					
	UXO clearance	The same Component 1	Competent Military Unit	PMU	- Counterpart fund. - IM: Contractor's conditions
	Land acquisition and resettlement, grave relocation	The same Component 1	PMU, City People's Committee	ISMC	- Counterpart fund - IM: approved RP
Construction phase					
2.1	**Subcomponent 2.1: Rehabilitating Cau Xang canal**				
	Odors from the dredged sediment of Cau Xang canal - People living in the densely populated area from Km0+00 to Km2+630. - People living in the densely populated area from Km4+020 to Km4+800.	- PMU will ensure that detailed design dredged sediment will consider collected and gathered along the construction site which is lined with geotextiles	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		At the sites - On-site location for temporary gathering of sludge must be to the tail end of the wind, far from residential areas and sensitive works. - Sediment dredged from channels would give off stinking odors of such gases as CH_4, H_2S, and mercaptans. To mitigate the impact from malodor of dredged sediment, it is therefore imperative to provide face masks, boots and gloves for workers who will work directly with this source of waste. - Dredged sediment will be collected and gathered along the construction site which is lined with geotextiles to prevent sludge leachate from infiltrating into the soil. This gathered sludge is to be transported and disposed of within 48 hours.	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		- In no case should dredged sediment be indiscriminately disposed of. This waste must be appropriately managed under the PMU's supervision and construction supervision consultant. - EM (Effective Microorganisms) deodorants are to be sprayed every day. These deodorants are able to remove offensive odors from H_2S and mercaptans. *Management of dredged sediments from the canals:* - The Dredged Materials Management Plan (DMMPs) for have for the dredged works has been prepared. The DMMP is described in detailes in Annex 1. - According to the analyses, the sediments from the canal dredging work are not hazardous, with heavy metals lower than the acceptable limits. However, the dredging soils and sediments have high amount of organic compounds and pathogenic microorganisms (e.g. Ecoli) thus should not be used directly for agricultural purpose. It is recommended that the sediments could be dewatered and kept at least 03 months to allow partial biodegradation of organic substances and removal of microbial organisms. The sediments could then be used for perennial crops or planting tree for urban landscape purpose, based on the actual needs of local people. Otherwise, it will be transported and disposed at No 4 Trang An landfill. - 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 develop a specific DMMP based on the updated DMMP. The contractor's DMMP shall be submitted to Construction Supervision Consultant for			

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary storage of dredged materials, and control of polluting material during storage and transportation, pollution control, and risks at disposal sites. - Manage to ensure sediment will be disposed appropriately according to the approved site-specific DMMP			
	Impacts due to transportation of the dredged sediments: along Highway 91C, 23/8 Street, Highway 1A, Tran Phu street	- PMU will ensure that detailed design will consider the plan and the time of construction for travel and circulation advantage	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- Clean up the transport vehicles before leaving construction site. Do not load to a height of 10 cm higher than the truck body so as not to spill out and scatter the dredged sediment onto roads, giving rise to offensive odor, dust, and endangering road users. - Do not park vehicles on 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. - Preriodically 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.	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions
	Risk of subsidence during construction (from Km0+00 to Km2+630 and from Km4+020 to Km4+800)	- PMU will ensure that detailed design will consider must include the complete survey in geology and hydrology of the area and protection the areas with soft soils	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure sustainability and stability of the embankment;	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		- Inform the local households of the construction activities and their potential risks of land subsidence due to construction activities in the canal at least 01 month before start of the construction. - 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. - Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to CSC and the authorities concerned for approval by the construction contractors. - Heavy-duty machinery and equipment must not be gathered near canal banks. - Regularly check and monitor the risk of landslides to plan for possible reinforcement. - Avoid or limit dredging in the rainy season. - Construction of side slope is made in accordance with the design - In case dredging causes landslides and affects the households and homes along the canal, the contractor is liable for damages or compensation of construction as the original status. - Immediately addess any issue/problem caused by the construction activities and raised by the affected households or the local communities.			
	Affecting residential access and traffic - 9 temporary bridges from Km2+630 to Km4+020 - At the junctions, including Huong Lo 6 (at Km0+160),	- PMU will ensure that detailed design will consider to make arrangements for temporary bridges and roads during construction	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- Inform the local communities of the construction activities and their potential impacts of limited access due to demolition of the temporary bridges across the canal at least 01 month before start of the demolition. - Put and maintain bulletin boards at the construction site, containing the following information: full name and phone	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	Tran Huynh street (at Km0+820), Nguyen Van Linh street (at Km1+260), Nguyen Thai Hoc street (at Km1+360), Hung Vuong street (at Km2+90), and Tran Phu street (at Km2+320)	number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work. - Local communities are to be consulted on measures to make arrangements for temporary bridges and roads during construction. Locals must be notified of these temporary inconveniences during construction. - Temporary roads and bridges need to be constructed at the positions with no local roads and bridges. Put the road sign direction to the temporary bridges. - Temporary bridges are to be dismantled with the successive method; simultaneous dismantling or demolition must be avoided. - Cover the incomplete trenches under construction at end of the working day. - Provide night lighting system with luminously painted fence and night lamp. - Machinery and equipment can be gathered only on one canal side. - Traffic instruction signs are to be erected to direct road-users into replacement traffic roads. - Deploy staff to guide the traffic during rush hours. - Immediately addess any issue/problem related to the temporary bridges and roads caused by the construction activities and raised by the affected households or the local communities.			
	Damaged infrastructure facilities at intersections At the junctions, including Huong Lo 6 (at Km0+160), Tran Huynh street (at Km0+820), Nguyen Van Linh street (at Km1+260), Nguyen Thai Hoc street (at Km1+360), Hung Vuong street (at Km2+90), and	The project management unit will ensure that dredging inside box culverts with proper means will be taken into account in the detailed design.	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- Dredging inside the box culverts must not be performed with heavy-duty motorized equipment such as excavators, scoops, etc. - In case of high water level inside the culverts, they must be cleared by specialized sewage trucks. And if the water level inside the culverts is low, tidying up is to be manually performed. - It will be strictly prohibited to place equipment, machines or materials inside the existing box culverts.	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	Tran Phu street (at Km2+320)	- In case of box culvert break, construction contractor needs to immediately implement proper flow diversion to ensure flow smoothness, and report to operation management unit for timely repairing, fixing. - Workers need to quickly clear dropped debris inside the culvert.			
	Local flooding during the dredging process (from Km0+00 to Km2+630 and from Km4+020 to Km4+800)	- PMU will ensure that detailed design will consider arrange Temporary drainage ditches AND The construction scope should not make up ½ water	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- 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. - The contractors must set up temporary drainage at the construction site and ensure that they are cleared of mud and other obstructions, such as: (i) building drainage works along/across the site prior to dredging operations; (ii) Digging drainage ditches/drains suiting practical conditions. - Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area. - Deploying standby pumps and other equipment items in case of extreme weather events - Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations.	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions
2.2	**Subcomponent 2.2, 2.3: Upgrading, widening Lo Ren and Lo Bo Tay street**				
Construction phase					

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	Impact on water flow due to construction of the Lo Ren and Lo Bo Tay roads - Lo Ren road: There are 10 junctions along the route (Lo Ren route intersects 10 hydraulic canal). - Lo Bo Tay road: there are 10 junctions along the route (Lo Bo Tay route intersects 10 hydraulic canal)	- PMU will ensure that detailed design will consider construction operations in line with the planned progress schedule	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- Building materials and waste must not be gathered at positions close to hydraulic canals. - At the close of each working day, building materials must be carefully covered to prevent rainwater from washing away materials into the canals. - In case of materials and waste falling into the canals during construction, contractors are to promptly have workers tidy them up. - Contractor will enter into contracts with URENCO for collecting waste every day. - The construction of sewers and bridges on hydraulic canals must be sped up compared with the normal progress and contractors must carry out construction operations in line with the planned progress schedule.	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions
	Impact on water quality and water flow of Hydraulic canal (unname) due to construction of the bridge at Km4+912	- PMU will ensure that detailed design will consider A construction plan of detailed measures and schedule is to be worked out for the building/laying of sewers and bridges; arrange a settlement pit for suspended matter to retain sludge	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- A construction plan of detailed measures and schedule is to be worked out for the building/laying of sewers and bridges at the intersections with the hydraulic canal. This plan must be informed 30 days in advance to local government authorities and residents in the affected areas of Lo Ren Street and Lo Bo Tay Street so that locals could work out reasonable plans for storing clean water or domestic use. - In the final segment of the drainage ditch temporarily connected to the canal, there will be a settlement pit for suspended matter to retain sludge, pollutants and waste in the water before it is discharged into the canal. This settlement pit will be emptied and	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		tidied up every day by workers. - Before operation, all construction means and machines will be carefully checked in terms of technical parameters as well as operational performance to limit possible spills of oil, grease or fuel. - Construction operations during high tides should be limited. - Construction supervision staff at site must carry out strict management of workers during construction processes in order to limit materials and waste from spilling into the canal. - No machine & equipment maintenance is to be carried out in areas close to the hydraulic canal. - Construction operations for bridge foundations and piers will be bound to increase the turbidity of surface water. The construction unit should speed up the progress to cut down the radius of pollution transmission.			
	Impacts on aquaculture (at 96 and 64 shrimp ponds along Lo Ren and Lo Bo Tay roads)	- PMU will ensure that detailed design will consider provide drainage at the construction site and separate construction areas near the shrimp ponds by hard close fencing.	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- Inform the shrimp farm owners of the construction schedule, activities and their potential impacts of construction activities such as increased suspended solids in the water, wastewater, domestic wates and construction spoils two month before start of the construction. Put in place notice boards provided in the cosntruction areas. Conduct monthly meetings with shrimp farmers on issues related to construciton. - Consult with the shrimp farmers on the water taking time: Construction contractor needs to clearly inform the residents of the detailed construction schedule and recommend the residents to take and store water in settlement ponds to minimize possibility of using water affected by construction activities during construction time. - Construction contractor needs to well sSeparate construction areas	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		near the shrimp ponds by hard close fencing before construction to minimize impacts of construction activities on these ponds, especially to avoid run off from construction sites to the shrimp ponds. - Provide drainage at the construction site to ensure no soil erosion and sedimentation to the shrimp farming area. - If possible, the civil works items nearby/related to water surfacce sources should be implemented after the shrimp crop has finished. There's need for application of "successive construction" method, with completion of section by section followed by quick reinstatement. - Minimize dropping of debris into surface water sources and raising ponds increasing turbidity during construction by using proper equipments and applying sanitational safety measures. - Strictly prohibit indiscriminate or illigal dumping of construction spoils or waste to the shrimp ponds. - Do not gather construction materials, waste and machineries within 100 m from the shrimp ponds ponds. - Arrange trash containers on the site for containing oil rags and other solid wastes. Waste materials and other types of waste need to be collected on daily basis. - Site supervisors need to closely supervise the workers to collect and dispose waste at proper place as required during construction course. - ConcentrationConstruction should be quickly completed at the water inputs points to ensure high water quality for the shrimp ponds. - Cooperate with local aquaculture technical staff to instruct and help people well cope with possible troubles. - Spray sufficient water during dry days to avoid dust to the around area. - Immediately address any related problem raised by the shrimp farm owners.			

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	Impact on water supply and communication infrastructure -Residents living along the roads	- PMU will ensure that detailed design will consider set up barriers around the construction area of water supply pipeline and limit breaking the pipeline or the communication information system cables.	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- Inform the water supply management and communication companies of the construction activities and their potential impacts such the risks of breakage other damages to the water supply pipelineat least 01 month before start of the construction. - Set up barriers around the construction area of water supply pipeline. - Use smaller excavation machine and Larsen pile driving method of construction to avoid breaking or disposition the water pipeline. - Deploy a qualified technical staff to supervise construction activities near the pipeline and communication cables. - In the case of breaking the pipeline or the communication information system cables, it is necessary to suspend the construction activities and immediately inform the water supply and communication companies and the local authority of the incident.	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions
	Impacts on PCRs and sensitives receptors: Relocated 32 graves, Bac Lieu Baptist Church (13 m to Lo Bo Tay) và Phap Tanh Pagoda (30 m to Lo Ren street), 2B primary school (4 m to Lo Bo Tay road)	- PMU will ensure that detailed design will consider arrange temporary walkways to ensure safety for those working or living on construction sites.	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		Relocation of graves: - Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation, reburial and other related costs which are necessary to satisfy customary religious requirements. Compensation in cash will be paid to each affected family or to the affected group as a whole as is determined through a process of consultation with the affected community. The level of compensation will be decided in consultation with the affected families/communities. All costs of excavation, relocation	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		and reburial (7,500,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways. - During implementation the Subproject Owner will make early announce to the households whose graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to the affected household as required in the subproject RP and ESMP. *<u>For Bac Lieu Baptist Church (13 m to Lo Bo Tay) and Phap Tanh Pagoda (30 m to Lo Ren street):</u>* - Inform the church/pagoda of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction. - The contractor shall coordinate with local authorities (leaders of local wards or communes) for agreed schedules of construction 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			

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		construction activities and raised by the pagoda/church. - The construction method shall include the measures to protect the foundation of the fence/gate/mainbuilding of the church and pagoda, such as using supporting pillars or steel frame to prevent the risk on structure collapse/cracking. - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the church and pagoda <u>*For 2B primary school (4 m from Lo Bo Tay road):*</u> - Inform the school boards of directors 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. If possible, implement the construction activities during the school summer vacation. - Supervision Consultants and Subproject Owner, duration and scope of work. - Cooperate with the school boards of directors in management of school students, security, and safety during construction, such as teachers to be informed of construction operations to keep pupils off the site during their break time. - Assign security guards around the construction sites so as to warn pupils in due time against approaching the construction site. - Put fences warding off the site and warning signs. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes, and to guard high risk operations, especially when school children go to and leave the school around construction area. - Prohibit gathering of construction materials within 100m in front of the school. If possible, provide separate entrances and exits for waste and material trucks. - Avoid activities generating great noise or vibration such as			

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		demolition of concrete structures or driving of piles during class hours. - Environmental training for the workers includes codes of conducts when working in pubic areas and sensitive receptors such as school. - Collect any wastewater generated by the construction to a setting tanks before discharging to the outside of the school. - Cover the incomplete trenches under construction at end of the working day. - Provide night lighting system with luminously painted fence and night lamp. - Schedule trucks transporting waste and materials not to enter and exit the school before the start of class hours, during school time, or just after class hours. - Gather materials and wastes neatly during construction and dispose the wastes at the designated site within the soonest possible time and within less than 24 hours. - The scope of application should not occupy half the area of the road in order to limit surface water drainage. - The contractor should create temporary ditches / drains which led to the sewer / canal area to ensure the drainage of the area. - Arranging backup pumps to drain water quickly in the event of heavy rain or extreme weather. - Immediately addess any issue/problem caused by the construction activities and raised by the school. - The construction method shall include the measures to protect the foundation of the fence/gate of the school, such as using supporting pillars or steel frame to prevent the risk on structure collpase/cracking. - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the school.			

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
2.3	**Subcomponent 2.4: Upgrading, widening Huong Lo 6 street**				
	Impact on water supply and communication infrastructure -Residents living along the roads	- The same Subcomponent 2.2, 2.3	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions
	Impact on PCR and sensitives receptors: The Than Temple (from 1.5 m), Thieu Quang Sung Thien Duong Pagoda (from 7 m) and people's Tieu graves (from 4 m)	- PMU will ensure that detailed design will consider arrange temporary walkways to ensure safety for those working or living on construction sites.	Detailed design consultant	PMU	- Fund: City - IM: detailed design contract
		- Inform the church/pagoda of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction. - The contractor shall coordinate with local authorities (leaders of local wards or communes) for agreed schedules of construction 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	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		construction activities and raised by the pagoda. - The construction method shall include the measures to protect the foundation of the fence/gate of the temple, such as using supporting pillars or steel frame. - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the temple.			
2.4	**Subcomponent 2.4: Constructing internal connection roads; in the western area of Nguyen Dinh Chieu street, extended Hai Ba Trung street**				
	Affect business of the HHs on two sides of Hai Ba Trung road	- 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	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		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.			
	Impact on water supply and communication infrastructure -Residents living along the roads	- The same Subcomponent 2.2, 2.3	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions
Operation phase					
2.1	**Subcomponent 2.1: Rehabilitating Cau Xang canal**				
	Mitigating the risk of re-contamination of Cau Xang Canal owing to indiscriminate disposal of waste into the Canal	- Campaigns are to be launched by local government authorities among local communities to raise their awareness of environmental sanitation and civilized urban lifestyle. - The operation management unit is to erect warning signs and regulations on banning waste disposal into canals and channels. - Public waste bins will be placed on operational roads along the Canal and waste will be periodically collected. - Punitive measures are to be applied to individuals who littering waste indiscriminately	Urban Management Committee Division	City	- City Budget - IM: City Operation and Maintenance Plan
	Traffic safety	- Local government authorities must be coordinated in deploying traffic guiding staff during rush hours; - Timely maintenance must be carried out upon signs of degradation or damage in the works.	Urban Management Committee Division	City	- City Budget - IM: City Operation and Maintenance Plan

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
2.2	**Subcomponent 2.2, 2.3, 2.4, 2.5: Upgrading, widening Lo Ren, Lo Bo Tay street, Huong Lo 6 street, Constructing internal connection roads; in the western area of Nguyen Dinh Chieu street, extended Hai Ba Trung street**				
	Impacts from maintenance of the drainage system	The same Component 1	Urban Management Committee Division	City	- City Budget - IM: City Operation and Maintenance Plan
	Traffic safety	- During the detailed design phase, the design consultant must pay attention to the estimated increase of traffic vehicles at a future point of time and to the connectivity to the local traffic network; - The detailed design must include the setting up of warning signs and traffic instruction signs at positions readily visible to the road-users. - Local government authorities must be coordinated in deploying traffic guiding staff during rush hours; - Timely maintenance must be carried out upon signs of degradation or damage in the works.	Urban Management Committee Division	City	- City Budget - IM: City Operation and Maintenance Plan
	COMPONENT 3: RESETTLEMENT				
Preparation phase					
	UXO clearance	The same Component 1	Competent Military Unit	PMU	- Counterpart fund. - IM: Contractor's conditions
	Land acquisition and resettlement, grave relocation	The same Component 1	PMU, City People's Committee	ISMC	- Counterpart fund - IM: approved RP
Construction phase					
	Generic environmental impacts	Applied the ECOPs (see 6.2.1)	Contractor	PMU, CSC IEMC	- Fund: IDA - IM: Construction contract conditions

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
Operation phase					
	Impact from air emission	- Regular clearing soil and sand on the road and bridge surface to reduce the dust; - Watering and washing the roads at least once a day during the dry season to mitigate the dust from surface of bridges/roads. - Inspecting/requiring the vehicles carrying the materials to be covered in order to avoid spilling materials on roads. - Checking the registry of the running vehicles which meet the emission standards as per the State regulations. - Planting trees along both road sides to prevent the dust dispersion into people's houses along the both sides.	Ward People's Committee	City	- City Budget IM: City Operation and Maintenance Plan
	Impact from waste water The generated wastewater from resettlement site is about 270 m^3/day.	- Households in the resettlement sites have to build the toilets with septic tank in accordance with regulations of the Government, the wastes from the toilets must be primarilytreated in the septic tanks of each household before discharging into the public drainage system. In this case, the pollutant load has to be reduced by additional 30-40 % BOD_5/COD after treatment in the septic tank. The wastewater will be then connected to the wastewater collection of Bac Lieu city. - Sewer systems should be designed as closed sewer system. - Daily cleaning and scrapping are required at the drainage manhole to avoid clog. - Regularly carry out the dredging to limit the accumulation and deposition of organic compounds.	Ward People's Committee	City	- City Budget - IM: City Operation and Maintenance Plan
	Impact from solid waste The volume of the solid waste (3,443 kg/day)	- Management Board of the resettlement areas must sign a contract for collection and transportation of municipal waste with URENCO or private waste collectors to transfer garbage emissions from resettlement areas; - Disposition of garbage cans along the internal transport line in resettlement areas. - Specification of trash can must meet the provisions of the construction according to the QCVN 07: 2010/BXD particular: i) the capacity of the trash can will be 100	Ward People's Committee	City	- City Budget - IM: City Operation and Maintenance Plan

No	Site-specific impacts	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		liters and not exceeding 1 m^3; ii) the trash can must be covered; iii) 1 trash can every 100 m; iv) rubbish in bins will not be left for than 24 hours; v) require daily emptying. - Management Board of the resettlement areas must coordinate with local government to encourage residents to do garbage categorization program..			

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

- Clean up the transport vehicles before leaving construction site. Do not load to a height of 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.

The details on the DMMP for Cau Xang canal and small canals in LIA 2:

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.

6.2.3. Emergency Procedures

During construction period, if there are environmental emergency or labor accidents, the Contractors have to make a report to describe in details the incidents and taken actions. The reports on the incidents have to be submitted to the Construction Supervision Consultants (CSC) and PMU for review and archive. The reports also have to be submitted to the concerned agencies if required. Please find below some risk response action plans:

6.2.3.1. Vehicle Accidents

Vehicle accidents may include, but are not limited to:

- Vehicle roll-over; and
- Vehicle crash with another vehicle, structure or with a person (worker or person from the local community).

Procedure:

- Stop work immediately;
- Turn off the vehicle, if possible;
- Help passengers of the vehicle(s) exit the vehicle and move to a safe place, if possible;
- If there is an injury, follow the procedure for medical emergencies (see below); and
- If there is a fuel/chemical spill, follow the procedure for spill emergency (see below).

6.2.3.2. Electrical faults/accidents

It is not safe to carry out the works within a 10m radius area of electrical cables, electrical accidents may happen as the result of:

- Collision with power cables and poles;
- Collapse of cable poles; and
- Hitting underground cables.

Procedure:

When an electrical accidents occurs:

- Stop work immediately;
- Isolate the power source, if possible and safe to do so (e.g. using a non-conductive rod to detach cables);
- If there is an injury/medical need, follow the procedure for medical emergencies (see below); and
- HSE Manager of the Contractor will inform EVN for further action (e.g. stopping power and conduct repairs), coordinate the authority inspection and facilitate the communication with authorities/media, if required.

6.2.3.3. Fire

Flammable hazardous materials and wastes will be present on site (including fuels, oils, etc.). A fire can also be caused by using ignition sources nearby (e.g. smoking or cooking by workers and residents) or engine incidents.

All the bulldozers, excavators, HW and hazardous materials storage areas, and the site office must be equipped with portable 2 kg fire extinguisher in each location (the type depends on the immediate fire risk). The fire extinguishers must be in good working condition. The Contractors' Supervisor – Vehicles and Devices shall perform monthly checks and replace as needed – tags shall be kept on the extinguishers which indicate their validity.

Procedure:

- Upon identification of a fire incident, try to suppress the fire if it is deemed possible and safe to do so using the available suppression equipment);
- If it is not possible to do so, move to a safe location (up wind and sufficient distance) and report the fire to the fire brigade stating your name, location, the status of the fire;
- Report the fire to the Contractors' General Manager; and
- The Contractors' General Manager will inform all workers and on-site visitors and ensure that they are all accounted for and in safe locations. They shall also inform the PMU HSE Manager, who shall inform the applicable government department and any households on or off site who may be in danger and advice them to evacuate.

6.2.3.4. Chemical/Fuel Spill

A spill of chemical/fuel has the potential to cause soil and underground water contamination, if not controlled and cleaned up timely and properly. Chemical/fuel spills include, but are not limited to, the following:

- Fuel spill during refueling;
- Fuel/oil/grease leaks during vehicle parking or operating; and
- Breaking of fuel tanks on vehicles.

Spill response facilities: A spill kit shall be provided on each heavy equipment (bulldozers and excavators), in the HW and hazardous materials storage areas, and in any designated fueling locations. A spill kit includes a drip tray, absorbent materials, and impermeable bags to collect contaminated soil and used absorbent materials, and a small spade used for collecting contaminated soil.

Procedure:

- When there is a spill, immediately use the absorbent materials to absorb the spilled materials and locate the drip tray to collect the spilled flow (if the spill continues);
- Collect used absorbent materials into an impermeable bag;
- Use the spade to collect the contaminated soil into the impermeable bag; note that there should be no contaminated soil left (stained soil must be collected to the full horizontal and vertical depth of the impact);
- Transfer the filled impermeable bag to the HW Storage Area for storage;
- If the spill is larger than one spill kit or person can handle, request another worker to support (e.g. to bring more spill kits);
- Use work gloves, safety glasses, long sleeved tops and trousers during the above response process and minimize direct contact with the spilled fuel/oil; and
- At and around the location of release, samples shall be taken to confirm whether any contaminated soil/underground water remains. The number of samples will depend on the scale of the release and the estimated impacted area. The parameters to be analyzed will depend on the substance released. Depths where samples are taken should be at the ground surface and immediately above the underground water table. These should be identified in a sampling plan prepared by the HSE Management and Monitoring Office in consultation with appropriately qualified technical staff. Response to any remaining contamination should be defined accordingly.

6.2.3.5. Medical Emergency

A medical emergency is a situation in which, due to an acute illness or injury, there is an immediate risk to a person's life or long-term health. Medical emergencies include, but are not limited to, the following:

- Injuries from vehicle accidents;
- Wildlife attacks, e.g. snake bites or bees attack;
- Heat stress;
- Electrocution; and
- Unexploded-ordnance incidents.

Procedure:

- Report the injury to the First Aider, stating your name, location, nature of emergency and assistance required;
- Where safe to do so, stay in the location until assistance arrives;

The First Aider will co-ordinate first aid response; the First Aider can give first aid as far as they are capable. If further medical attention is required, then the injured shall be transferred to the nearest medical clinic for further treatment.

Within two working days of receiving an occupational accident investigation record and the minutes of the meeting about disclosure of the occupational accident investigation record, the First Aider must prepare statistics of the occurred occupational accidents and records in a Statistic Book with following principles:

- Every occupational accident that has happened to workers must be recorded;
- When a worker suffers from multiple occupational accidents, each accident must be separately recorded;
- Every occupational accident that has happened to workers that cause them to take one day off or more must be recorded.

6.2.3.6. Adverse Weather

Potential adverse weather events include, but are not limited to: Heavy rain; Strong wind; or Typhoon. The potential for an earthquake, tsunami and heavy flood happening at the site is considered unlikely.

Procedure:

The Contractor General Manager will check the national and local weather forecast each morning prior to work commencing. Should adverse weather be predicted, depending on the severity and timing of the weather expected. If adverse weather is expected to be serious, lengthy and soon (e.g. in the case of a typhoon), the Contractor General Manager shall contact all workers not to come to work. If the weather is less serious and is not expected to last long, the Contractor Supervisor - Workers will cover this situation during the daily toolbox talk, continue to monitor the weather situation throughout the day and issue instructions as necessary to stop work, do their work sites safe, and find a safe sheltering location (either back at the site office, if sufficient time to return, or locally to the active works (in the case of the latter, the worker shall call the Contractor Supervisor – Workers to inform them where and when they are in the sheltering location). If the Contractor Supervisor – Workers do not hear from a worker(s) within 15 minutes of instruction to shelter, the Contractor Supervisor – Workers shall mobilize to the location by car to ensure the safety of the worker(s).

6.2.3.7. Broken water pipes

The existing water supply pipes on the routes may be broken due to the following reasons:

- During earthwork process for constructing foundation holes, inappropriate identification of the location or the wrong operating actions by the workers, non-compliance with the technical design drawings may cause the collision between the construction equipment and the water supply pipes;
- The affecting force of the construction equipment focuses on one place, while the foundation of the construction area is weak, which creates the break of the water supply pipes;
- Such incidents if occur will create a loss of the huge water volume and an impact on the domestic water demand of the residents who access to this water supply source.

Procedure:

- Immediately turn off the valve/use the 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.

6.2.3.8. Sanitary Effluent Spill

- A spill of sanitary effluent has the potential to cause surface water, soil and underground water contamination and nuisance/health hazard to nearby households, if not controlled and cleaned up timely and properly. Sanitary effluent spills can occur during emptying and transportation of effluent from septic tanks being demolished on site.
- Spill response facilities: A spill kit shall be provided on each septic tank collection truck. A spill kit includes impermeable bags to collect contaminated soil and a small spade used for collecting contaminated soil.

Procedure:

- When there is a spill, immediately stop the flow;
- Use the spade to collect the contaminated soil into the impermeable bag; note that there should be no contaminated soil left (contaminated soil must be collected to the full horizontal and vertical depth of the impact);
- Transfer the filled impermeable bag to the Waste Storage Area for storage;
- If the spill is larger than one spill kit or person can handle, request another worker to support (e.g. to bring more spill kits);
- Use work gloves, safety glasses, long sleeved tops and trousers during the above response process and minimize direct contact with the spilled effluent.

6.3. SOCIAL ACTION PLAN

6.3.1. Occupation training foundation

Establishment of the occupational training foundations for the households, the members of which are unemployed is the critical demand in order to ensure that the people stay in the project areas and able to find out the appropriate job. Curriculums on skills need to be designed relevant to the households consultation on the priorities, demand and educational background. The curricula need to be focused to ensure to find out the jobs. It is necessary to coordinate with the potential employers in this matter.

The occupational training schools under MOET management in the project areas, the occupational training centers may organize the training courses on IT, textile and sewing skills, mechanics, electrical techniques, mushroom planting, animal husbandry, other agricultural technical supporting services…; organize training courses, expanding programs for the high schools pupils and even for the members of the rural households. It is necessary to train both men and women in the project areas. Moreover, it requires setting up the training courses on occupational re-training for men and women just in case they loose the jobs after completing the project. It also includes the training for the households having people with disability.

6.3.2. Supporting internal and external forces for the people

Around 1/3 of the interviewed people advised that they have received the supports. However, many people told that many supporting programs have taken place in the past, now only a few programs are ongoing. The main supporting sources are from the government agencies and locality, mainly from the communes' People's Committees and villages, Women's Union, Farmers Union of the communes, villages, and hamlets. Some people said that the supporting sources are from NGO, Red Cross and Vietnamese overseas.

During project implementation, it is necessary to conduct the consultation with the affected households on the programs of the government, the local unions such as Women's Union, Farmers' Union, and Youth Union. The seriously affected households should be able to access to the ongoing national programs such as National Target Program on Water Supply and Sanitation, especially for the poor.

6.3.3. HIV/AIDS and other sexually transmitted diseases, human trafficking

During project implementation, there will be a large amount of the labor force focusing in the construction sites. According to the experience from the previous similar construction projects, the STI rate in the labor groups will increase if there are no applied prevention measures in order to ensure that the workers are protected against the STD, which include HIV/AIDS. The public health action plan will be set up based on the previous experience of the earlier projects and the public consultation in order to ensure that the works are protected against STI.

In order to mitigate and address the HIV/AIDS related risks and human trafficking, it requires paying a special attention to women. The Project needs to conduct a good communication and dissemination on HIV/AIDS and other risks such as drug abuse and human trafficking. HIV/AIDS programs should include the awareness enhancement campaigns in the construction sites and in the community, peer education development and public monitoring in combination with understanding about safe migration which are implemented and monitored by the communities, PMU and Women's Unions of the project's communes.

6.3.4. Gender action plan

Gender action plan should be developed to ensure the participation of women in all activities of the project and ensure equality for women in getting benefits and access to the project. The Gender Action Plan should ensure the following objectives:

- To ensure the presence of female representative in the community monitoring and management activities:
    - At least 30 % women are trained in the field of project management.
    - At least 50 % of women are trained about sensitive issues.
    - For community leaders, government officials and consultants involved in the implementation and handing over of the project, the Project Management Unit will take the objective of recruiting 50% female staffs, of which 30 % holding decisive position.

- To create jobs for female workers in the project area: 15 % of unskilled workers to be hired in construction time will be women. 10 % of staffs for operation and maintenance of the project will be women.
- To raise public awareness about the activities of the project and to improve the sustainability of the environment: At least 5 campaigns will be conducted during the implementation of the project, including fields of environmental sanitation and social risks to support equality of women and men in accessibility to services.
- Raising awareness of the local leaders and local people on gender;
- Raising awareness of local people including men and women about the positive and negative effects of the project;
- Ensuring the involvement of both women and men in the area in communication activities to mitigate negative impacts of the project;
- Ensuring equal opportunity for both women and men in accessing to and getting benefits from livelihood supporting programs, especially single women, poor women, women from ethnic minorities.

6.3.5. Communication and community consultation

Community consultation meetings need to be organized through the implementation of the project, from preparation to construction and after handing over and operation of the project, ensuring (i) to provide people with full information on the project; (ii) community consultation on technical solutions in LIAs; (iii) active participation of community in activities of the project; (iv) participatory monitoring and evaluation of the community.

Information in the public consultation will be provided free of charge, publicly and in advance; people's demands, wishes and contribution ideas will also be recorded in these consultation meetings.

6.3.6. Temporary impact mitigation measures

The implemented activities include:

Increase the community awareness on safe transport and prevention of social evils during construction period;

Incorporate in the Contracts with the Contractors the measures for transporting the materials and sludge wastes in conformity with the regulations on the loads of the vehicles taking the materials and wastes. When there are damages in the local infrastructures due to the transportation, the contractors have to recover the affected infrastructures, reinstate the original site as before carrying out the project.

Table 6.3: Social impact mitigation measures

Negative impacts	Mitigation measures	Implementing agencies
Impacts on transport and incremental social evils	Public awareness improvement on safe transport and prevention of social evils for the local citizens	PMU should coordinate closely with the various level authorities in carry out the communication strategy. Based on the available communication system in the communes, to take necessary action on dissemination of information on Project's activities to the households.
Effects to the infrastructures	Contractors' compliance with the rules on infrastructure recovery	PMU should request the contractors to follow the regulations on loads and environment and sanitation measures in transporting materials as well as

Negative impacts	Mitigation measures	Implementing agencies
		regulations stipulated for cases of creating effects on roads.

6.4. ENVIROMENTAL 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 6.8.2). Many of these measurements are required by Vietnamese regulations and would need to be done even if not directly related to expected project impacts.

Sampling locations are described in Annex 2 and the number of samples are made in accordance with progress of each work.

Table 6.4: Location, parameters and frequency of monitoring

No	Monitored items	Preparation and construction phase
I	**Monitoring of air quality**	
	1. Monitoring parameters	Noise, TSP, CO, NO_2, SO_2, L_{eq}, vibration
	2. Monitoring frequency	Preparation phase: 01 time before construction Construction phase: measurements taken every six-months
	3. Applied Regulation	QCVN 05:2013/BTNMT, QCVN 06:2009/BTNMT; QCVN 26:2010/BTNMT; QCVN 27:2010/BTNMT
	4. Monitoring positions	56 samples (Sampling locations are presented in Appendix)
II	**Surface Water Quality Monitoring**	
	1.Monitoring parameters	pH, DO, COD, BOD, $N\text{-}NH_4^+$, $N\text{-}NO_2^-$, $N\text{-}NO_3^-$, $P\text{-}PO_4^{3-}$, oil & grease, Coliform, Cl^-, Fe, TSS
	2. Monitoring frequency	Preparation phase: 01 time before construction Construction phase: measurements taken every six-months
	3. Applied Regulation	QCVN 08-MT:2015/BTNMT
	4. Monitoring positions	17 samples (Sampling locations are presented in Appendix)
III	**Wastewater quality monitoring**	
	1.Monitoring parameters	pH, BOD_5, COD, H_2S, $N\text{-}NH_4$, $N\text{-}NO_3$, $P\text{-}PO_4$, oil & grease, Coliforms, TSS
	2.Monitoring frequency	Preparation phase: 01 time before construction Construction phase: Do not monitor
	3. Applied Regulation	QCVN 14:2008/BTNMT
	4. Position monitoring	03 samples (Sampling locations are presented in Appendix)
IV	**Soil**	
	1. Monitoring parameters	As, Cd, Cu, Pb, Zn, Cr
	2. Monitoring frequency	Preparation phase: 01 time before construction Construction phase: measurements taken every six-months
	3. Applied Regulation	QCVN 03-MT:2015/BTNMT
	4. Monitoring positions	24 (Sampling locations are presented in Appendix)
V	Monitoring of erosion	During embankment construction
VI	Monitoring of solid waste	Monitoring volume of waste generated and sludge dredged
VI	Monitoring of hazardous waste	Monitoring volume at storage location

6.4.4. Monitoring Effectiveness of the ESMP

The ESU assisted by IEMC will monitor performance of the ESMP implementation during the detailed design/bidding stage as well as during construction and first year operation of the facilities to ensure that (a) appropriate dredging and disposal of drainage sludge is properly carried out, in accordance with the DMMP, 9b) other impacts identified in the ESMP are effectively managed and mitigated; and (c) traffic management is adequate and the level of impacts are acceptable (no complaints or outstanding cases. Results/are to be properly kept in the project file for possible review by PMU and the WB. Cost for the monitoring will be part of the PMU cost.

6.4.5. Estimated Costs for Environmental Monitoring Program

Table 6.5: Estimated cost for samples and analysis in construction phase

(Exchange rate: 1 USD = 23,330 VND)

No.	Monitoring	Frequency	The number of samples	Total samples	Unit (VND)	Amount (VND)	Amount (USD)
1	Quality of air, noise and vibration	Every 6 months	56	185	854.000	157.990.000	6,771.967
2	Wastewater quality monitoring	Every 6 months	17	71	1.962.000	139.302.000	5,970.939
3	Surface water	Every 6 months	17	71	1.962.000	139.302.000	5,970.939
4	Aquatic	one time	17	17	2.100.000	35.700.000	1,530.219
5	Soil	one time	24	24	870.000	20.880.000	894.985
Total						**493.174.000**	**21,139.048**

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 6.9:

Table 6.6: Proposed social monitoring program for Bac Lieu city subproject

Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
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
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	
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	As the above

Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
			- Activities on traffic lane control and divergence	
Supervising mitigation of conflicts of benefits and local economic effects	Minimizing local conflicts of benefits due to free labor migration	Recruiting local labor force instead of recruiting workers from other areas.	- Number of recruited local laborers / total workers of the construction structures	As the above
Supervising mitigation of gender impacts	Assuring maximum participation of the women during the Project implementation as well as the economic role of the women in the HHs	- Mobilizing women to join in community activities of the Project - Supporting to maintain the previous occupation or change to the new ones. - Training on new occupations for women if needed	- Ratios of women participating in Project's community activities - Number of women is assisted to maintain the previous occupations. - Number of women attends in the new occupational training courses.	As the above
Supervising information release and 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 beresponsible for implementing mitigation measures. These measures will be included in bidding documents and their costs are to be included in construction bid packages;
- CSC will be responsible for monitoring the day-to-day implementation of mitigation measures. Related 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.

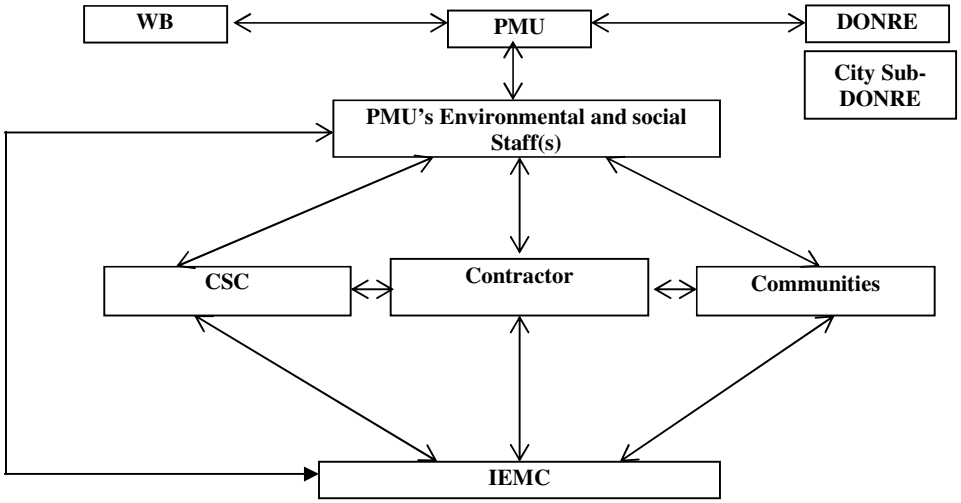


Figure 6.1: Organization chart for ESMP Implementation

Table 6.7: Roles and responsibilities of key parties

Community/Agencies	Responsibilities
PMU	- 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 subproject. 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 subproject 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 ESMP (CESMP) for each construction site area, submit the plan to PMU and CSC for review and approval before commencement of construction. In addition, it is required that the Contractor get all permissions for construction (traffic control and diversion, excavation, labor safety, etc. before civil works) following current regulations. - The Contractor is required to appoint a competent individual as the contractor‘s on-site *Safety and Environment Officer (SEO)* who will be responsible for monitoring the contractor‘s compliance with health and safety requirements, the CESMP requirements, and the environmental specifications (ECOP). - Take actions to mitigate all potential negative impacts in line with the objective described in the CESMP. - 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's existing

Regarding project implementation experience

So far, 23 projects financed by WB, ADB or IFC have been implemented in Bac Lieu province. However, These project have been carried out by Bac Lieu Provincial Management Unit / Department of Agriculture and Rural Development on behalf of Bac Lieu People's Committee.

Bac Lieu 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 subproject construction activities and secondly, apply the mitigation measures under ESMP to prevent harm and nuisances on local communities and environment caused by the impacts in construction and operation phases.

Remedial actions that cannot be effectively carried out during construction should be carried out on completion of the works (and before issuance of the acceptance of completion of works)

- The duties of the Contractor include but not limiting to:

- Compliance with relevant legislative requirements governing the environment, public health and safety;
- Work within the scope of contractual requirements and other tender conditions;
- Organize representatives of the construction team to participate in the joint site inspections undertaken by the Environmental Staff of the CSC;
- Carry out any corrective actions instructed by the Environmental Staff of the PMU and CSC;
- In case of non-compliances/discrepancies, carry out investigation and submit proposals on mitigation measures, and implement remedial measures to reduce environmental impact;
- Stop construction activities, which generate adverse impacts upon receiving instructions from the Environmental Staff of PMU and CSC. Propose and carry out corrective actions and implement alternative construction method, if required, in order to minimize the environmental impacts; Non-compliance by the Contractor will be cause for suspension of works and other penalties until the non-compliance has been resolved to the satisfaction of the ES of PMU and CSC.

(ii) Contractor's Safety, Social and Environmental Officer (SEO)

The contractor shall be required to appoint competent staff(s) as the Contractor's on-site safety, Social and environmental officer (SEO). The SEO must be appropriately trained in environmental management and must possess the skills necessary to transfer environmental management knowledge to all personnel involved in the contract. The SEO will be responsible for monitoring the contractor‘s compliance with the ESMP requirements and the environmental specifications. The duties of the SEO shall include but not be limited to the following:

- Carry out environmental site inspections to assess and audit the contractors' site practice, equipment and work methodologies with respect to pollution control and adequacy of environmental mitigation measures implemented;
- Monitor compliance with environmental protection measures, pollution prevention and control measures and contractual requirements;
- Monitor the implementation of environmental mitigation measures;
- Prepare audit reports for the site environmental conditions;
- Investigate complaints and recommend any required corrective measures;
- Advise the contractor on environment improvement, awareness and proactive pollution prevention measures;
- Recommend suitable mitigation measures to the contractor in the case of non-compliance. Carry out additional monitoring of noncompliance instructed by the ES of PMU and CSC
- Inform the contractor and ES (of PMU and CSC) of environmental issues, submit contractor's ESMP Implementation Plan to the ES of PMU and CSC, and relevant authorities, if required;
- Keep detailed records of all site activities that may relate to the environment.

(iii) Independent Environmental Monitoring Consultant (IEMC)

In order to minimize the environmental impacts during construction phase of the Subproject, the Subproject owner shall ensure that environmental quality monitoring requirements are established for the subproject. An IEMC appointed by PMU shall carry out the monitoring.

- IEMC will be responsible for carrying out environmental sampling, monitoring and marking report during all phases of the subproject. Environmental quality monitoring will be report periodically to PMU and World Bank (respectively every 03 months for PMU and every 6 months for WB in construction phase).
- EMC will also supply specialized assistance to PMU and ES in environmental matters.

(iv) Environmental and Social Supervision during Construction (CSC)

During construction phase, a qualified CSC reporting to the PMU shall carry out the environmental supervision. The CSC will assign environmental and social staff(s), will be responsible for inspecting, and supervising all construction activities to ensure that mitigation measures adopted in the ESMP are properly implemented, and that the negative environmental impacts of the subproject are minimized. The CSC shall engage sufficient number of Environmental Supervision Engineers with adequate knowledge on environmental protection and construction subproject management to perform the required duties and to supervise the Contractor's performance. Specifically ES of CSC will:

- Review and assess on behalf of the PMU whether the construction design meets the requirements of the mitigation and management measures of the ESMP,
- Supervise site environmental management system of contractors including their performance, experience and handling of site environmental issues, and provide corrective instructions;
- Review the ESMP implementation by the contractors, verify and confirm environmental supervision procedures, parameters, monitoring locations, equipment and results;
- Report ESMP implementation status to PMU and prepare the environmental supervision statement during the construction phase; 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 6.8 below.

Table 6.8: Regular Reporting Requirements

No.	Report Prepared by	Submitted to	Frequency of Reporting
1	Contractor to the Employer	PMU	Once before construction commences and monthly thereafter
2	Construction Supervision consultant (CSC)	PMU	Weekly and monthly
4	Community Monitoring	PMU	When the community has any complaint about the subproject safeguards implementation
5	PMU	DONRE	Every three-month
6	PMU	WB	Every six-month

6.7. TRAINING AND CAPACITY BUILDING

The table 6.8 below provides a typical training program on safety policies. Training programs will be developed and implemented by a team of Technical Assistance for the implementation of safety policies for PMU. PMU / IEMC with the help of the Technical Assistance Team will provide training for contractors, CSC and other groups.

- Trainee groups: the PMU staff, the ESU department staff, the field engineers (FE), construction supervision consultants (CSC), the building contractors, representatives of relevant stakeholders and local communities in the project area. The contractors take the responsibility for training workers and drivers.
- Training Schedule: Training will be given at least one month before performing the first construction contract. Subsequent training sessions can be modified to suit the construction schedule for project components.
- Frequency of training: The basic training programs given in the table below will be provided every 6 months annually, and the contents will be updated and tailored to items to be implemented. Training programs for PMU staff are expected to continue in the first years of the Project. Three-day training for CSC and contractors is also planned to take place twice a year for at least 2 years.

Table 6.9: Advanced training program on environmental monitoring management capacity

I. Subjects	**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 ESTIMATES

The following table provides a cost estimate for the implementation of environmental management plan (ESMP). The cost of ESMP6 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

6Excluding costs for RP implementation and independent monitoring the performance of RP/EMP

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 and district levels are balanced in the cost estimates of the Fatherland Front Committee at provincial/district level and allocated from the provincial budget".

The following table provides the estimated costs for environmental quality monitoring and IEMC (in accordance with national practices) for reference purposes. However, final costs will be updated in the detailed design phase.

Table 6.10: Estimated EMP implementation cost (mil. USD)

Content	Items of Bac Lieu 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	0.06	WB
(e) Independent environmental monitoring consulting(IEMC)	0.093	WB
(f) Capacity building programs on safeguard policies	0.01	WB

Table 6.11: Estimated cost for IEMC (1 USD = 23.330 VNĐ)

No.	Content	Unit	Quantity	Price (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 DISCLOSURE

This Chapter describes the process and results of public consultations as required in the national and Bank environmental safeguard policies. It describes feedback and options received from each ward or commune-based consultation and evidence of broad community support for the subproject investments. It provides sample pictures of public consultation meetings. The Chapter also summarizes responses and commitments of the subproject owner in complying with the environmental and social mitigation measures and information disclosure.

7.1. PUBLIC CONSULTATION PROCESS

Public consultation is used to help identify opportunities and risks, improved subproject design and implementation, and increase subproject ownership and sustainability. Public consultation is specifically required by the World Bank's environmental and social safeguard policies. A meaningful public consultation was used for the subproject. This is a two-way process in which beneficiaries provide advice and input on the design of the proposed subproject that affect their lives and environment, promotes dialogue between governments, communities, NGOs and implementing agencies to discuss all aspects of the proposed subproject. The feedbacks from consultation will be incorporated into the subproject ESIA and design.

Those affected by the subproject include those resettled and those in the nearby communities affected by subproject impacts, intended beneficiaries of the subproject, key interest groups – depends upon the subproject, local NGOs/Mass organizations, including women's unions, local authorities and other stakeholders.

Public consultation in preparation of the subproject ESIA also must comply with the requirements in the Government's Decree No. 18/2015/ND-CP dated 14 February 2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan, and Circular No. 27/2015/TT-BTNMT dated 29 May 2015 of the Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment and environmental protection plan.

The objectives of public consultation were as follows:

- To share all information on the items and tentative activities of the Subproject with local community and stakeholders;
- To gather opinions, comments, and concerns from local authorities and the community on local particularities and environmentally sensitive matters, especially matters that the environmental and social impact assessment 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 and 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 and social impacts and propose the most effective and feasible mitigation measures.

Information disclosure and public consultations are conducted during the subproject preparation and implementation processes to ensure that affected households and key stakeholders are timely informed about land acquisition, compensation and resettlement. This is also an opportunity for the affected people to participate and express their opinions with regards to resettlement implementation programs. The ESIA preparation was done in coordination with the representatives of the DPCs, Town PC and CPCs in the subproject area, and leaders of the villages organizes public meetings and consultations in order to inform and guide about the next steps in a timely manner.

Organizations and individuals concerned about land acquisition and impacts and resettlement had and will take part of the public meetings and consultations. Representatives of mass organizations in the subproject that area attended the meetings and consultations included the Vietnam Women's Union, and Fatherland Front and Vietnam. Key topics covered in the public consultations are as followings:

i. Disseminate key information related to policies of the World Bank, the Government and the subprojects.

ii. Provide locals with subproject on resettlement, environment, gender as well as ethnic minority issues through village loudspeaker system and subproject information brochures/leaflets;

iii. Collect opinions and feedback of the local communities regarding the subproject implementation;

iv. In the community consultation, needs to introduce and public all information of subproject and WB's safeguard policies, collect opinions and comments of the residents on design and resettlement options as well as their aspirations and expectations are recorded;

v. Respond questions to local communities concerning the subproject and safeguard policies;

vi. CPCs and PMU provided answers to questions to local residents related to subproject and local policies;

vii. Local communities, representatives of the CPC's and other stakeholders' contributions

This is a Category A subproject, thus according to WB's requirements, consultation is implemented into two different rounds during environmental and social impact assessment process.

The public consultation was carried out with local communities and authorities at project area including 8 wards/commune including. 1, 2, 3, 5, 7, 8, Nha Mat Ward and Hiep Thanh commune. The first consultation was conducted from from 17-29 July 2016, which provide informations on the projects investmens and scope of ESIA process, and the anticipated potential impact. The second consultation was conducted from 26-29 October 2016 on the first draft of the ESIA. Public consultations were conducted through questionairs and public consultation meetings. The public consultation meetings were held at the Ward/Commune PC.

15 days prior to each public consultation, the consultant informed the local authority about the proposed investments and cooperated with the local authority to invite the affected people and representatives of the affected HHs to attend public consultation meetings. 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. 63 participants attended the first consultation and 301 participants attended the second consultations. The results of the two public consultation meetings are described in the following Table 7.1 and 7.2.

7.2. RESULTS OF PUBLIC CONSUTATION

Table 7.1: Summary of result of the 1st public consultation results

No.	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
1	Ward 1 28/07/2016	Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Farmer Association, Women's Union: 11	- Xang canal is frequently flooded during rainy season because of damaged, degraded sewage system. - The compensating reservoir in residential areas and some road sections in the ward is flooded in rainy season, and domestic wastewater is directly discharged into receiving bodies. - Huong Lo 6 currently does not have water drainage system, causing flooding in rainy season. - Residents request to arrange waste gathering locations in residential areas. - Replacement, land clearance and resettlement should be transparently implemented. - Measures to avoid subsidence during embankment construction must be carried out. - Ensure labor safety during construction, traffic safety during transportation.	The project owner acknowledges these comments and will implement specific assessment on local situation in order to come up with proper and effective design, construction and policies as well as measures.
2	Ward 2 28/07/2016	Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Farmer Association, Women's Union: 8	- Water supply system has not been installed in the project implementation area. Therefore, households use well water for their daily domestic activities. - Flooding usually occurs during rainy season, causing unsanitary environment. - Some households do not have proper sanitary toilets due to economic difficulties. - Material transport vehicles need to be covered and comply with the traffic law. During construction, measures to prevent flooding should be implemented in order to avoid effects on residents. - Ensure labor safety during construction; implement measures to treat domestic waste, hazardous waste caused by construction activities. - Implement mitigation measures as shown in the environmental	The project owner acknowledges these comments and will incorporate them into environmental impact assessment activities, resettlement programs and come up with proper mitigation measures.

No.	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
			impact assessment report. - Compensation, land clearance and resettlement should be implemented in the way that ensures both community benefits and personal benefits, facilitating relocated households to stabilize their lives.	
3	Ward 3 28/07/2016	Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Farmer Association, Women's Union: 10	- The project implementation area is frequently flooded during rainy season. - Replacement, land clearance and resettlement should be transparently implemented. - Material transport vehicles need to be covered and comply with the traffic law. During construction, measures to prevent flooding should be implemented in order to avoid effects on residents. - Ensure labor safety during construction; implement measures to treat domestic waste, hazardous waste caused by construction activities. - Implement mitigation measures as shown in the environmental impact assessment report. - The project should dredge and maintain sewage system in the area.	The project owner acknowledges and will assess as well as incorporate them into design solutions and during the project implementation and will minimize impacts on residents in the project area.
4	Ward 5 29/07/2016	Representatives People's Committee, the Veterans Association, Senior citizen, the Vietnam Fatherland Front, Women's Union: 5	- Along Lo Ren road, residents use well water; domestic water is directly discharged into surrounding canals. The expected construction area is frequently flooded during rainy season. Some sections are degraded, and lighting system has not been invested synchronously. - Compensation, land clearance and resettlement should be implemented in the way that ensures both community benefits and personal benefits, facilitating relocated households to stabilize their lives. - Material transport vehicles need to be covered and comply with the traffic law. During construction, measures to prevent flooding should be implemented in order to avoid effects on residents.	The project owner acknowledges these comments and will implement specific assessment on local situation in order to come up with proper and effective design, construction solutions and policies as well as ensure good progress so that residents can stabilize their lives soon.

No.	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
			- Ensure labor safety during construction; implement measures to treat domestic waste, hazardous waste caused by construction activities. - Implement mitigation measures as shown in the environmental impact assessment report.	
5	Ward 7 28/07/2016	Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Farmer Association, Women's Union: 11	- Internal Western road sections of Nguyen Dinh Chieu road are currently still flooded in rainy season. For Tra Kha canal, residents directly discharge domestic wastewater and garbage into the canal, causing environmental pollution. - Compensation, land clearance and resettlement should be implemented in the way that ensures both community benefits and personal benefits, facilitating relocated households to stabilize their lives. - Material transport vehicles need to be covered and comply with the traffic law. Measures of fire fighting and prevention and measures to ensure security and order must be carried out at construction sites. - Ensure labor safety during construction; implement measures to treat domestic waste, hazardous waste caused by construction activities. - Implement mitigation measures as shown in the environmental impact assessment report.	The project owner acknowledges and will assess as well as incorporate them into design, construction solutions in order to minimize impacts on residents in the project area.
6	Ward 8 29/07/2016	Representatives People's Committee, the Veterans Association, Senior citizen, the Vietnam Fatherland Front, Farmer Association, Women's Union: 7	- Tra Kha canal is currently seriously polluted. Stinking smell seriously affects health and lives of residents in the area. - Ensure labor safety during construction; implement measures to treat domestic waste, hazardous waste caused by construction activities.	The project owner acknowledges these comments and will implement specific assessment on local situation in order to come up with proper and effective design, construction solutions and policies in order to minimize impacts on residents in the project area. Ensure good project progress and comply with regulations of the

No.	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
				law.
7	Nha Mat Ward 23/8/2016	Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Farmer Association, Women's Union: 11	- Ensure labor safety during construction; implement measures to treat domestic waste, hazardous waste caused by construction activities. - Implement mitigation measures as shown in the environmental impact assessment report.	The project acknowledges these comments and will implement specific assessment on local situation in order to come up with proper and effective design, construction solutions to ensure quality and progress of the project.
8	Hiep Thanh commune 17/8/2016		- At present, Lo Ren road has not had domestic waste collection unit, and rain water drainage system has not been invested, leading to flooding situation in rainy season. Domestic wastewater and solid matters are directly discharged into the canal along the road. - Ensure labor safety during construction; implement measures to treat domestic waste, hazardous waste caused by construction activities. Closely cooperate with the locality. - Material transport vehicles need to be covered and comply with the traffic law. Measures of fire fighting and prevention and measures to ensure security and order must be carried out at construction sites. - Compensation, land clearance and resettlement should be implemented in the way that ensures both community benefits and personal benefits, facilitating relocated households to stabilize their lives. - Implement mitigation measures as shown in the environmental impact assessment report.	The project acknowledges these comments and will implement specific assessment on local situation in order to come up with proper and effective design, construction solutions to ensure quality and progress of the project.

Table 7.2: Summary of result of the 2nd public consultation results

No.	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
1.	Ward 1 27/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 6 - Affectec households: 45	- Unify the content in the report of environmental impact assessment of the project. - Notice people on compensation plans as soon as possible. - Avoid material gathering along the route affecting regional traffic. - Transparency in the relocation, clearance and resettlement. - Perform electrical work safety and fire protection to avoid affecting the residentials - During the construction of embankments, there must be measures to avoid subsidence. - Ensure the safety of construction workers and traffic safety during transport.	- Comply with the committed contents - Organize meetings and notify the details about the project to the people when the project is approved
2.	Ward 2 28/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 5 - Affectec households: 38	- The compensation for clearance and resettlement should harmonize the community and individual interests, and create conditions for relocated households to stabilize their lives. - Use rolling method to avoid prolonging the construction - Spray water to avoid dust generation during construction - Ensure the safety of construction workers; take measures to handle household waste and hazardous waste generated during construction. - Materials transport vehicles are required to be screened and comply with the traffic law. During the construction process, measures must be taken to combat flooding affecting residents in the region	Comply with the committed contents Consider the contriubuted ideas of the residents
3.	Ward 3 26/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam	- Disclosure of information about the project, provide the appropriate policy - Materials transport trucks must be fully covered to prevent material spillage, affecting sanitation	The commitments of residents are focused, the mitigation measures must be fully implemented as committed

No.	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
		Fatherland Front, Women's Union: 8 - Affectec households: 20	- Implement the project quickly - The compensation must be clear and timely implemented to stabilize the lives of residents.	
4.	Ward 5 30/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 3 - Affectec households: 36	- Those affected must be supported and provided information. - Publication of detailed implementation schedule for the community to know. - The vehicles must be checked and not driving beyond the speed limit allows.Materials transport trucks must be fully covered to prevent material spillage, affecting sanitation Issues of generated dust and emissions are included in the ESIA and mitigation measures will be applied. - Strict management of workers to avoid insecurities. - Avoid construction on the rest time of the residents. - Implement the mitigation measures as undertaken in the EIA report content.	Issues of generated dust and emissions are included in the ESIA and mitigation measures will be applied.
5.	Ward 7 29/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 6 - Affectec households: 36	- There should be policies to support and publicize information to households affected if the project is about to last - Materials transport vehicles are required to be screened and comply with the traffic law. During the construction process, measures must be taken to combat flooding affecting residents in the region - Pay attention to the construction piling, avoid affecting the lives of residents - Check and record the condition before the construction works as a basis for compensation.	- Publication of detailed implementation schedule of the project in each location before the construction - The commitments are in the ESIA report
6.	Ward 8 28/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's	- The mosquitoes will grow while dredging, there needs to be sanitation teams to prevent disease and to spray sanitizer for disease reduction. - Arrange hygiene team to prevent the disease and spray sanitizer to prevent the spread of disease when dredging	The commitments are in the ESIA report and construction package

No.	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
		Union: 4 - Affectec households: 21	- Make sure that domestic wastewater of workers do not emit into the environment, affecting people in the region	
7.	Nha Mat Ward 27/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 3 - Affectec households: 43	- Avoid delaying the project - Provide specific and clear schedules and plans - Seriously implement the commitments - Take measures to mitigate the impact on aquaculture activities of the locals.	The commitments of residents are focused, the mitigation measures must be fully implemented as committed
8.	Hiep Thanh Commune 29/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Farmer Association, Women's Union: 4 - Affectec households: 34.	- Upgrade the water supply canals serving aquaculture. - Take measures to mitigate the impact on aquaculture activities of the locals. - When there is neccessary relocation, arrange the resettlement sites with adequate infrastructure to ensure the lives of the people.	On procedures for construction and repair of buildings, people can contact the People's Committee wards for guidance on prescribed procedures.

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 Committeesof 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 Bac Lieu City People's Committee and the People's Committees of subproject wards and communes on January 7, 2017. The draft ESIA report allows local people to further access the subproject information and contribute their opinions/comments on environmental and social concerns to the subproject owner. The draft ESIA was also disclosed in the World Bank's Operations Portal on January 10, 2017.

CHAPTER 8. CONCLUSIONS, RECOMMENDATIONS AND COMMITTMENTS

8.1. CONCLUSIONS

The "Viet Nam ***Scaling Up Urban Upgrading Project (SUUP) - Bac Lieu 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. Bac Lieu project will help to improve the city's drainage conditions, local flooding and environmental conditions, contributing to the sustainable growth of the city.

The ESIA report complies with the current environmental impact assessment requirements stipulated by the Vietnamese Government and WB's safeguard policies. The report will be one of the key documents to be submitted to State management agencies in charge of the environment to determine the location and scope of the work as a basis for applying for an investment license. In addition, this is also an important document fpr the project appraisal and in the negotiation and signing of the loan agreement between the Government of Vietnam and the World Bank.

Environmental impacts:

The environmental impacts were assessed with support from the baseline and statistical data as well as experiences from similar projects-assisted by the World Bank. The impacts are relatively quantified as best as they can be for three stages of project's preparation, construction and operation. It will be further assessed and adjusted during the project implementation in order to mitigate the negative impacts and enhance the positive ones.

The positive impacts of the project include improvement of water supply and drainage and other basic infrastructures in LIAs, mitigation of local flooding, better connectivity within and out of the city and enhancement of climate resilience. The embankment of Cau Xang canal will help to address the drainage, environmental pollution and local encroachment and will create more green spaces for the city.

Most of the impacts during the pre-construction and construction stages are temporary and short-term, taking place in areas around construction sites or on transport routes and at disposal sites. The main impacts during the site preparation relate to the acquisition of land affecting residential land, agriculture land and small areas around fences of some religious facilities and local residents. In the construction phase, impacts from dust, vibration and noise as well as issues of social security and occupational safety are much likely to arise. In addition, the transportation and disposal of dredging sludge will also be an area of concern. However, these can be limited or mitigated to the lowest levels by the implementation of the ESMP.

Subproject construction operations might cause a number of negative impacts on the social life of residents in the Subproject area, by bringing about changes in their living conditions and disturb their daily routines as well as production and economy. Emerging issues might include increase in air pollution and traffic accidents, land subsidence or breakdown of drainage or road system, accumulation of sediments and sludge at manholes or canals among others. Nevertheless, these impacts are short-term and can be mitigated.

Mitigation measures:

Measures to control pollution and limit adverse impacts on environment in the construction and operation phases proposed and recommended in this report. Besides the application of appropriate managerial and technical measures, awareness raising and behavior change communication to local people should be paid attention to help maintain the good environment.

All the measures are proven to be feasible and able to meet Vietnamese environmental standards.

The environmental monitoring program will be carried out as soon as the State's approval and the license of subproject construction and operation have been obtained. Monitoring data will be stored and serve as a legal basis for compliance with the Environmental Protection Law of Vietnam as well as the environmental safeguard policies of World Bank. These data will also serve the evaluation of the effectiveness and environmental sustainability of the project.

An environmental and social management plan (ESMP) is to ensure the management, monitoring, reporting, preparation and adjustment of measures to avoid and minimize environmental pollution during project implementation. The project owner, contractors and project management unit will be responsible for implementing this ESMP in cooperation with local state management agencies and authorities.

Two rounds of participatory public consultations were conducted to share the project contents, potential environmental impacts and mitigation measures to local residents and concerned stakeholders. So far, the project has been receiving great support from the local communities and authorities.

8.2. RECOMMENDATION

This is an environmentally significant project, contributing to the sustainable growth of Bac Lieu City and in particularly helping Bac Lieu to achieve several key targets for becoming the class III city by 2020. Therefore, the Owner would like to propose for DONRE's appraisal and approval of the ESIA report of the project as well as WB's approval for timely and prompt deployment of the project.

During the Project implementation, the Project PMU/ Project owner would seek the participation, coordination, support and constructive comments from line departments and local authorities in carrying out the environmental protection efficiently. In particular, the Project would like DONRE to provide capacity support for PMU staff and related operational workers in the areas of environmental compliances and environmental management and awareness raising and communication on environmental protection to local people.

In order to ensure the synergy between this project and other investments of the city, PMU would like to urge the Provincial Committee (PC) to accelerate the implementation and operation of the proposed waste and wastewater treatment facilities so that the project can connect into.

8.3. COMMITMENT OF IMPLEMENTATION

During the operation of the project, the Owner commits to carrying out seriously the regulations of Vietnam's environmental protection laws, including: the Law on Environmental Protection No.55/2014/QH13 passed by the National Assembly of the Socialist Republic of Vietnam dated 23 June, 2014; Decree No.80/2014/ND-CP dated 6 August, 2014 by the Government on drainage and wastewater treatment; Decree No.19/2015/ND-CP dated 14 February, 2015 by the Government detailing the implementation of some Articles of the Law on Environmental Protection; Decree No.18/2015/ND-CP dated 01 April, 2015 by the Government on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan; Circular No.27/2015/TT-BTNMT dated 29 May, 2015 by MONRE on strategic environmental assessment, environmental impact assessment and environmental protection plan, and other relevant documents. The Owner also commits to complying with WB's environmental safeguard policies.

In addition, the Client commits to carrying out environmental protection and mitigation measures as mentioned in Chapters 5 and 6. The Client commits to fulfilling commitments towards the communities specified in Chapter 7. The Owner also commits to make compensation and overcoming environmental pollution once environmental incidents and risks

occur during the implementation of the project and taking steps of environmental recovery in accordance with to legal regulations on environmental protection when subproject operation has been completed.

APPENDIX 1 - BAC LIEU DREDGED MATERIALS MANAGEMENT PLAN

1.1. Location of Dredging, Volume and Characteristics of Dredged Materials

Dredging of small cannal round LIA 02: The volume of dredging sediment estimated about 260 m^3.

Upgrading and dredging of Cau Xang canal: The volume of dredging sediment estimated about 96,000 m^3.

1.2. Final Disposal Site

According to the analyses, the sediments from the canals dredged work are not hazardous, with the levels of heavy metals. However, it has high amount of organic compounds and pathogenic microbial (e.g. *Ecoli*) thus should not be used directly for used for agricultural purpose. This could rather be drained out and kept at least 03 months so as to remove the microbial and partial decomposition of organic compounds. The sediments could then be used for perennial crops or planting tree for urban landscape purpose, based on the actual needs of local people. Otherwise, it will be transported and disposed at Sediment 4 / Trang An dump.

The disposal site – Sediment 4 / Trang An dump located on Highway 1A, Bac Lieu City is away approximately 7 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.

1.3. Contractor's Dredging Management Plan

The Contractor is required to prepare a Contractor's Dredging Management Plan (CDMP) and submitted to the Environmental Consultant of the Construction Supervision team and the PMU Environmental Officer for review and approval. The CDMP will include, but not limited to the followings:

1) The Scope of Works in the Contract package, construction method and schedule;
2) Volume and quality of water quality and sediment quality in the dredging area covered by the contract;
3) Water users that may be affected by the dredging and embankment lining;
4) Materials uploading and transportation method: indicate proposed route of the transport from the dredged site to the disposal area, time of operation, type of vehicles/trucks and proposed measures to reduce the leakage of the dredged materials from the transport trucks;
5) Schedule to inform the nearby communities about the project, disclosure of name and contact number for possible complaints;
6) Potential social and environmental impacts, including the site-specific impacts and risks;
7) Mitigation measures to address the potential impacts and risks. The mitigation measures should be proposed based on ESIA/ECOP, ESMP, SEMP, the potential impacts and mitigation measures presented in Section 4 and 5 of this Plan and the following requirements;
8) Environmental Quality Monitoring plan carried out by the contractor (particularly pH, DO, TSS, BOD, salinity etc. for water and heavy metals including pH, Hg, As, Cd, Cu, Pb, Zn and Cr, Organic Materials and Mineral Oils for sediments and soil;

9) For soil and sediment: The number of samples taken will follow the following guidelines.

The number of Sediment samples

Volume of dredged (m^3)	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.

1.4. Potential Impacts and Mitigation Measures for Dredging and Embankment lining

Potential Impacts and Mitigation Measures

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. Exposure to odour pollution affect the health of workers, local residents and cause public nuisance.	- 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; - Load the materials on-site tidily; - Do not load the materials temporarily outside the construction corridor determined for each canal section; - Avoid loading the sediment in populated residential areas or near public buildings such as kindergarten. Load the sludge as far from the houses and buildings as far as possible; - Cover the temporary sediment loads when

Impacts and Description	Mitigation Measures
	loading near sensitive receptors or longer than 48 hours unavoidable.
Dust and nuisance - Temporary loading of sediment 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 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.	- During field survey for the preparation of CDMP, the contractor in coordination with the Environmental Officer of PMU and the Environmental Consultant of the CES identify weak structures that may be at risk and determine appropriate mitigation measures accordingly; - 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.

Impacts and Description	Mitigation Measures
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 sediment; - 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; - 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 45^{o}; - 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

Impacts and Description	Mitigation Measures
	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.

1.5. Specific Guidance for Dredging at Cau Xang canal

- 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: 2 m, Footing width: 5 m, and Surface width: 1 m. 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.