

**PEOPLE'S COMMITTEE OF BEN TRE PROVINCE  
PEOPLE'S COMMITTEE OF BEN TRE CITY**

**THE VIETNAM SCALING UP URBAN UPGRADING PROJECT  
SUBPROJECT OF BEN TRE CITY, BEN TRE PROVINCE**

*(Final)*

**ENVIRONMENTAL  
AND SOCIAL IMPACT ASSESSMENT**

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# **ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT**

*( Final)*

## **THE VIET NAM SCALING UP URBAN UPGRADING PROJECT SUBPROJECT OF BEN TRE CITY, BEN TRE PROVINCE**

**PROJECT OWNER  
PEOPLE COMMITTEE OF  
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## ABBREVIATION AND ACRONYMS

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

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

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

### **1.1.1. General Background of the Viet Nam 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<sup>2</sup>, with 17.5 million people accounting for about 20 % of the country's population. VMD 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 VMD 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 VMD 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 VMD (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-sectorial 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. Laws 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 on 18/06/2012;
- Urban Planning Law No. 30/2009/QH12 passed by the National Assembly of the Socialist Republic of Vietnam on 6/17/2009;
- Biodiversity Law No. 20/2008/QH12 passed by the National Assembly of the Socialist Republic of Vietnam 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 on 11/22/2013;
- Law on Protection of People's Health 21/ LCT/HDNN ratified by the National Assembly of the Socialist Republic of Vietnam, adopted on 30/06/1989;
- Decree No. 59/2015/ND-CP dated 18 June 2015 of the Government on construction project management;



- Decree No.18/2015/ND-CP dated 14 February 2015 of the Government on promulgating environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan;
- Decree No. 19/2015/ND-CP dated 14 February 2015 of the Government detailing the implementation of some articles of the Law on Environmental Protection;
- Decree No. 38/2015/ND-CP dated 24 April 2015 of the Government on management of waste and scap materials;
- Decree No. 43/2014/ND-CP dated 15 May 2014 of the Government detailing the implementation of some articles of the Land Law;
- Decree No. 44/2014/ND-CP dated 15 May 2014 of the Government regulating on land prices;
- Decree No. 45/2014/ND-CP dated 05/15/2014 of the Government regulating on collection of land use fees;
- Decree No. 47/2014/ND-CP dated 15 May 2014 of the Government regulating compensation, support and resettlement upon land acquisition by the State;
- Decree No. 80/2014/ND-CP dated 06 August 2014 of the Government regulating on drainage, and wastewater treatment;
- Decree No. 179/2013/ND-CP dated 11/14/2013 of the Government regulating on sanctioning of administrative violations in the field of environmental protection;
- Decree No. 25/2013/ND-CP dated 29 March 2013 of the Government regulating on charges of environmental protection for wastewater;
- Decree No. 147/2007/ND-CP dated 29 November 2007 of the Government regulating on charges of environmental protection for solid waste;
- Decree No. 59/2007/ND-CP dated 09 April 2007 of the Government regulating on solid waste management;
- Decree No. 149/2004/ND-CP dated 07/27/2004 regulating on the exploitation and use of water resources, discharging wastewater into receiving water bodies;
- Circular No. 27/2015/TT-BTNMT dated 29 May 2015 of the Ministry of Natural Resources and Environment (MONRE) on strategic environmental assessment, environmental impact assessment and environmental protection plan;
- Circular No. 36/2015/TT-BTNMT dated 30 June 2015 of MONRE on hazardous waste management;
- Circular No. 32/2013/TT-BTNMT dated 25 October 2013 of MONRE 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 MONRE on the assessment of capacity to receive wastewater of water sources;

***b. Vietnam's Applicable Standards and Regulations***

During the preparation of this ESIA, the following Vietnam's technical regulations on environment quality 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 identification 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;
- Pursuant to the Letter No. .../UBND dated..... 2016 of Ben Tre Provincial People's Committee on appointing Ben Tre Department of Construction to be the Project Owner.

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

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

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

The ESIA is carried out in compliance with the World Bank Environmental and Social Safeguard Policies. According to the Bank Operational Policy on Environmental Assessment OP/BP 4.01 (<http://go.worldbank.org/OSARUT0MP0>), this subproject is classified as a Category A subproject due to its significant impacts related to land acquisition and resettlement issues. Therefore, as per the Bank policy, a full ESIA is required to examine the subproject's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental

performance. The negative impacts will be mitigated by the application of comprehensive mitigation measures that indicated in the Environmental and Social Management Plan (ESMP) of the Sub-project, including monitoring plan and the requirements of health and safety for construction workers. The implementation of the ESMP will be a requirement for contractors during subproject implementation.

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

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

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

- World Bank-financed projects should also take into account the World Bank Group Environmental, Health, and Safety Guidelines (known as the "EHS Guidelines"). The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice.
- The EHS Guidelines contain the performance levels and measures that are normally acceptable to the World Bank Group and are generally considered to be achievable in new facilities at reasonable costs by existing technology. The environmental assessment process may recommend alternative (higher or lower) levels or measures, which, if acceptable to the World Bank, become project- or site-specific requirements. This subproject should conform to the general EHS Guidelines and industry specific EHS Guidelines on Water and Sanitation.

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

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

<sup>2</sup>Detailed description of OP/BP 4.12 is available at the Bank

website:<http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543978~menuPK:1286647~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html>

<sup>3</sup>Full description of OP/BP 4.04 is available at

<http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543920~menuPK:1286576~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html>

<sup>4</sup> OP/BP 4.11 is accessible at

<http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543961~menuPK:1286639~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html>

<sup>5</sup> OP/BP 7.50 is accessible at

<http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20544007~menuPK:1286706~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html>

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

### 1.3. DESCRIPTION OF BEN TRE SUBPROJECT

In recent years, the authority of Ben Tre city has tried to construct a complete technical infrastructure system for improving urban traffic conditions as well as promoting Ben Tre city to become 2<sup>nd</sup> urban category (Type II) in 2020. Given with existing Dong Khoi Avenue and urban-oriented expansion towards Eastern and Western side of the city, traffic intersections of Dong Khoi Avenue were completed. However, the city's authority has not completed the infrastructure system yet to promote urban development and land resource because of funding limitation. This caused a delay of development and a profound effect on the city's targets.

In addition, Ben Tre city also paid attention to the conditions of drainage and sanitation in residential areas. Environmental pollution in main urban drainage canals were improved through mobilizing people living along the canals to set bar screen for dumped garbage to keep the canals clean and to enjoy fresh air, and resetting urban landscape. However, pollution conditions in some canal sections were relapsed. Domestic wastes and wastewater from households were discharged directly into the canals that made water becomes black and with stinking odor, etc. This exacerbated urban landscape, polluted canal water seriously and affected the drainage capability.

It is a fact that the city has encountered the reality of restrictions on urban technical infrastructure and environmental sanitation service, including: incomplete infrastructure systems because of so long time investment, the lack of connection of main arterial roads, the degradation of the canal embankment systems, the malfunction of urban drainage systems in terms of waterlogging and flooding reduction, inadequate technical infrastructure in poor residential areas; and the recent severe impacts of floods and droughts due to global climate change in particularly. All these agglomerative challenges have influenced the living conditions of urban dwellers. Therefore, in order to enable Ben Tre city to become one of the regional centers, the investment of the project "*Viet Nam Scaling up Urban Upgrading Project – The Ben Tre city Sub-project*", is entirely appropriate to the scheme of Vietnam urban development in general and the Mekong Delta region in particular. The Subproject will contribute greatly to the development of the city and help the city's authority to achieve urban development goals in the future.

#### 1.3.1. Subproject location

Ben Tre City is one of 9 administrative authorities and is an economic, cultural and social center of Ben Tre Province. Ben Tre City is located in the center of the province, within the area of Cu Lao Bao, influenced by the tidal regime of the Ben Tre River and a part of Ham Luong River.

Ben Tre City distance to Ho Chi Minh City about 87 km along National Highway 1A - Highway 60 and distance to Can Tho city about 121 km along Highway 60 - Highway 57. If the route of Ho Chi Minh City - Tra Vinh crosses Co Chien Bridge is complete, that helps to eliminate geographical separation, create favorable conditions for the city to promote the intermediate role as exchanging goods between the inside and outside districts of the province.

Regarding to administrative geographical boundaries, Ben Tre city is bordered on the following sides:

- In the North and West: bordering Chau Thanh District, Ben Tre Province;
- In the East and South East: bordering Giong Trom District, Ben Tre Province;
- In the South and South West: bordering Mo Cay Bac District, Ben Tre Province with natural boundary is Ham Luong River.

The natural area of Ben Tre city is 6,748.78 ha (about 67.5 km<sup>2</sup>), accounting for approximately 2.9 % of the total provincial area, with 16 administrative municipalities, including: 10 wards (1, 2, 3, 4, 5, 6, 7, 8, Phu Khuong, Phu Tan) and 6 communes (Son Dong, Phu Nhuan, My Thanh



An, Thanh Nhon, Phu Hung and Binh Phu). The proposed subproject components are expected to be implemented in 8 wards: 1, 3, 4, 5, 6, 8, Phu Khuong, Phu Tan and a part of Phu Hung commune, Ben Tre city.

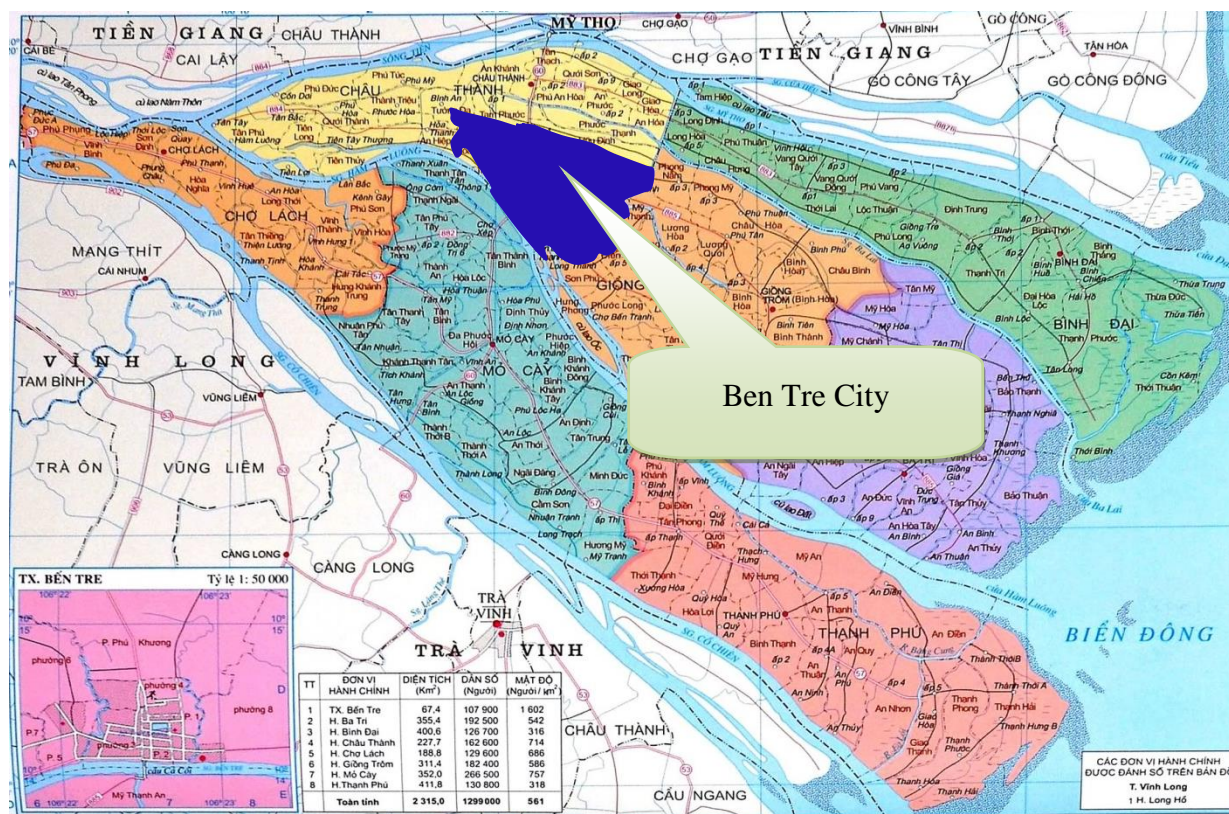


Figure 1.1: Location of Ben Tre city in the Mekong Delta Region

### 1.3.2. Detailed Description of Ben Tre sub-project 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 categories of Ben Tre projects

No.	Investment category	Description
1	Component 1	<b>Upgrading tertiary infrastructure in 4 LIAs (1, 2, 6, and 7) with a total area of 118.15 ha and 5,000 people</b>
	Upgrading tertiary infrastructure in LIAs 1, 2, 6, and 7	<b>The investment categories include:</b> <ul style="list-style-type: none"> <li>- Enlarging major alleys into concrete alleys of at least 3 - 4 m in width with a total length of 1.58 km;</li> <li>- Upgrading and rehabilitating existing 2-3 m branch alleys into concrete alleys with a total length of 10.18 km;</li> <li>- Constructing a stormwater drainage system of D400 – D800 steel-reinforced concrete sewers with a total length of 7.16 km;</li> <li>- Constructing a wastewater collection system of 220 UPVC pipes with a total length of 8.95 km;</li> <li>- Installing a water supply pipeline of D63-D100 with a total length of 10.74 km;</li> <li>- Dredging small canals in LIAs to depths of 0.2.-0.3 m with a total length</li> </ul>

No.	Investment category	Description
		<ul style="list-style-type: none"> <li>of 2.97 km; building 5.7 km of upright riprap embankments;</li> <li>- Provision lighting and waste bins.</li> </ul>
2	Component 2	<b>Upgrading and constructing streets linking to LIAs; upgrading and rehabilitating channels in inner-city areas</b>
2.1	Rehabilitating Chin Te Canal	<p><b>The investment categories include:</b></p> <ul style="list-style-type: none"> <li>- Dredging the Canal from its existing depth of 1.5 m to a designed depth of 2.0 m within the existing width of 3 – 4 m, with a dredging length of 2.5 km;</li> <li>- Building embankments on both sides of the Canal with a total length of 4.8 km: embankments of upright riprap structure with walls 1.5 m high and 0.3 – 0.75 m thick; embankment base of 1.35 m wide and 0.5 m thick; 1.0 m-wide green space on embankments;</li> <li>- Building 3m-wide concrete operational roads on both embankments: 2.25 km on the left side of the embankment route from Km0+00 to Km1+566.78 and from Km1+793.35 to Km2+476.87; 0.13 km on the right from Km1+664.50 to Km1+793.35;</li> </ul> <p>Building a drainage system for the operational roads, consisting of a stormwater drainage system of D400 steel-reinforced concrete pipes with a length of 1.88 km; and a wastewater collection system of D200 UPVC pipes with a length of 1.5 km.</p>
2.2	Constructing Ngo Quyen Street Extension	<p><b>The investment categories include:</b></p> <ul style="list-style-type: none"> <li>- Constructing Ngo Quyen Street into an asphalt concrete street with a total length of 1.61 km and a width of 18 – 20.5 m;</li> <li>- Building a drainage system, consisting of: <ul style="list-style-type: none"> <li>▪ A stormwater drainage system of D600 pipes on both sidewalks with a total length of 3.22 km;</li> <li>▪ A wastewater collection system of 220 UPVC pipes with a total length of 3.22 km;</li> </ul> </li> <li>- Provision of lighting and tree planting along the road.</li> </ul>
2.3	Constructing linking branch roads	<p><b><u>N6 Street</u></b></p> <ul style="list-style-type: none"> <li>- Constructing new asphalt concrete N6 Street with a length of 1.31 km and a width of 17 m;</li> <li>- Building 03 box culverts along the street: 01 culvert of 19 m in length, 2 m in height and 3 m in width at the intersection with 30/4 Canal (Km0+292.88), and 02 culverts of 19 m in length, 2 m in height and 2 m in width in the intersection with Chin Te Canal (Km0+665.83);</li> <li>- Building a separate drainage system, consisting of: (i) a stormwater drainage system of D600 steel-reinforced concrete pipes on both sidewalks with a total length of 2.62 km; and (ii) a wastewater collection system of 220 UPVC pipes with a total length of 0.76 km;</li> <li>- Provision of lighting and tree planting along the road.</li> </ul> <p><b><u>N18 Street</u></b></p> <ul style="list-style-type: none"> <li>- Constructing new asphalt concrete N18 Street with a length of 1.32 km and a width of 24 m;</li> <li>- Building 02 box culverts along the street 28 m in length, 2 m in width and 2 m in height at the intersection with Chin Te Canal (Km0+683.65);</li> <li>- Building a drainage system, consisting of: (i) a stormwater drainage system of D600 steel-reinforced concrete pipes on both sidewalks with a total length of 2.64 km; and (ii) a wastewater collection system of 220 UPVC pipes with a total length of 0.92 km;</li> </ul> <p>Provision of lighting and tree planting along the road.</p>
2.4	Constructing	<b>The investment categories include:</b>

No.	Investment category	Description
	Dong-Tay Avenue	<ul style="list-style-type: none"> <li>- Constructing the new Dong-Tay Avenue, an asphalt concrete road 41 m wide (road surface of 25 m wide and pavements of 2x8 m) and 2.15 km long;</li> <li>- Constructing 3 small concrete bridges on the avenue intersecting with Ca Loc Channel at: (i) Km0+717.5: bridge 18 m long, 28 m wide; (ii) Km1+443.5: bridge 15 m long, 28 m wide; and (iii) Km1+997.15: bridge 33 m long, 28 m wide;</li> <li>- Building a drainage system along the avenue, consisting of: (i) a stormwater drainage system of D600 steel-reinforced concrete pipes on both sidewalks with a total length of 4.3 km; and (ii) a wastewater collection system of 220 UPVC pipes with a total length of 1.6 km;</li> <li>- Provision of lighting and tree planting along the road.</li> </ul>
2.5	Rehabilitating 30/4 Canal	<p><b>The investment categories include:</b></p> <ul style="list-style-type: none"> <li>- Dredging the Canal from its existing depth of 1.2 m to a depth of 1.7 m, within the existing width of 3 - 4m and with a dredging length of 0.7 km;</li> <li>- Building embankments on both sides of the Canal: upright riprap structure with walls 1.2 m high and 0.3-0.6 m thick; embankment base of 1.26 m wide and 0.5 m thick; 1.5 m-wide green space on embankments;</li> <li>- Building 3 m-wide concrete operational roads on both sides: 0.48 km on the right side from Km0+00 to Km0+477.37; and 0.22 km on the left side from Km0+477.37 to Km0+692.08;</li> <li>- Building a drainage system for the operational roads, consisting of a stormwater drainage system of D400 steel-reinforced concrete pipes, with a length of 1.26 km; and a wastewater collection system of D200 UPVC pipes with a length of 1.0 km.</li> </ul>
3	<b>Component 3</b>	<b>Resettlement site</b>
	Resettlement site (already developed in Phu Tan Ward)	<ul style="list-style-type: none"> <li>- 5.4 ha resettlement site with internal road system and water supply &amp; drainage system already in place;</li> <li>- The Project will purchase ground plots available in the Resettlement Site to relocate HHs displaced by the Project.</li> </ul>



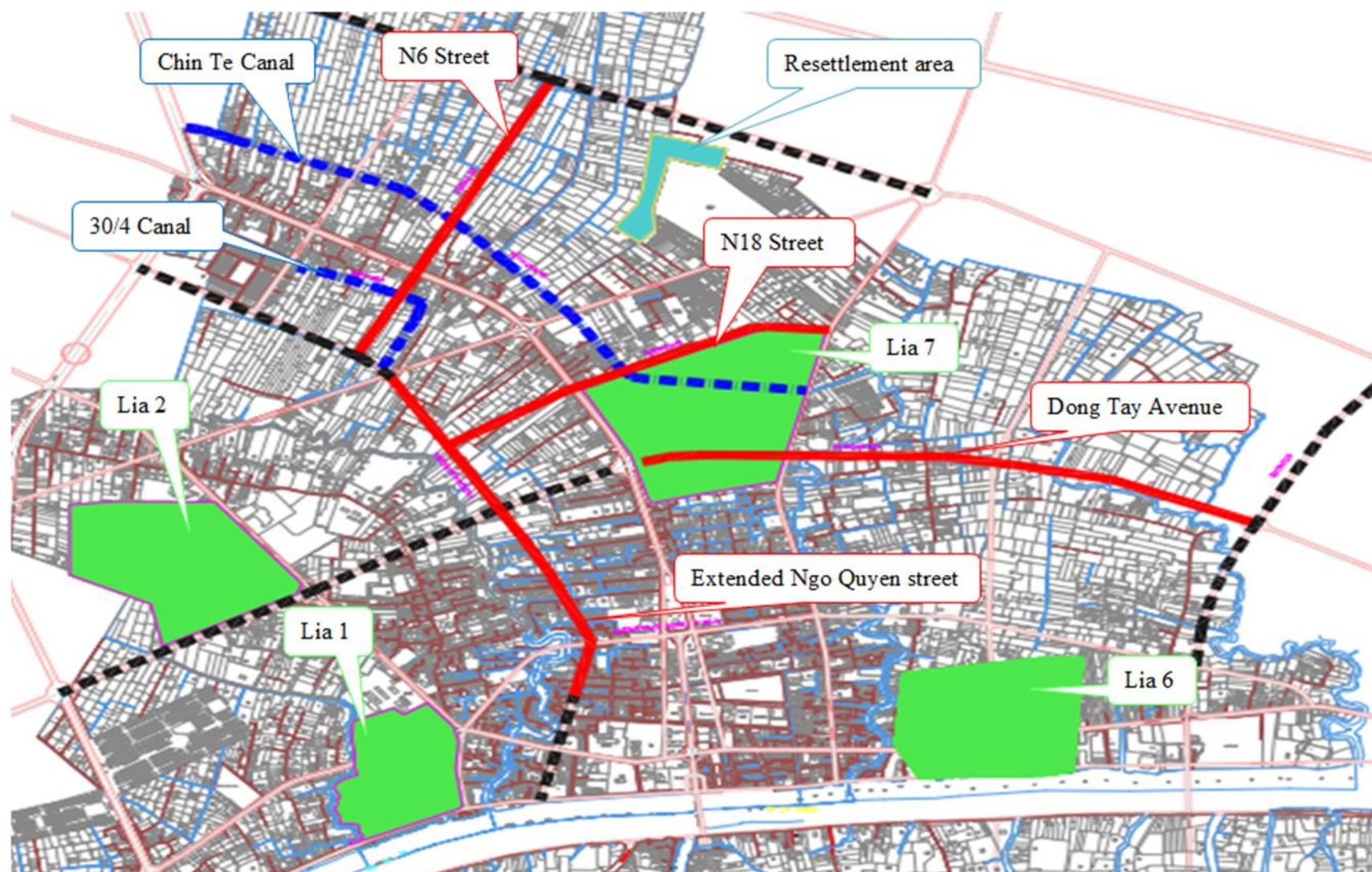


Figure 1.2: Map of investment items of Ben Tre subproject

### **1.3.3. Construction methods**

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

#### **➤ *Road construction methods***

The road construction measure includes the following steps:

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

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

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

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

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

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

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

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

##### **1. Site preparations**

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

##### **2. Dredging**

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

- Construction of temporary drain system;
- Demarcate construction section on the canal by using melaleuca piles or sand sacks at the two ends of the demarcated section. On average each section is 50-100 m long;
- Dry off the section by water pump in the pile/sack coffer;



- Use specialized equipment combined with manual labor to dry dredge canal to the designed elevation;
- Sludge is temporarily gathered in an identified area at site. After sludge volume reduces, transport it by truck to landfill;
- Construction of embankment as designed.

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

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

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

- The pilling test
  - Casting the test pile to the designed length
  - Excavating foundation to the designed elevation; positioning the test pile
  - Installing positioning bracket
  - Driving test pile and determining the length of mass piles
- The mass pilling
  - Positioning and erecting pile driving machine
  - Driving piles to the designed elevation
- Construction of embankment
  - Applying geotextile layer to separate the sand filling and embankment foundation
  - Constructing sand layers to the designed elevation
  - Removing the pile shackle, driving pile to the steel bottom of embankment
  - Pouring the concrete foundation primer
  - Installing rebar, formwork and the bottom, and the embankment vertical wall
  - Casting concrete floor and wall embankment

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

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

#### **1.3.4. List of Machinery and Equipment**

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

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

Equipment	Component 1				Component 2					
	LIA1	LIA 2	LIA 6	LIA 7	Chin Te canal	30/4 canal	Extended Ngo Quyen street	Dong Tay Avenue	N18 street	N6 street
Excavator (one bucket) 0.8 m <sup>3</sup>	-	-	-	-	4	3	5	5	5	1
Bulldozers 108 CV	-	-	-	-	4	3	5	5	5	1
Scraper 1.20 m <sup>3</sup>	-	-	-	-	3	-	-	-	-	-
Self-propelled graders 108 CV	-	-	-	-	2	1	3	4	4	1
Excavator 2 m <sup>3</sup>	-	-	-	-	2	1	3	4	4	1
Road roller 10 T	-	-	-	-	3	2	6	5	7	1
Wheeled Compactors 16 T	-	-	-	-	2	2	3	4	3	1
Watering truck 5 m <sup>3</sup>	1	1	1	1	2	2	4	5	4	1
Crane 130 T	-	-	-	-	2	2	3	3	4	1
Mortar mixers	4	4	3	3	4	3	6	6	6	2
Water pumps	1	1	1	1	3	2	3	3	3	1
Asphalt sprinkler	-	-	-	-	2	1	3	3	3	1
Pilling hammer	-	-	-	-	2	-	2	2	2	-
Generator	1	1	1	1	1	1	1	1	1	1
Tipper truck	3	3	2	2	5	3	6	6	8	2
Bending mower	3	3	3	3	10	4	8	8	8	4
Electric welding machine	3	3	3	3	10	2	6	6	6	2
Welding transformer	1	1	1	1	4	2	2	2	2	2
Road compactor	6	6	5	5	6	4	6	5	6	4
Concrete driller	4	4	3	3	4	2	2	2	2	1

### 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 used for construction works of the subproject are presented in Table 1.3.

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

Items	Quantity					
	Cement (kg)	Sand (m <sup>3</sup> )	1×2 stone (m <sup>3</sup> )	Asphalt (kg)	Macadam type 1 (m <sup>3</sup> )	Macadam type 2 (m <sup>3</sup> )
LIA 1	587,543.48	667.16	1,286.88	-	-	3,120
LIA 2	577,192.01	655.79	1,264.73	-	-	1,865.43
LIA 6	535,272.51	603.08	1,165.98	-	-	1,174.8
LIA 7	264,177.71	299.58	578.09	-	-	1,208
Extended Ngo Quyen street	62,082.41	636.03	697.02	181,338.33	2,898	4,025
Dong Tay Avenue	82,905.08	1,652.28	1,717.16	508,535.74	8,127	11,287.5
N6 street	50,398.57	383.21	435.47	103,047.47	1,646.82	2,287.25
N18 street	50,899.86	611.09	659.25	178,409.88	2,851.20	3,960
Chin Te canal	515,216.25	581.31	1,123.41	-	-	756
30-4 canal	158,686.61	179.04	346.01	-	-	415,8
<b>Total</b>	<b>2,935,274.34</b>	<b>6,746.77</b>	<b>9,803.07</b>	<b>971,331.42</b>	<b>17,669.52</b>	<b>33,081.03</b>

##### ❖ Supply sources

- Rocks and gravel will be transported from quarries in Dong Nai, An Giang provinces to the construction sites by waterways.
- Sand will be transported from sand mines in Tan Chau (An Giang) to the construction sites by waterways.
- Soil will be transported from soil borrow pits in Ben Tre city to the construction sites by road.
- Iron, steel, cement, etc.... will be purchased at retail outlets or construction materials store near by 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				
		Sand	Sand	Rock	Soil	Cement
1	Location	My Thanh An Commune, Ward 7, Binh Phu Commune, My Thanh Commune	Viet Trung Private Enterprise (16B Quarter 1, Ward 8, Ben Tre City)	Viet Trung Private Enterprise (16B Quarter 1, Ward 8, Ben Tre City)	Ben Tre City	Viet Trung Private Enterprise (16B Quarter 1, Ward 8, Ben Tre City)
2	Distance to construction site (to Ben Tre City km)	Located in Ben Tre City (Distance to construction site about 3-5 km)	Located in Ben Tre City (Distance to construction site about 3-5 km)	Located in Ben Tre City (Distance to site about 3-5 km)	Located in Ben Tre City (Distance to site about 3-5 km)	Located in Ben Tre City (Distance to site about 3-5 km)
3	Quality of material	Backfill	Building	Building	Backfill	Building
4	Supply ability	8 million m <sup>3</sup> /year	108,000 m <sup>3</sup> /year	108,000 m <sup>3</sup> /year	-	108,000 m <sup>3</sup> /year
5	Transportation	Boat, ship, truck	Boat, ship, truck	Boat, ship, truck	Boat, ship, truck	Boat, ship, truck

The above-mentioned mines are licensed by People's Committee of Ben Tre province. These mines do not only provide construction materials for this SUUP – Ben Tre project, but also for other projects of neighbouring provinces. The demands for construction materials of the Ben Tre subproject will not cause any opening of new mines.

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

##### **❖ Power and fuel supply**

- The national electricity grid system already covers the entire Ben Tre 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 Ben Tre 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 129,235 m<sup>3</sup>. This excavated soil does not contain hazardous substances (according to soil analysis presented in Chapter 2), and therefore, it can be reused for ground leveling. Waste spoils disposal sites will be surveyed for capacity, distance to the subproject area and agreement with the local authorities. The possible spoil disposal sites will be indicated in the Bidding document.

- Dredging sediment from Chin Te canal, 30/4 canal and small canal in LIAs is expected to be 12,699 m<sup>3</sup>. 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 decomposition 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 Ben Tre Waste Treatment Plant.
- Domestic solid waste: Solid waste generated activities at the site will be collected in the containers with lid, and transported to the waste treatment plant by Ben Tre Urban Construction Works Ltd Company.
- 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 contracts. 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.

### **Ben Tre Waste Treatment Plant**

Ben Tre Waste Treatment Plant is located in Hamlet 2, Huu Dinh Commune, Chau Thanh District, which is away from the subproject area by about 4 km. This plant is built to make composting from domestic wastes. The total area of the plant is 4ha; with a treatment capacity of 200 tons/day (the capacity was calculated up to 2025 projection scenario for Ben Tre City), total investment cost is 175 billion VND. The plant construction has already started and is expected to be complete for operation in 2017.

Waste is to be transported to the plant and classified by manual and mechanization. Then, the organic waste is put into high speed aerobic fermentation to produce fertilizer. Non-productive waste and recyclable waste is burned or buried. Due diligence on disposal site is included in Annex 1.

### **1.3.6. Area of Influence**

In the course of ESIA preparation, the identification of the affected area plays an important role. The Ben Tre 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 and 1.4):

- Upgrading tertiary infrastructure in LIAs (LIA 1, LIA 2, LIA 6, LIA 7): construction activities will affect the residents living in Ward 5, 6, 8 and Phu Khuong Ward.
- Construction of extended Ngo Quyen Street: construction activities will affect residents in Wards 3 – 4, Phu Tan and Phu Khuong wards.
- Construction of Dong Tay Avenue: construction activities will have impact on local residents in Ward 8, Phu Khuong ward and Phu Hung commune.
- The connecting streets in the city inner area (N18, N6): construction activities will affect residents in Phu Tan and Phu Khuong wards.
- Renovation of 30/4 canal: dredging and construction activities will affect residents in Phu Tan ward. Moreover, downstream and upstream parts of 30/4 canal will also be affected by the dredging and construction activities of embankments.

- Renovation of Chin Te canal: similar to 30/4 canal, dredging and construction activities will affect residents living on both sides of canal in Phu Tan and Phu Khuong wards. Moreover, downstream and upstream parts of Chin Te canal, Ca Loc canal will also be affected by the dredging and construction of embankments.

Environmental and social impacts of the project investments will also relate to some areas outside the city and project area as indicated above. These include borrow pits for the construction of project embankments, roads, and resettlement site (section 1.3.4); the disposal site for dredged materials and solid waste generated from the project i.e. (Ben Tre waste treatment plant).

The routes for transportation of construction materials and waste (Dong Khoi Avenue, Nguyen Dinh Chieu Street, Nguyen Thi Dinh Street, Doan Hoang Minh Street). There are mostly on the City's main roads with high density 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. Trucking material and waste will increase vehicle density, which generate dust, emissions, noise, vibration and affect people and structures on the roads.

In addition, other projects are implemented in Ben Tre City can also generate or affect indirectly to this project. They are:

**a. Project title: Ben Tre Waste Treatment Plant**

- Capital source: government budget (\$US 8 million)
- Investor: Capital of Ben Tre Solid Waste Treatment JSC
- Project progress: being constructed, estimated to be completed by 2017
- Capacity: 200 tons/day

Linkage with Ben Tre City Sub-project: All domestic and construction solid wastes generated from construction activities of the 4 LIAs (LIA 1, 2, 6, 7), 4 roads (Ngo Quyen extended, Dong Tay Avenue, N6 street and N18 street) as well as dredged mud of 2 canals (Chin Te canal, 30/4 canal) will be collected, transported and processed at Ben Tre Waste Treatment Plant.

**b. Project title: Ben Tre City Wastewater Treatment Plant**

- Capital source: ADB ODA (\$US 35.6 million); government budget (\$US 7.1 million)
- Project progress: Under the establishment of FS, estimated to be started in 2018 and operated by 2020.
- Capacity: 8,500 m<sup>3</sup>/day, 72 km wastewater collection pipelines and 13 pumping stations.
- The purpose of this project is to collect and treat wastewater from 10 wards of Ben Tre city (Wards 1 – 5, a part of Wards 6 – 8, Phu Khuong and, Phu Tan wards).

Linkage with Ben Tre City Sub-project: Wastewater from the SUUP sub-project will be collected, conveyed and treated by Ben Tre WWTP. Accordingly, wastewater from proposed civil construction works (LIAs, Chin Te canal, 30/4 canal and upgrading roads) will be connected and treated by WWTP.



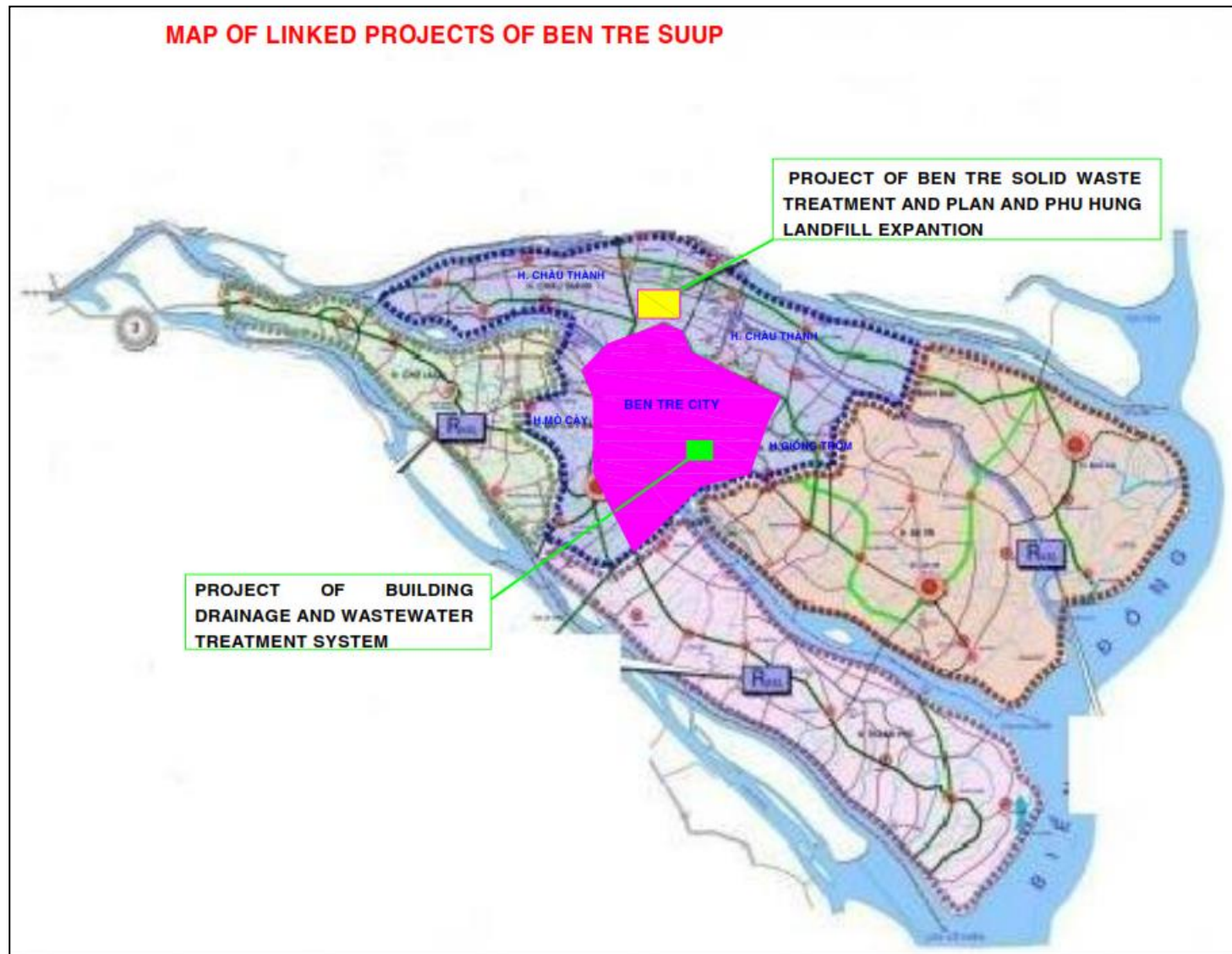


Figure 1.3: Map of linked project of Ben Tre SUUP





### **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 Ben Tre 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 Ben Tre Province.

#### **❖ Sub-project owner - People's Committee of Ben Tre City**

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

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

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

#### ❖ Investment fund

Total investment fund of the Subproject is US \$ 46,507,000 in which:

- ODA fund: US \$ 35,000,000 accounting for 75.3 % of total investment fund, of which
  - IDA fund: US \$ 20,000,000
  - IBRD fund: US \$ 15,000,000
- Counterpart fund: US \$ 11,507,000 accounting for 24.7 % of total investment fund.

#### ❖ Implementation schedule

Estimated implementing period: 6 years, from 2016 to 2021. The construction phase will be commenced in 2018.

### 1.4. ESIA METHODS

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

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

components (air, water, soil and flora and fauna) in the project area was conducted throughout the year both in dry and rainy seasons.

8. **Sample analysis:** All water, air and soil samples collected in the field were stored and brought the laboratory for analyzing at Au Viet Center.
9. **Public consultation:** Public consultation is used to help identify opportunities and risks, improved subproject design and implementation, and increase subproject ownership and sustainability. Public consultation is specifically required by the World Bank's environmental and social safeguard policies. A meaningful public consultation will be used. This is a two-way process in which beneficiaries provide advice and input on the design of the proposed subproject that affect their lives and environment, promotes dialogue between governments, communities, and implementing agencies to discuss all aspects of the proposed subproject. The feedbacks from consultation will be incorporated into the subproject ESIA and design. Those affected by the subproject include those resettled and those in the nearby communities affected by subproject impacts, intended beneficiaries of the subproject, key interest groups – depends upon the project, local mass organizations, including women's unions, local, state and central governments, other donor and development agencies, and other stakeholders.
10. **Disclosure of information:** Disclosure of the subproject information including the subproject safeguards and instruments will allows the public access to information on environmental and social aspects of the subprojects. Disclosure is mandated by policies for the WB's Environmental Assessment, Involuntary Resettlement, and Indigenous Peoples. The subproject safeguards and instruments will be disclosed in country and in local languages and at the World Bank Infoshop, like all consultations, it is an ongoing process during the subproject preparation and supervision process.
11. **Statistical and data processing:** All statistical data and documents acquired from local levels (Commune, Ward and City levels), as well as on-site measurements were processed and expressed in tables, figures and charts for interpretation. This data is systematized according to time, adjusted to serve the determination of natural and socio-economic environment situation; the analysis of trend in environmental change in the project area. These data are very crucial to make the basis of environmental impact assessment and prediction when implementing the project, as well as proposing countermeasures.

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

### **2.1. GEOGRAPHICAL SETTINGS**

#### **2.1.1. Topographical and Geological Conditions**

##### **2.1.1.1. Topography**

Ben Tre City is a flat islet with a dense and interlaced canals system. Its terrain tends to lower from Northwest to Southeast with an average altitude is 1-5 m above sea level. The City is an alluvial land on a low-lying area surrounded by the Ham Luong River in the West, Ben Tre river in the South, Chet Say canal in the East. The City's inner area has Cai Ca canal, Ca Loc canal, Kien Vang canal and Go Dang canal.

The terrain of Ben Tre city can be divided into 3 main types:

- Low-lying Zone: This area covers rice paddy fields of Binh Phu Commune, Ward 7 and some hollow areas belong to Phu Hung Commune, My Thanh An, Thanh Nhon ... This zone is often flooded when rising tide levels;
- Average Elevation Zone: This zone has average altitude 0.97-1.3 m, distributing in the suburban areas;
- Upland/High Elevation Zone: This zone covers Ward 2 and 3, areas along major traffic routes and some sand dunes in Phu Hung Commune. The average altitude is 1.3-1.6 m.

##### **2.1.1.2. Geology**

Geological characteristics of Ben Tre include the following layers:

- Layer D: Soil, blue-gray, gray-brown clay with some sand, gravel and plant roots. Status: soft plastic - solid plastic.
- Layer 1b: riverbed mud clay, referring black-brown colored. State: liquid.
- Layer 1: grained marsh estuary sediments clay components: heavy sub-clay and sandy clay, black-gray - dark brown, mixed with fine sand lenticular, tiny little broken shells and vegetable humus. State: Plastic liquid.
- Layer 1a: Has the same alternatives like layer 1 but the particle density of sands in clay rising locally so that the ingredients contain heavy sub-clay - sand clay. State: Plastic, sometimes very soft or soft plastic liquid. Layer exists within layer 1 in the form of lenticular without distinction line, making the fine particle concentration, humidity and ductility reduced locally.
- Layer 1c: main components are grained sub-sand mixed with seam clamp clay – sub-clay forming light sub-sand – sub-clay, grey – yellow grey – light brown coloured. Untight construction is considered as marking layer with significantly increased shells. Besides, there are lenticular layers existing in layer 1 and 1a.
- Layer 1d: is layer 1 with mixed grained sand lenticular density, making an increase in the ingredients of heavy-medium heavy sub-clay and in the viscosity in the state of liquid. Layer 1d exists within layer 1 under the form of lenticular when concentrating a significant density of individual grained sand lenticular owning water particles that increase particles density and local viscosity.
- Layer 2: Sea sediment of late level 4 with components of sand clay – medium sand, yellow – light brown-yellow – rippling light white-green. State: solid-semisolid.

Within the layer 1c sometimes there are layer 1d and 1a formed by the slight mud holes and the lenticular concentration.

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

### **2.1.2.1. Climate**

Ben Tre is located in tropical monsoon area, closes to the equator, with a mild climate, less affected by the disaster. Climatic conditions differentiated into two distinct seasons: the rainy season (beginning in May, ending in November) and the dry season (lasting from December to April). Rainfall is mainly from August to October (accounting for 80 % of annual rainfall).

#### **❖ Temperature**

The region is relatively high and stable temperatures, no spatial differentiation. Annual temperature regime in Ben Tre is 27.3<sup>0</sup>C. The highest temperature is 29.7<sup>0</sup>C, and the lowest temperature is 24.1<sup>0</sup>C.

The average temperature in 2014 is 27.5<sup>0</sup>C. January, February, December have the lowest average temperature: 24.8<sup>0</sup>C and highest in May: 29.7<sup>0</sup>C. Temperature changes during the year, but there is big difference in the average temperature between months, the average temperature difference between the hottest month and the coldest month is about 4 – 5<sup>0</sup>C.

The most notable feature is the fluctuation of temperature during the day. Daily temperature amplitude is 10<sup>0</sup>C. Despite of hot and sunny daytime, night and early morning still have dew. These are favorable conditions for the growth of trees and crops throughout the year.

#### **❖ Rainfall**

Rainfall is by divided into two distinct seasons. Rainfall concentrated from April to November - prevalent period of the southwest monsoon. Total rainfall of this period accounts for 90-95 % of the annual rainfall. In contrast, during the period from December to the next April - the period of the East wind prevails, rainfall is relatively low, accounting for only 5-10 % of the total annual rainfall. The annual rainfall regime of Ben Tre is 1,312 mm/year. The highest rainfall is 1,486 mm/year, and the lowest rainfall: 955 mm year.

Total rainfall in 2015 was less than in 2012, 2013, 2014. The common rain form is showers accompanied by little thunderstomrs.

#### **❖ Humidity**

Average air humidity is relatively high, averaging 84 %/year. The rainy season is the rainy periods so the humidity reaches the highest value in the year, by contrast, the dry months of high air temperatures and rainfall, humidity is very small, the lowest value of the year 2014, average humidity in the rain season ranged 77-94 %, the highest in July (average 94 %). The dry season has lower humidity, often only about 75 – 90 %. In which month has the lowest average humidity is in December (75 %).

#### **❖ Wind, storm**

Ben Tre is influenced by the prevailing wind directions: East - Northeast and West – Southwest.

- West - Southwest Monsoon appears in the rainy season from May to November, with average velocity is 1.0 - 1.2 m/s, the maximum velocity is 10-18 m/s.
- East - Northeast Monsoon has the most effect on Ben Tre in the dry season, occurring from December to April of the following year, blowing from the sea to inland with average velocity is below 3 m/s. The type of wind makes the rising tide, push sea water intrusion further inland causing salinity in major rivers, affecting crops and drinking water sources.

Ben Tre is not located in the areas affected by tropical cyclones and storms. It is often affected by storms at the end of rainy season, but no damages. However, in 20 recent years, global climate change has become complicated posing floods, tornadoes, and salinity.

#### ❖ **Sunshine hour**

Total average annual hours of sunshine: approximately 2,392 hours. In comparison with other Mekong Delta provinces, sunshine in Ben Tre is not high. In the dry season, average of sunshine is 6-8 hours/day (mainly in February to April), and 4 – 5 hours/day in the rainy season.

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

Ben Tre has a vast and dense river network with a total length approximately of 6,000 km and has the highest density of river network in Vietnam (2.7 km/km<sup>2</sup>). Ben Tre has 4 big rivers, namely Tien River, Co Chien River, Ham Luong River, Ba Lai River and many other large and small rivers and canals. Statistically, there are about 60 main canals with a total length of over 2,367 km; in which Giao Hoa canal (Chau Thanh - Binh Dai districts), Mo Cay canal, Cai Cam canal, Vam Thom (Mo Cay district), Bang Cung, Eo Loi, Khem Thuyen (Thanh Phu district), Ben Tre, Son Doc (Giong Trom town), Vam Ho, Cay Da, Muong Dao, Ba Tri are the most important canals.

#### ❖ **River System**

Ben Tre city has 2 big rivers flowing through as follows (Figure 2.2):

- *Ham Luong River*: total length is about 72 km. The section flows through Ben Tre city is 20 km in length. Ham Luong is the big river located entirely in Ben Tre province, the river bed is broad and deep, which is strongly influenced by flooding regime from the upstream part of the Mekong river and tidal regime of East Sea. Discharge in the rainy season is 3,360 m<sup>3</sup>/s and sharply plunged in the dry season at 829 m<sup>3</sup>/s.
- *Ben Tre River*: with a length of about 30 km. The section flows through Ben Tre city is 15 km in length, starts from the center of Bao Island (Tan Hao - Giong Trom), a tributary links with Chet Say river via Ba Lai River, another tributary flows through Ben Tre river before entering to Ham Luong River. This is an important waterway route of the province, connecting Ham Luong River and Tien River.

Besides the two major river systems, Ben Tre city also has several canals providing water sources for production, irrigation and domestic activities of the people. These canals also serve as the waterways connecting residential areas for trading purposes of local people. The subproject implements their investment items in two canals in the inner city with the status quo of canals as follow:

- *Chin Te Canal*: 2.5 km through the project. The beginning point meets Nguyen Hue Street, and ends at the intersection with Highway 60. The canal is 1.5-3 m wide and receives waste water from households living among both banks. There is black water with foul smell on slack tide and the sediment that reduces the canal depth to approximately 1.5 m.
- *30/4 canal*: 2.5 km through the project. The canal starts at Ao Sen - Chua Market resettlement area and ends at Doan Hoang Minh street. The canal is 1.5-2 m wide. Compared to Chin Te canal, 30/4 canal is less polluted because people living along both sides of the canal are not many, so the direct discharge of wastewater into the canal is somewhat limited.





### ❖ **Water Level and Tidal Regime**

Ben Tre City is located in a downstream part of the Mekong River, and is influenced by an irregular semi-diurnal tidal regime. There are 2 times of up and down tides daily. The difference between the top - bottom of high tide is 2.5 - 3.5 m, and approximately 1.0 m of low tide.

According to statistical data at Tan Thuy hydrological station, the highest water levels in November is > 1.68 m and the lowest in the dry season is <2 m (in June).

The tidal amplitude is quite large (about 3.82 m), riparian zones have the average maximum tide level is > 1.38 m falling October - December, the lowest tide level is <2.44 m in April-May.

### ❖ **Wave Feature**

Wave regime is influenced by Northeast and Southwest monsoon, and 2 transition months between these two monsoons.

- *Northeast monsoon*: waves are commonly in the North direction, wave altitude is high (approximately from 2 m onwards).
- *Southwest monsoon*: waves are commonly in the West and Southwest directions, wave altitude is lower than the one is the Northeast monsoon.

April and October are typical transition periods between the two monsoons, and therefore, the frequency of waves is fairly distributed all directions.

### ❖ **Salinity**

In the dry season, saltwater intrudes into inland through major rivers, including Ham Luong River, Ben Tre River and the canal network which cause salt intrusion further inland of rice paddy fields.

The salinity of Ham Luong River is observed from February to May. The content of salinity varies from 2.6 to 4.3 ‰ in the flood season (July - December) and from 4.2 to 12.9 ‰ in the dry season (January – June), respectively.

### ❖ **Salt intrusion in canal networks**

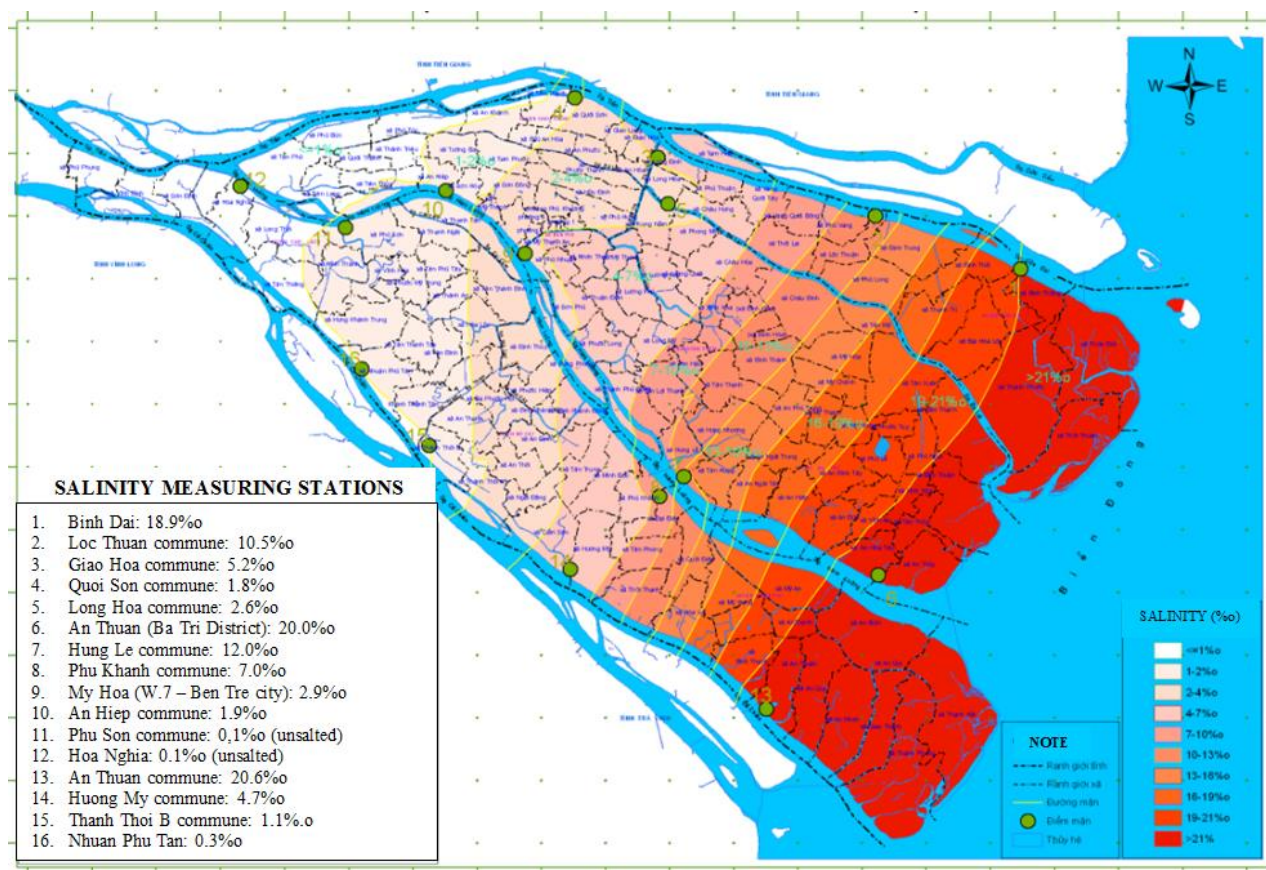
Due located adjacent to the sea, the phenomenon of salt intrusion often occurs in Ben Tre province. Salt water from East Sea penetrates the inland through Co Chien, Ham Luong, Ba Lai and Cua Dai Rivers. Although major estuaries have anti-salt water sluice and dam systems, the situation of salt intrusion is currently very complicated movements, exacerbating water quality in inland areas.

In May 2016, the situation of salinization in major rivers as follows:

- Salinity of 4 ‰ in major rivers was observed at the following locations:
  - Cua Dai River: Giao Hoa commune – Giao Long commune (Chau Thanh district), which is about 40 – 42 km away from the estuary.
  - Ham Luong River: My Thanh An commune (Ben Tre city), is about 45 – 47 km away from the estuary.
  - Co Chien River: Cam Son commune (Mo Cay Nam district), at the distance of 34 – 36 km from the estuary.
- Salinity of 1 ‰ in major rivers was observed at the following locations:
  - Cua Dai River: Tan Thach commune – An Khanh (Chau Thanh district), which is about 50 – 52 km away from the estuary.
  - Ham Luong River: An Hiep commune – Tien Thuy (Chau Thanh district), which is about 56 – 58 km from the estuary.



- Co Chien River: Thanh Thoi B commune (Mo Cay Nam district) – Khanh Thanh Tan (Mo Cay Bac district), which is about 46 – 48 km from the estuary.



**Figure 2.2: Saltwater Intrusion Map in Ben Tre Province**

Salinization affects significantly to freshwater resources which provide for domestic and manufacturing activities of local residents.

### ❖ Flood

In main rivers, water flow in the flood season (July - November) accounts for 70-80 % (Ham Luong: 3,360 m<sup>3</sup>/s), and only 20-25 % in December – April (Ham Luong 829 m<sup>3</sup>/s). Tide transmission in Ham Luong River is quite strong and fast, estimated at 15-25 km/h (Ben Tre DONRE, 2015).

### 2.1.3. Natural Resources

#### ❖ Soil resources

According to Ben Tre Department of Science and Technology (DOST), Southern Sub-institute for Agricultural Planning (2004), the distribution of soil types in Ben Tre city is summarized as follows:

- *Acid Sulfate Soil Group*: Most of actual Acid Sulfate Soil (Alum) has obvious differentiation, distributed in low-lying land areas located mainly in Nhon Thanh, Phu Nhuan, Phu Hung, Son Dong and Binh Phu communes occupying an area of about 900 ha, accounting for 13.3 % of Ben Tre City's natural area. This soil group is favorable to sugarcane, coconuts.
- *Sandy Soil Group*: This group has an area of 330 ha, accounting for 4.9 % of the natural area, distributed mainly in Phu Khuong, Phu Hung and Son Dong communes. This soil type was formed during the period of sea receding in the Mekong Delta, which is slightly

acidic soil, poor humus and nutrients, light mechanical structure, high organic contents and well ventilation and drainage.

- *Alluvial Soil Group*: this soil group is observed in Son Dong, Phu Hung and Thanh Nhon communes, occupying an area of about 884 ha, accounting for 13.1 % of the natural area, distributed mainly in communes of the Southern side of Ben Tre River. Alluvial soil consists of 9 types, in which alluvial soils patchy with red and yellowy; gray ground alluvial soils and alluvial soils with organic matters layer are dominant soil types. These oil types occupy the largest area of fertility and high ventilation, adaptable to rice and perennials. Due to soil is silty annually, the soils are fertile, humus content  $> 2\%$ , average contents of N and P,  $N > 0.15\%$  and  $P_2O_5 > 0.08\%$ , and is enrichment of potassium with  $K_2O > 1.5\%$ . The soil is slightly acidic with pH ranging from 4.6 to 6.2, and high concentration of exchange cations such as  $Ca^{2+}$  and  $Mg^{2+}$ .
- *Man-made Soil Group*: The area of this group is about 3,927 ha, occupying 58.2 % of natural soil located mainly in Nhon Thanh, Phu Nhuan, Binh Phu, and Son Dong communes. This soil group is not natural state, and is formed primarily from acid sulfate and alluvial soil, less acidity and average nutrient content.

### ❖ **Water Resources**

#### *Surface water*

Surface water in Ben Tre city is provided primarily from Ham Luong River (with a 20 km section crosses through Ben Tre city) and Ben Tre River (with a section of 15 km) via a dense network of rivers and canals. In the East - Northeast monsoon (Northeast wind), in associated with high tides, surface water is suffered from high salt intrusion.

#### *Groundwater*

Basically, groundwater resource in Ben Tre city is scarce and limited to domestic and industrial purposes. There are three major aquifers:

- *Sand dune aquifer* is formed by the infiltration of rainwater and is stored in sandy structure at depths from 5 to 20 m. This type of groundwater is found in Phu Hung and Binh Phu communes.
- *Shallow aquifer* is almost no freshwater for domestic demands. The analysis result of well water at Phu Hung commune showed that water is high concentration of alum (Fe: 0.05-1 mg/l) and salinity (Cl: 1,200 - 4,750 mg/l).
- *Deep aquifer* is at more than 100m in depth, and is complicated in terms of size and depth. In Ward 6, groundwater is slightly fresh (Cl: 400-600 mg/l), groundwater in Ward 8 (Go Dang bridge) is saline water (high concentration of Cl: 1,800 mg/l), which is unable to use for the domestic purpose, although the quantity is abundant.

#### *Rainwater*

Rainwater is also considered as a form of water source which is essential for domestic and industrial uses. The provincial rainfall is classified as low average in comparison with the average rainfall of the Mekong Delta region. Generally, rainwater is good quality and can be used for domestic purposes harvesting facilities are properly clean and hygienic conditions.

#### *Water Quality*

Given with a network of rivers, canals evenly distributed over Ben Tre city, surface water resource in Ben Tre city is abundant, and can meet quality and quantity demands for domestic and industrial purposes if exploited properly. However, water sources are being contaminated by the following reasons:

- Salt intrusion from the sea: the extent of salinity depends on hydrological and topographical conditions and river flows. In the Southern and Southeastern areas, river water is brackish or saline due to salt intrusion in particularly in the dry season.
- Pollution by industrial and domestic activities: local habits and domestic practices are insanitary due to toilets and barns are located in rivers, canals, causing serious environmental pollution, especially in the rainy season, when floods are high. Further, water environment is degraded by wastes from processing facilities and navigation means.
- Agricultural wastes: Water sources are contaminated by organic matters not only due to fertilizers, domestic effluent, but also residues of pesticides and agricultural chemicals.

#### ❖ **Mineral Resources**

Ben Tre province has virtually no kinds of mineral resources which are economic value and large stock for exploiting. Merely, a few kinds of common minerals are construction materials with low reserves such as sand, clay, brick, etc.

#### ❖ **Biological Resources**

##### *Vegetation and Flora*

Ben Tre City has 25 terrestrial flora species belonging to 19 families, in which cork-tree, nipa trees, mangroves are observed along Ham Luong and Ben Tre rivers and grasses, reeds which are low economic value. These species are mainly nature-based vegetation minimizing erosion and improving ecological conditions.

According to regional statistical data, 185 phytoplankton species, 93 zooplankton species and 90 benthic species were recorded in estuaries.

##### *Crops*

Crops are structured properly. Rice is popular in Phu Nhuan, Phu Hung and Son Dong communes, ensuring partstaple food for Ben Tre city. Besides, industrial crops such as coconut, pomelo (mainly on the Southern bank of Ben Tre City), fruit trees are a favorable feature for tourist development.

##### *Aquatic resources*

Coastal and Ben Tre estuarine identified 214 fish species belonging to 51 families, including brackish and freshwater fish.

- Ecological conditions in the project area: Through the survey, the current status of the project area shows:
- *Terrestrial Ecosystems*: in 7 wards in the project area there is no wild ecosystem or endangered species. Current status of the project is in the area of agricultural land planted alternating mainly coconut. Except for households in the facade of the main roads, land is used primarily for business. The majority of households in small roads plants coconuts with various size. There is also a number of species of fruit trees such as custard-apple, pomelo, jackfruit; vegetable crops, cabbage, etc.; some shrubby plants such as the duckweed, sedge, and the weeds. In the area there are other animals such as frogs, clones, reptiles, insects, birds, etc. that mostly live along the banks of the dredging canals.
- *Aquatic ecosystem*: aquatic ecosystems in the project area are mainly in the basin of Chin Te and 30/4 canal. The creatures living in the water ecosystem are mainly aquatic species that are self growing and developing in the canals as eel, tilapia, snakehead, etc.; some other crustaceans, such as shrimp, snails, etc.; and some molluscs that also live in the underwater environment of the canals. In addition, some species of aquatic plants are also

found in the aquatic ecosystem as hyacinth, water hyacinth, etc. There are no species considered rare under the Red Book of Vietnam and the world.

## **2.2. ENVIRONMENTAL 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 investigation, sampling and collecting relevant information on environmental status conditions. Collected samples were transported to the laboratory for analyzing in accordance with Vietnamese standards. Detailed results of each sampling site are shown in Appendix 4.

### **2.2.1. Air Quality**

The subproject's owner and consultant conducted monitoring, obtaining and analyzing 19 air samples in the project area. Sampling dates: 25-27 August 2016; weather conditions: sunny, low wind velocity, air temperature was 29-34<sup>0</sup>C, air humidity was 60-80 %.

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

**Table 2.1: Analysis Results of Air Quality**

Name	Code	Location	Measurement and Analysis Indicators					
			Dust <sup>(*)</sup>	CO	NO <sub>2</sub> <sup>(*)</sup>	SO <sub>2</sub> <sup>(*)</sup>	Noise <sup>(*)</sup>	Vibration
			µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	dBA	dB
LIA 1	A1	In front of Kim Quang pagoda	123	5,150	32	25	56.2	26.02
	A2	In front of Ong temple at the corner of Hoang Lam and Hung Vuong street	126	5,315	36	29	64.5	26.02
	A3	Alley 3 cross to Nguyen Van Tu street	164	5,250	34	30	71.3	33,97
LIA 2	A4	In front of Bach Van pagoda	152	5,370	33	27	72.1	36,90
	A5	Kenh Ho alley cross to Tran Van An alley	128	5,520	37	28	62.5	35,56
LIA 6	A6	In front of Primary School Ward 8	132	5,621	41	31	68.5	33,97
	A8	Alley 7, Nguyen Dinh Chieu street	145	5,750	37	32	63.1	32,04
Extended Ngo Quyen street	A7	Unname alley cross to Ngo Quyen street extended	115	5,220	35	30	55.7	38,06
	A19	Thong Nhat alley cross to Ngo Quyen street extended	122	5,021	45	32	60.7	36.90
LIA 7	A9	Unnamed alley at Ca Van Thinh street on the right side of sport center	143	5,980	36	29	50.02	36.90
Chin Te canal	A10	Ending point of Chin Te canal (small population)	177	5,720	32	28	43.4	35.56
30/4 canal	A11	Starting point of 30/4 canal	165	5,085	30	28	54.2	29.54
	A12	Ending point of 30/4 canal at the right side of Alley 171	148	5,050	31	27	52.3	26.02
N18 street	A13	Intersection point of N18 street and Dong Khoi street	135	5,860	42	35	64.9	36.90
	A14	Intersection point of N18 street and Nguyen Hue street.	139	5,630	40	33	64.6	35.56
Dong Tay avenue	A15	Intersection of Dong Khoi street and Dong Tay Avenue street	164	5,920	45	36	69.5	38.06
	A16	Unnamed alley cross to Phu Khuong street	105	5,370	39	32	45.2	33.98
Resettlement area	A17	In the middle of resettlement area	145	5,030	44	30	44.2	35.56
	A18	Residential areas near resettlement area	162	5,011	43	29	41.8	35.56
	<b>QCVN 05:2013/BTNMT (Average 1 hour)</b>		300	30,000	200	350	-	-
	<b>QCVN 26:2010/BTNMT</b>		-	-	-	-	70	-
	<b>QCVN 27:2010/BTNMT</b>		-	-	-	-	-	75

**Notes:**

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

**Remarks:**

The results show that the air quality of all samples is within the limits allowed by the national technical regulations. However, there are some features making differences in the measurement values at the sampling sites, especially dust indicator:

- In the alleys (A1, A5, A7, A19, A16): the lowest dust concentrations ranged from 105-128  $\mu\text{g}/\text{m}^3$  because of traffic low.
- At the routes (samples A3, A4, A8, A9, A10, A11, A12, A15, A18): the concentration of dust is highest caused by high traffic density. However, for this sites, dust concentrations are within the permitted limits.

From the above-mentioned analysis and comparison, it can be preliminarily seen that the quality of air environment in the project areas is currently not contaminated and safe for the people living around as well as for workers when the project is implemented.

**2.2.2. Water Quality*****2.2.2.1. Surface Water***

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



**Table 2.2: Monitoring Results of Surface Water Quality**

Items	Code	Sampl- ing time	Measurement and Analysis Parameters														
			pH	DO	COD	BOD <sub>5</sub>	TSS	Ammo nia	Nitrite	Nitrate	Phosph ate	Chlori de	Coliform	E. coli	Oil &Grease	Total surfact- ant	Iron
			-	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	MPN/ 100ml	MPN/ 100ml	mg/l	mg/l	mg/l
LIA 1	SW1	ST	7.5	10.3	2.56	1.89	126	ND	ND	0.015	0.008	92.5	4.2x10 <sup>3</sup>	300	ND	ND	1.56
		NT	6.8	10.9	6.5	3.32	75	0.082	ND	0.060	0.012	270	3.0 x 10 <sup>3</sup>	500	ND	ND	1.61
	SW7	ST	7.15	8.9	83.2	38.7	12	2.238	0.009	2.192	0.618	148	15x10 <sup>3</sup>	700	2.325	0.932	0.69
		NT	7.1	8.6	64	35.7	55	1.670	0.004	1.468	0.475	292	7.1x10 <sup>3</sup>	500	2.821	0.762	1.94
Chin Te canal	SW2	ST	7.35	10	51.2	26.8	32	1.280	0.004	1.170	0.372	500	5.7x 10 <sup>3</sup>	300	1.385	0.972	1.45
		NT	7.1	5.46	6.4	3.92	20	0.057	ND	0.032	0.005	576	4.8x 10 <sup>3</sup>	100	ND	ND	1.32
	SW5	ST	7.15	5.92	25.6	16.8	64	0.923	ND	0.871	0.014	384	81x10 <sup>3</sup>	4,000	0.827	0.062	2.50
		NT	7.25	7.8	38	17.3	10	1.104	0.005	0.982	0.197	317	59x10 <sup>3</sup>	2,000	0.981	0.076	2.65
30/4 canal	SW3	ST	7.4	7.9	57.6	29.3	150	1.382	ND	1.927	0.342	543	9.3 x 10 <sup>3</sup>	700	2.762	0.873	1.52
		NT	7.5	6.9	10.24	6.43	46	ND	ND	0.027	0.014	279	5.2 x 10 <sup>3</sup>	300	0.152	0.090	1.00
	SW4	ST	7.25	6.89	64	35.8	157	2.350	ND	2.270	0.417	271	7.8 x 10 <sup>3</sup>	1,500	3.746	0.318	3.15
		NT	7.2	7.95	3.2	1.57	124	ND	ND	0.021	0.003	571	3 x 10 <sup>3</sup>	300	ND	ND	2.2
Dong Tay avenue	SW6	ST	7.3	4.8	96	49.7	51	2.741	0.008	2.143	0.682	400	4.2 x 10 <sup>3</sup>	500	1.762	0.521	2.10
		NT	7.2	5.1	89.6	43.2	17	2.145	0.007	1.983	0.542	387	3.3 x 10 <sup>3</sup>	100	1.627	0.421	2.00
LIA 6	SW8	ST	7.2	7.7	64	39.5	88	1.710	0.004	1.516	0.481	130	3.3x10 <sup>3</sup>	3,000	2.257	0.932	1.62
		NT	7.25	7.3	6.4	3.4	93	0.012	ND	0.021	0.009	398	0.27x10 <sup>3</sup>	100	ND	ND	1.59
	SW9	ST	7.25	10.3	128	69.7	154	2,687	0.012	2.547	0.820	88.8	18x10 <sup>3</sup>	300	3.476	1.043	0.73
		NT	7.3	7.8	6.4	2.75	52	ND	ND	0.012	0.005	358	5.1 x 10 <sup>3</sup>	120	ND	ND	0.66
	SW10	ST	7.2	10.21	25.6	16.5	33	0.742	ND	0.618	0.245	84.3	8.1 x 10 <sup>3</sup>	240	0.937	0.582	0.80
		NT	7.5	8.9	224	168.7	51	2.920	0.008	2.846	1.572	270	6.3 x 10 <sup>3</sup>	90	2.785	0.714	1.02
	SW11	ST	7.4	9.9	6.4	4.86	150	0.082	ND	0.072	0.009	128	3.0 x 10 <sup>3</sup>	120	ND	ND	0.79
		NT	7	8.7	76.8	43.7	165	2.021	0.009	1.986	0.725	353	8.1 x 10 <sup>3</sup>	150	ND	ND	0.91
Analysis method			TCVN 6492 : 2011	TCVN 7325 : 2004	SMEW W 5220.C : 2012	TCVN 6001 : 2008	TCV N 6625: 2000	EPA METHO D 350.2	SMEWW 4500- NO <sub>2</sub> <sup>-</sup> B:2012	SMEWW 4500- NO <sub>3</sub> <sup>-</sup> : 2012	TCVN 6202:  2008	TCVN 6194: 1996	TCVN 6187 – 2:2009	TCVN 6187 – 2:2009	SMEWW 5520B.F: 2012	TCVN 6622 : 2000	TCVN 6177 : 1996
QCVN 08- MT:2015/	Class A2		6-8.5	≥ 5	15	6	30	0,3	0.05	5	0.2	350	5,000	50		0.2	1
	Class B1		5.5-9	≥ 4	30	15	50	0,9	0.05	10	0.3	350	7,500	100	1	0.4	1.5

Items	Code	Sampling time	Measurement and Analysis Parameters														
			pH	DO	COD	BOD <sub>5</sub>	TSS	Ammonia	Nitrite	Nitrate	Phosphate	Chloride	Coliform	E. coli	Oil & Grease	Total surfactant	Iron
			-	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	MPN/100ml	MPN/100ml	mg/l	mg/l	mg/l
<b>BTNMT</b>	<b>Class B2</b>		<b>5.5-9</b>	<b>≥ 2</b>	<b>50</b>	<b>25</b>	<b>100</b>	<b>0,9</b>	<b>0.05</b>	<b>15</b>	<b>0.5</b>	<b>-</b>	<b>10,000</b>	<b>200</b>	<b>1</b>	<b>0.5</b>	<b>2</b>

SW1: Cau Dau bridge

SW2: Chin Te canal crosses Ca Van Thinh street

SW3: Starting point of 30/4 canal, 350 m away from the stadium

SW4: At the bend section of 30/4 canal

SW5: Chin Te canal crosses Highway 60

SW6: Dong Tay Avenue crosses Cai Lay canal

SW7: 1/5 Bridge on Nguyen Van Tu street

SW8: Ca Loc 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 quality of water.

### **Water quality of Ben Tre River**

Surface water of Ben Tre River is collected at 3 sites SW9 (downstream part), SW10 and SW11 (upstream part) by 2 times of spring (high) tide and neap (low) tide. The results showed that:

- At the time of spring tide: the concentration of pollutants is lower than the values measured at neap tide and this tends to increase from upstream to downstream part. This is attributed by the two reasons:
  - At the time of spring tide, water flow is greater and that leads to the dilution of pollutants.
  - At the downstream part, sites SW10 and SW11 receive liquid and solid wastes generated by navigation activities (boats) and wastewater from Ca Loc canal. Meanwhile, the results of surface water quality in Ca Loc canal (SW8) have shown that this canal was contaminated by organic pollutants.
- At the time of neap tide: the concentration of pollutants is higher from downstream to upstream part (from SW9 to SW11) evidenced by the fact that the content of BOD<sub>5</sub> at SW9 site is 2.75 mg/l which increased up 43.7 mg/l at SW11, COD concentration is from 6.4 mg/l at SW9 to 76.8 mg/l at SW11.
- At the site SW10: the concentration of pollutants is much higher than the other 2 monitoring sites. This site closes to Ben Tre agricultural market (Agromarket) with concentrated vessels and boats, and therefore, pollutants are totally discharged into river water.

### **Water quality of Ca Loc, 30/4 and Chin Te canals and channels within LIA 1:**

- The monitoring results show that canal water is currently degraded by organic pollutants. This surface water pollution is due to waste and wastewater from markets (trading activities) and domestic wastes from people residing along the canals.
- The concentration of samples collected at spring tide is higher than neap tide (for 5 out of 8 monitoring samples) due to:
  - The sampling time is spring tides which disturb and diffuse pollutants (deposited during neap tide).
  - The canal and channel system is affected by the semi tidal regime in which pollutants (during neap tide) cannot be flushed away. When the tide is up, pollutants are pushed back the water bodies, and can be diluted during the peak of spring tide.

#### **2.2.2.2. Groundwater Quality**

Currently, the rate of people provided with piped water in Ben Tre city is 97.66 %. This means that city's dwellers do not exploit and use groundwater. Given this context, groundwater is not sampled for analyzing.

Instead, monitoring results of groundwater quality in 2010 and 2015 are referred to in this ESIA. The monitoring results were performed by DONRE of Ben Tre province. Monitoring sites were selected as three representative areas: *industrial zone and handicraft village*; *landfill area*; and *saltwater intrusion area*. The results showed that most of groundwater parameters meets the permitted limits regulated by QCVN 09-MT:2015/BTNMT. Some parameters exceeded the allowable levels as follows:

- *Industrial zone and handicraft village*: the content of hardness; total suspended solids; ammonia (N-NH<sub>4</sub><sup>+</sup>); chloride (Cl<sup>-</sup>) and total Coliform exceeds the permitted level at 3.84; 9.6; 54.4; 30.95 and 10 times, respectively.

- *Landfill Area:* the quality of groundwater was exacerbated due to leachate from nearby landfill site. Hardness level exceeds permissible level 1.68 – 5.6 times; the concentration of suspended solids and ammonia ( $\text{N-NH}_4^+$ ) is higher year by year over the period 2010 – 2015; the content of Lead (Pb) exceeds regulated level (at 2 out of 5 monitoring sites); monitoring content of Arsenic (As) exceeds permitted levels from 8.9 – 51.11 times (at 4 out of 5 monitoring sites); the content of Chloride ( $\text{Cl}^-$ ) and Coliform is higher than allowable level from 7.2 and 24 times, respectively.
- *Saltwater Intrusion Area:* This area is affected by saline water with the highest measured salinity is 5.2 ‰. Other monitoring parameters, including hardness, ammonia ( $\text{N-NH}_4^+$ ) and Coliform, also exceeded permitted levels.

### **2.2.2.3. Domestic Wastewater Quality**

Sampling sites and monitoring results are presented in Table 2.3.

**Table 2.3: Monitoring Results of Wastewater Quality**

Code	Sampling location	Monitoring and analysis parameters										Total Surfactants
		pH	TSS	COD	BOD <sub>5</sub>	P-PO <sub>4</sub> <sup>3-</sup>	N-NH <sub>4</sub> <sup>+</sup>	S <sup>2-</sup> (per H <sub>2</sub> S)	N- NO <sub>3</sub> <sup>-</sup>	Oil &Grease	Total Coliform	
		-	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	MPN/100 ml	
WW1	Drainage canal in LIA 1	6.9	49	96	50.2	3.71	6.75	0.057	28,7	5.152	36×10 <sup>6</sup>	0.327
WW2	Sewerage outlet from households discharging to Chin Te canal	7	27	51.2	28.7	2.15	2.87	0.013	18.2	3.38	24×10 <sup>5</sup>	0.274
WW3	Ben Tre Agro- Markets	6.8	16	25.6	15.5	1.85	2.23	0.025	15.5	2.75	18×10 <sup>4</sup>	0.089
QCVN 14:2008/BTNMT (Class B)		5-9	100	150	50	10	10	4	50	20	5,000	10

**Comments:** In comparing with QCVN 14:2008/BTNMT – National technical regulation on domestic wastewater quality (Class B), the results of 3 monitoring sites show that wastewater is highly organic and microbial polluted. The content of BOD<sub>5</sub> and Coliform exceeds permitted levels, except measured values of BOD<sub>5</sub> at the sites of WW2 and WW3.

### 2.2.3. Soil Quality

Fourteen (14) 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 presented in Table 2.4.

**Table 2.4: Monitoring Results of Soil Samples**

Code	Sampling site	Measurement and Analysis Parameters				
		As	Pb	Cd	Zn	Cu
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
S1	Ending point of the alley on the left side of Ham Luong hotel	0.135	0.275	0.071	8.75	3.12
S2	Intersection of Alley 3 and Nguyen Van Tu street	0.067	0.421	0.085	7.27	4.56
S3	Tran Van An alley	0.237	0.721	0.217	57.5	29.28
S4	In front of Rang Dong Kindergarten	0.125	9.371	0.368	80.14	21.58

S15	Alley 7, Nguyen Dinh Chieu street	0.070	56.753	0.490	118.5	66.77
S5	Unnamed alley crosses extended Ngo Quyen street	0.082	3.750	0.121	32.75	12.59
S16	Thong Nhat alley crosses extended Ngo Quyen street	0.153	0.351	0.473	<b>208.7</b>	55.26
S6	Unnamed alley at Ca Van Thinh street on the right side of sport center	0.055	6.273	0.153	29.72	11.32
S7	Ending point of Chin Te canal (low population density)	0.076	10.727	0.272	46.75	9.17
S8	Starting point of 30/4 canal	0.054	ND	0.077	35.92	7.28
S9	Ending point of 30/4 canal at the right side of Alley 171	0.106	ND	0.127	7.06	14.03
S10	Intersection point of N18 street and Dong Khoi street	0.069	13.52	0.321	27.83	8.79
S11	Intersection point of N18 street and Nguyen Hue street	0.053	ND	0.081	7.92	1.85
S12	Intersection of Dong Khoi street and Dong Tay Avenue	0.052	ND	0.347	169.9	5.79
S13	Unnamed alley crosses Phu Khuong street	ND	ND	ND	9.82	4.64
S14	At the middle site of resettlement area	0.052	ND	0.069	25.2	6.42
<b>QCVN 03-MT:2015/BTNMT</b>	<b>Industrial purpose</b>	<b>25</b>	<b>300</b>	<b>10</b>	<b>300</b>	<b>300</b>
	<b>Agricultural purpose</b>	<b>15</b>	<b>70</b>	<b>1.5</b>	<b>200</b>	<b>100</b>
	<b>Residential purpose</b>	<b>15</b>	<b>70</b>	<b>2</b>	<b>200</b>	<b>100</b>

**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, Zn of monitoring soil samples meets the requirement of QCVN 03-MT:2015/BTNMT for industrial purposes; 13 out of 14 soil samples are suitable for the use of soils for agricultural and residential purposes. Only one soil sample (at the site of S6) has the concentration of Zn is 1.04 times higher than allowable level for agricultural and residential purposes.
- The reason for this high content of Zn (S6 sample) 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 levelling, 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.

#### 2.2.4. Sediment Quality

As per se the project's scope of works, the Chin Te and 30/4 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**

Paramete	Monitoring Result										QCVN 07:200 9/BTN MT (ppm)	QCVN 43:2012/ BTNMT (mg/kg)	QCVN 03- MT:2015/ BTNMT (mg/kg)
	SM1	SM6	SM2	SM5	SM3	SM4	SM7	SM8	SM9	SM10			
Sampling site	Cau Dau canal	1/5 bridge on Nguyen Van Tu street	Chin Te canal crosses Ca Van Thinh street	Chin Te canal crosses Highway 60	Starting point of 30/4 canal	Bent sections belong to 30/4 canal	Ca Loc canal	Ben Tre river, near Ben Tre market	Ben Tre river, middle of LIA 6 area	Ben Tre river, towards the Tien River			
	Heavy metals												
As	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	40	17	15
Pb	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	300	91.3	70
Cd	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	10	3.5	1.5
Zn	1.722	6.381	2.526	2.119	1.674	6.693	1.622	1.200	2.193	1.048	5000	315	200
Cu	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	-	197	100
Total Hydro	<0.6	3.1	1.8	<0.6	2.1	2.5	1.6	1.8	1.2	3.6	-	100	-
	Organic Chlor – based Pesticides												
Aldrine	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	10	-	-
α-BHC, β-BHC, γ-BHC, δ-BHC	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	6	-	-
Endosulfan-I,	<0.045x10 <sup>-3</sup>	<0.045x10 <sup>-3</sup>	<0.045x10 <sup>-3</sup>	<0.045x10 <sup>-3</sup>	<0.045x10 <sup>-3</sup>	<0.045x10 <sup>-3</sup>	<0.045x10 <sup>-3</sup>	<0.045x10 <sup>-3</sup>	<0.045x10 <sup>-3</sup>	<0.045x10 <sup>-3</sup>	4	-	-

Endrin, Dieldrine, Heptachlo	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<b>0.2</b>	<b>0.0067</b>	-
p,p'-DDT	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<0.015 x10 <sup>-3</sup>	<b>20</b>	<b>0.0048</b>	-
Chlordane	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<0.045 x10 <sup>-3</sup>	<b>0.6</b>	<b>0.0089</b>	-
Heptachlor epoxide	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<b>0.8</b>	<b>0.0027</b>	-
DDE, DDD	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<0.03 x10 <sup>-3</sup>	<b>20</b>	0.0058 - 0.0068	-
<b>Plant protection chemicals Organic Phosphorus</b>													
Malathion Parathion	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<0.15 x10 <sup>-3</sup>	<b>2-20</b>	-	-

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 and sludge 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 and sludge 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), these are favourable for the management practices of dredging sludge and sediments. The dredged sediments and sludge can be disposed at landfills for being treated as solid wastes. This dredging materials can be also used for levelling at nearby households or can be used as fertilizer for trees.
- According to the analyses, the sediments from the canal dredged work are not hazardous, with the levels of heavy metals. However, it has high amount of organic compounds and pathogenic microbials (e.g. Ecoli) thus should not be used directly for used for agricultural purpose. This could rather be drained out and kept at least 03 months so as to remove the microbial and partial decomposition of organic compounds. The sediments could then be used for prennial crops or planting tree for urban landscape purpose, based on the actual needs of local people. Otherwise, it will be transported and disposed at Ben Tre Waste Treatment Plant.

### 2.2.5. Current Status of Aquatic Resources

Sampling sites are presented in Table 2:6 below.

**Table 2.6: Aquatic Sampling Sites**

Code	Sampling site
AQ1	Cau Dau canal
AQ6	1/5 Bridge on Nguyen Van Tu street
AQ2	Chin Te canal crosses Ca Van Thinh street
AQ5	Chin Te canal crosses Highway 60
AQ3	Starting point of 30/4 canal, about 350 m away from the stadium
AQ4	At the bend sections of 30/4 canal, just behind Nguyen Dinh Chieu High School
AQ7	Ca Loc canal
AQ8	Ben Tre River, near to Ben Tre Agro-market
AQ9	Ben Tre River, middle of LIA 6
AQ10	Ben Tre River, towards the Tien River

### 2.2.5.1. Plankton

#### ❖ Zooplankton

##### Characteristics of species

11 species and 1 larva are recorded at sampling sites. Copepods are the dominant species accounting for 58.4 % of the species composition. Cladocera species account for 25 %, Rotatoria for 21.1 % and Larva for 8.3 %.

- Estuaries and coastal groups included: *Pseudodiaptomus beieri*, *Schmackeria bulbosa*.
- Group indicator species for acid drinks included: *Mesocyclops varicans*, *Ectocyclops phaleratus*.
- Group indicator species for nutrient-rich environment included: *Moina dubia*, *Ceriodaphnia rigaudi*, *Mesocyclops leuckarti*, *Thermocyclops hyalinus*.

##### Feature number and the most dominant species

Zooplankton density in the survey area ranged from 17-57 individuals/sample. Species: *Thermocyclops hyalinus*, *nauplius copepoda* have advantages.

#### ❖ Phytoplankton

##### Characteristics of species

The Bacillariophyceae species account for 44.8 %, Cyanophyta for 21.1%, Chlorophyta for 15.8 %, Euglenophyta for 13.2 % and Dinophyta for 2.6 %.

- Indicator species for acid water are *Phormidium tenax*, *Diatoma elongatum*, *Eunthia lunaris*, *Navicula phyllepta*, *Pinnulania braunii*, *Epithemia turgida*, *Desmidium grevilli*, and *Gonatojygon kinahani*.
- Indicator species for nutrient-rich water environment including species of cyanophyta, euglenophyta and bacillariophyta such as *Aulacoseira granulata*, *Cyclotella comta*, *Cyclotella meneghiniana*, *Fragilaria capucina*, *Synedra acus*, *Nitzschia longissima*, *Nitzschia sigma*, *Pediastrum duplex* and *Scenedesmus javaensis* (chlorophyta).

##### Number of individuals and dominant species

- Individual number of phytoplankton is 405 – 1,610 individuals/sample. Phytoplankton is dominated by species of bacillariophyta which are representative of nutrient-rich water environment.
- Bacillariophyta is dominant with 17 species, accounting for 44.8 % of total species composition. Number of species from collected samples reflects the salinity of rivers in the dry season. In the rainy season, freshwater species of chlorophyta, cyanophyta (cyanobacteria), and euglenophyta become common making the diversity of phytoplankton the project area.

### 2.2.5.2. River-bed Invertebrate (large size)

##### Species structure

Approximately 8 large invertebrate species with predominance of Gastropoda species were detected. These include 5 species (62.5 %) of *Gastropoda* and 3 species (37.5 %) of *Bivalvia*.

- Species in estuaries and coastal environments found is *Novaculina siamensis*.
- Indicator species for acidity water are *Pila gracilis*, *Pomacea canaliculata*, *Melanoides tuberculatus*, *Filopaludina (Filopaludina) sumatrensis*.

### Density and the dominant species

The density of invertebrate in the survey area ranges from 9 to 27 individuals/sample. Dominant species are *Pomacea canaliculata*, *Lymnea viridis*, *Novaculina siamensis*, and *Corbicula*.

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

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

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

Annual average economic growth rate is always higher than the province's share from 1.1 to 1.3 times. Economic growth rate increased approximately 16.5 %/year in period 2011-2015 in which service sector rises from 19.4 to 19.6 %/year, industry - construction sector increases from 10 to 11.0 %/year and the agriculture and fishery sectors increased by an average of 0.7-1.0 %/year.

Over the past years, economic structure has shifted towards the trend of increasing the part of services sector, reducing the proportion of agriculture - forestry - fishery. Trade and service sectors continue to have significant growth, rapid development in the number, type, size and quality assurance to better meet consumer needs of people. Economic structure of Ben Tre city in 2015 includes 66.08 % of Commercial-services, 30.89 % of Industrial – small handicraft, and 3.03 % of Agriculture- Forestry - Fishery.

#### ***Trading, service***

Trading activities and services continue to grow all around the city, concentrating in new development areas such as along Nguyen Van Nguyen, Vo Nguyen Giap, Ca Van Thinh, Nguyen Thi Dinh to Giao Long Harbour. Goods are diversified in types and prices, meeting demand of all people for production, domestic use within the province, in which Made-in Viet Nam high quality products are available all over supermarkets, agents and shops. Total sales of goods and services in 2015 estimated 19,600 billion, increased 14.92 % compared with 2014.

Commercial infrastructures have been upgraded and newly constructed by many enterprises like Cho Lon center, Coconut hotel, floating restaurant, Sense city supermarket (near Co.op Mart supermarket) and some markets in the area have been improved.

Services are developing significantly. In 2015, revenue from transportation services was estimated to be 979 billion dongs, increased 12.1 % in comparison with 2014. In addition, financial services, telecommunication services have been stably developed. There are 18 bank branches all over the province and 7 enterprises for telecommunication services and 6 providers for pay TV services.

Tourism activity has gradually developed, number of visitors in 2015 estimated to be 250,000 turns, increasing 5 % in comparison with 2014, total revenue from tourism activities are estimated to be over 100 billion.

#### ***Industrial –small handicraft sector***

Industrial and small handicraft activities in the city have been remained and developed. Key industrial sectors in the area include: food processing (agricultural and aquaculture products), garment and textile, machinery, electronic device, chemical...Main products are from food processing sector include: canned coconut water, lingzhi mushroom, coconut oil, coconut oil face mask, coconut candy, aquaculture products... In 2015, value of aquaculture production increased 11.3 % compared with 2014, value of coconut candy production increased 8.74 %, etc. Other sectors like garment and textile, construction also provide higher production value compared with 2014 (industrial garment and textile products increased 24.39 %, burnt brick

increased 14.98 %, etc). Total production value (comparing price) estimated to be 3,110 billion dongs, increased 7.87 % compared with 2014.

### ***Agricultural-Aquaculture production***

Total value of agricultural production is estimated to be 308,395 billion, increased 4.41 % compared with 2014 thank to increase in production of fruit trees and high price (Pomelo, coconut, vegetable ...).

Rice plantation area in 2015 continued to decrease (482.85/653.54 ha, equal to 73.88 % compared with 2014) due to the fact that people have converted to planting other crops. Plantation area of coconut is stable with 2,485 ha, increasing 23 ha in comparison with 2014 (increasing 0.93 %); productivity of 18,600 tons, increasing 2,980 tons (19.08 %). Area of fruit trees is 1,182 ha, increasing 14 ha (1.20%); productivity 11,680 tons, increasing 76 tons (0.65 %) from 2014; area of fruit trees is converted from trees with low productivity and instable price (organic, guava fruit...) to high-efficient fruits (pomelo). In general, the area of pomelo plantation is around 626 ha, increasing 79 ha (increasing 14.4 %).

Poultry and livestock: Developing by concentrated scope; diseases of cattle and poultry are controlled, not the occurrence or spread of dangerous diseases. In 2015, there were estimations of 2,100 cows, 7,500 pigs and 172,000 poultries.

The re-structuring of agricultural sector: to implement the model of herb plantation (Rhizoma Dioscoreae Persimilis) at Phu Tan ward, area of 1,000m<sup>2</sup>, plantation model of Pomelo by VietGap standard in Son Dong commune, 19 bio-gas works under the low-carbon agricultural support program; in addition, many seminars, training courses of scientific and technical transfer in production, animal husbandry have been organized; Son Dong and My Thanh communes have been selected to implement the pilot re-structuring program for agricultural sector of the province.

Fishery and aquaculture sector: Area for aquaculture in 2015 is 69.75 ha, decreasing 31.68 ha compared with 2014 (31.68 %). Productivity of aquaculture and fishery in the year reached 165 thousand tons. Aquaculture products have been exported to 40 countries and regions like: Japan, America, Spain, Portugal, England, France...

## **2.3.2. Social Conditions**

### ***2.3.2.1 Population characteristics***

Ben Tre city is the Type III city with 17 administrative units (10 wards, 7 communes). According to Statistical yearbook in 2015 of Ben Tre city, total population of the city is 152,078 people, equivalent to 35,293 households.

The subproject of Ben Tre city covers 7 wards with population of 88,229 people, accounting for 58.02 % total population of the city.

### ***Ethnicity***

Results of the survey show that there are only few households of Khmer and Chinese living in the project area of Phu Khuong ward and Ward 5. Among 928 people answering the survey sheet, 0.1 % are Khmer and 0.5 % are Chinese. However, these households of ethnic minorities are living in harmony among Kinh people and they speak Vietnamese language.

### ***Gender***

Gender is one important aspect in the interview as well as in social issues. Female-Male ratio balanced and gender equality in family and society. Both genders have right to give out comments, making decision and discussing problems with each other. The surveyed results



show that there is no big gap in male-female ratio in Ben Tre city, specifically: 53.2 % surveyed people are male and the remaining 46.8 % are female.

To learn the role and responsibilities of the gender as well as to evaluate gender status in the project area, together with studying data on gender status in Ben Tre, the consultation team has also surveyed by questionnaire and group discussions with both male and female beneficiaries to identify gender situation in the area. Survey results on Gender in the project area as follows:

- *Division of labor in household*

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

Survey results showed that women still play a key role as a housewife of the family, caring for children, 76 % of women in the family in charge of cooking. The percentage of men having a major role in the activities of cooking, cleaning and taking care of children is very small. However, they can play a role of responsible and loving supporter for his wife and mother. The percentage of households with both men and women participating in doing housework is: 18.8 % for the cooking, 33.0 % for cleaning, especially for as hard as the children caring and raising, the percentage was 75.3 %. This is a promising sign for the development of society in the area. When children are receiving care from both parents, they will have condition to fully develop in physical, intellectual and spiritual manners.

For money-making activities, women are especially involved in small business and service (hair salon, nailing...). In the project area, 63.6 % people working in this field are female. Employment with male accounting for major proportion is paid employment (71.7 %), seasonal jobs (builder, transport, etc). These results show that there is limited employment opportunity and adaptation to the change in employment for women. In case requiring resettlement, relocation, women will be more affected than men, especially single middle-age women.

- *Participation in community meetings*

Survey about participation in community activities, participation in local organizations showed that there is difference between the genders: men participate in these two activities more often than women. 52.5 % of respondents said that men are the main participants in the meetings in both family and local meetings while this percentage is 21.9 % in women. Similarly, for the results of participation in local organizations, male-female ratio is 54.6 % and 21.9 % respectively.

- *Decision making for family issues*

For the decisions on family issues, in most of families, men and women discuss and make decision. The percentages for purchasing, children's education, career change, bank loan, property ownership... are respectively 61.0%, 86.3%, 79, 5%, 76.5% and 61.7%. In the remaining families, women are often the decision-maker on purchasing and children related issues while men making decisions on job change, bank loan, property ownership...

### ***Vulnerable households***

Vulnerable households in the project area include: (i) ethnic minorities (mainly Khmer people); (ii) single women of difficult condition, with dependents and without supporter (iii) households with disabled people.

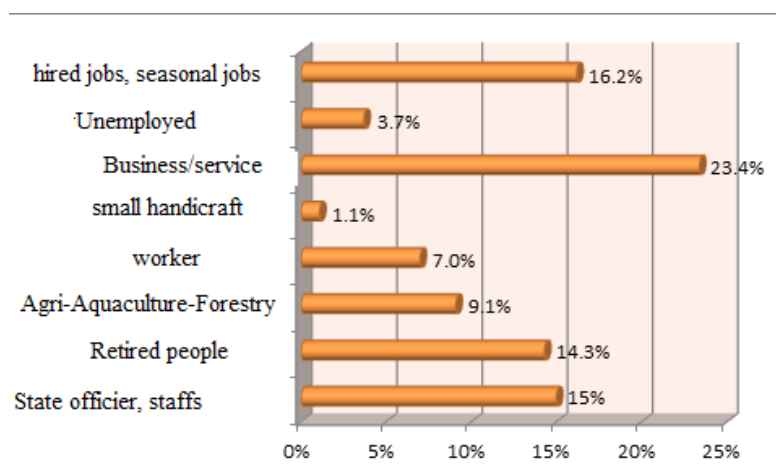
- Ethnic minority: In the project there is no community of ethnic minority living separately. Only one household of Khmer people living in community of Kinh people. So, it is not necessary to prepare Ethnic Minority Action Plan for these subjects.

- Women-headed households: there are 244 households headed by women in the project area, in which 98 households are single women who have dependents and difficult condition. These subjects have income mainly from free jobs with instable income source. During the consultation, it is recognized that households headed by single women are usually in difficult condition while there is no priority policy. Therefore, it is required that the project provides both financial and employment supports for these households.
- Disabilities: In the project area, there are some households suffered from orange agent and getting social allowance, and some handicapped women making living by simple jobs like sewing, selling lottery tickets... However, there are not many people of this aspect so it is not necessary to have individual action plan;
- Poor households: According to initial surveyed result, there are 19 poor households (registered at commune level) in the project area. At the present, there are many policies for this type of households like program 135, credit program, housing loan program, or direct incentives like school fee reduction/exemption, health insurance card...

### 2.3.2.2 Labor, employment and income

#### *Employment*

Results from the survey for employment in the project area show that: employment structure of people here is diversified, in which the highest percentage is business/service with 23.4 %, and seasonal jobs of 16.2 %, state officer, staffs (15 %), retired staff (14.3 %). Employment percentage of the people joining the survey is represented in following chart:



**Figure 2.3: Employment structure of surveyed people**

Surveyed results on employment of the interviewees in wards/communes in the project area show that Phu Hung commune has highest percentage of Agriculture- Aquaculture- Forestry with 28.3 %; ward 5 with the highest percentage of trading/service of 42.4 % and ward 6 has the highest level of seasonal jobs and unemployed of 47.7 % and 4.6 % respectively.

By gender of the interviewed people, data analysis shows that there is no great difference in employment between men and women. However, with typical ingenuity, women having higher percentage joining in small business like nailing, handicraft than men. One issue to be interested is that women get higher percentage of unemployment than men. They have limitation in job opportunities, especially manual jobs usually preferential for men.

#### *Household economic condition*

Results of the self-assessment of household economic condition of people in the project area are presented in following table:

*For poor households:* By surveyor's assessment, among those participating in the survey, there are 2.5 % of poor households (in which: Phu Tam ward is the ward with highest percentage of poor households: 6.3 %; then ward 4 with 4.4 %; ward 6 and ward 8 with low percentage of poor households: 0.9 %).

*For rich households:* survey's results show that percentage of rich households on average is 6.0 % In which, Phu Khuong ward has the highest percentage of 13.1 %, ward 6 and ward 8 have lowest percentage of rich households: 0.9 %.

*For medium households:* Medium households account for the highest percentage in the wards in project area by assessment of community and surveyor. Percentage of households with medium economy is 66.5 % on average.

### ***Income***

Household income is one of the most important criteria for assessing the living standard of every household. Vietnamese people tend to be shy and not open for certifying their real income, just giving out the "approximation". This cause many difficulties in the process of surveying the area, but through a combination of observation and interview on details of living condition of households, the surveying work has collected rather detail information on income sources and total income of households in this area.

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 (3,873,126 VND/person/month), 8.7 times of the income per capita of poor households (443,139 VND/person/month), 2.3 times in comparison with medium households (1,711,649 VND/person/month), 1.5 times higher in comparison with good households (2,611,005 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. Detail information is presented in following table:

Income per capita of poor households as assessment of surveyor is 443.139 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).

There is not much difference in average monthly income of households in wards in the project area. Results are presented in following table:

The stability of income source plays a crucial role in stabilizing the living conditions of the family. Assessment for the stability of household income is considered very necessary. Survey results show that, on average 81.1 % of households surveyed said their household income is relatively stable, this percentage is relative high in comparison with households having ideas that their income are unstable (18.9 %); The stability of income varies among the groups, only 8.7 % of poor households considered that their income is stable, 77.1 % of the average households state that their income is stable and the good and rich household groups said that their household income was stable (over 90 %). Obviously when evaluated according to the standard of living, poor households are households with higher risk of vulnerability because they do not have enough money to afford the life and expenses in urban areas, their income depends on many factors and risks of the market when they have an unstable job for making living ... As a result, the process of implementation of the project, it is required to pay proper attention to poor households because it can be difficult for them to move to new place and restore their life and income.

### ***Average expenditure***

Average expenditure of the rich household in month is 2,803,000 VND/person/month, about 7 times higher than expenditure of poor household (392,000 VND/person/month); 2 times higher than medium household (1,423,000 VND/person/month) and 1.4 times higher than good households (2,056,000 VND/person/month).

#### ***2.3.2.1. Education and healthcare***

##### ***Education***

Education reflects civilization and development of the country and society. Surveyed results in the project area of Ben Tre are promising that all children at school age have opportunity to go to school.

The network of schools and classes are continually improved, Phu Tho primary school (phase 1, 2), Binh Minh kindergarten (ward 7), Son Dong primary school ... have been newly constructed and under operation; Rang Dong kindergarten (ward 8) is under construction; quality of education and training has been continue; percentage of good and excellent students is increasing on the contrary with percentage of fair and weak students is decreasing; percentage of graduates from public high schools is higher than expected and high in comparison with general percentage of the province (reaching 98.75 % compared with plan 95 %, province's percentage 96.96 %), system of frequent education does not meet the plan but higher than general percentage of the province (reaching 81.1 %, plan 85 %, provincial percentage 76.2 %).

According to the education level of the interviewees by gender, there is no great difference between the educational level of male and female in the project area.

The construction of schools meeting national standards is a challenge; there are three schools recognized to be national standard schools of which 1 getting level-2 standard (there are 23/33 standard schools in the province, including 8/13 pre-schools, primary school 9/13; 6/7 secondary schools). Educational socialization continues to be implemented, mobilizing all resources from parents, organizations and individuals inside and outside the province to take care of education (school supplies, scholarship, support for students of difficult condition, reward), total mobilization fund from early 2015-2016 to present is 1,135 billion.

##### ***Healthcare***

Disease prevention, protection and monitoring is improved, proactively treating and preventing the spread of disease. By end of September 2015, 47 cases of dengue fever were recorded, increasing 1 case from 2014 (increasing percentage 2.17 %); the hand- foot-mouth symptom of 44 cases (reducing 52 cases, equivalent to reduction percentage of 58.3 %); 139 cases of mumps, increasing 20 cases (16.8 %), detecting 29 new cases of HIV, 29 cases turning to AIDS and 11 cases died of AIDS.

Health check is remained, providing health check for 92,968 patients, increasing 7.92 % in comparison with the same time of the year 2014. Malnutrition prevention has met the demand, in which consultation activities have been promoted, percentage of under 5 children getting malnutrition has decreased to 9.24 %. With the implementation of the set of National criteria on Health, 13 wards/communes reach over 90 % and 4 wards/communes reach 80 % of the specified criteria.

The inspection for food safety has been carried out regularly. Ben Tre city has cooperated with local authorities of wards/communes to conduct the inspection for 2,191 food processing facilities and food business (increasing 21.2 %), thereby detecting 670 facilities violating regulation, mainly in health check, training knowledge on food safety and hygiene... These cases have got reminding note and 5 facilities have got administrative penalty.

Communication for changing behavior, taking care of reproductive health is done quite efficiently. Percentage of spouses using contraception reaches 76.93 %. 1,086 children have been born in the year, birth rate of 8.72 %, increasing 0.05 % from 2014.

## **2.4. INFRASTRUCTURE CONDITIONS**

### **2.4.1. Traffic situation**

Ben Tre city has several main transportation routes, including: section of Highway 60 through the city is about 5 km in length; Bypass to Highway 60 is 2.2 km long; Roadway to Giao Long Port is 5.4 km, provincial roads 884, 885 and 887. Bus station is also built in accordance with national standard II with an area of 2.2 ha.

Ben Tre city is surrounded by Ham Luong River, Ben Tre River and Chet Say Canal. Ham Luong River is the Category I River, 71 km in length, crossing through Ben Tre city with a section of 7 km long, width 500 - 1400 m, depth 3.6 m - 10 m. Ham Luong River is untapped for ports and is enable to navigation load of 3000T ships. Ben Tre River is the Category II River. Its length, width and depth are 21.5 km, 80-136 m and 2.2 - 6 m, respectively. The city crossing section is 15 km long, is capable for 300T barges; Chet Say canal is Category I Canal, which spans across Ben Tre city with 3.2 km long, width > 160 – 170 m, the maximum water level is 2.8 m and is capable for 950T ships. In addition, Cai Son canal is also the waterway in the city area.

The dock in Ben Tre city with wharf 60 m can receive the ships type 100-200 tons. There are problems such as overcrowding and limited space.

Urban traffic is quite dense with many great lines and forming a network of urban roads. The total length of internal roads is about 18 km.

### **2.4.2. Water Supply Infrastructure**

Currently, there are 2 water supply sources for Ben Tre City, including: Son Dong Surface Water Plant with a capacity of 31,900 m<sup>3</sup>/day (upgraded and expanded in 2012) and Huu Dinh Groundwater Plant in Chau Thanh with capacity Q=10,000 m<sup>3</sup>/day. However, Huu Dinh Groundwater Plant is currently operating at about 6,000 m<sup>3</sup>/day because of some broken wells. Both these plants are providing water for Ben Tre city, a part of Giong Trom town and Chau Thanh district and Giao Long Industrial Zone, An Hoa. The rate of urban water supply is 97.66 %, water loss is 27 %. The pipeline network is about 100 km in length and pipeline is DN100-DN400 in diameter (cast iron and PVC). Most of the network has been renovated and replaced since 1995 (about 50 km). Ben Tre Water Company (BEWACO) is directly managing these water supply systems.

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

#### ***Collection***

The solid waste collection network in Ben Tre city is applied to three types: domestic waste, industrial waste and medical waste.

- Domestic waste: According to the Ben Tre Urban Projects Company (BENTREPCO), the volume of garbage generated in Ben Tre city is 120 tons/day, including the garbage that is collected about 110 tons/day, 91 % occupancy rate. Currently, the collection system covering the whole boundary of the ward and commune in the city with 100 vehicles as dedicated trolleys, 7 dumpsters type 3.5 to 5 tons, 2 dumpers 5 tons. The garbage collecting points now include regional old medical center (Ward 1), market area (Ward 2), near the old courthouse, Coopmart area, front guard stations Nguyen Dinh Chieu Hospital, behind the police headquarters, Ham Luong park, 1/5 bridge, roundabout Ward 7, near Phu Nhuan CPC. Currently the city has put into operation 02 fixed garbage transfer



station located in Ward 6, Tan Phu. Domestic waste in Ben Tre city is collected by Ben Tre Urban Projects Company (BENTREPCO).

- Industrial waste: Ben Tre city has only Phu Hung industrial cluster. Because it has not operated yet, so has no generated industrial waste. However, when it comes into operation, waste from companies in industrial cluster must be sorted, sold recyclable scrap, reused as raw materials for production. Unusable waste is collected and treated by Ben Tre Urban Projects Company (BENTREPCO). Hazardous waste is transferred to functional companies to handle according to regulations.
- Medical waste: the classification of medical waste is only done at the provincial hospitals and district hospitals. The waste collection method was used such as classification of municipal waste and medical waste, using the containers or garbage bin or PE – PP bags to classified waste but generally not meet the requirements of the Ministry of Health. The level of response is about 65 %. In commune clinics, medical waste is not reasonably collected and treated, almost be collected with municipal waste, burned in manual incinerator or buried in the campus.

### ***Treatment***

- Domestic and industrial non-hazardous: the total amount of urban garbage and non-hazardous industrial waste in Ben Tre city was collected by Ben Tre Company Limited Urban and transported to the Phu Hung landfill (extension) to handle. Phu Hung landfill (extension) operations in 2014, has an area of 0.53 hectares, not walled, with the bottom liner, used technology to landfill disposal.
- Medical waste: domestic waste, medical waste regular hospitals, district and city health centers was collected by Ben Tre Urban Projects Company or the team of Ben Tre town's sanitary treatment at landfills. Hazardous medical waste is collected and processed in the form of burning. Currently, there are five provincial hospitals and 7 district hospitals equipped with medical waste incinerator of hazardous (incinerator technology of Japan or DO incinerator or autoclave sterilization).
- The Solid waste generated activities of Ben Tre Subproject will be collected and transported to Ben Tre waste treatment plant.

### **2.4.4. Electrical System**

The main power supply line for Ben Tre Province is 220 KV line: My Tho 2 - Ben Tre connected to the Ben Tre Substation 220 KV and 110/22 KV (25 + 40 MVA). There are also Dong Khoi power plants with capacity 10.5 KW give patients the provincial People's Committee, the Provincial Committee, hospitals, ... when grid breakdown.

### **2.4.5. Urban Drainage and Inundation**

#### ***2.4.5.1. Drainage status***

Currently, the drainage system in central city is a combined drainage system for rainwater and wastewater. The total length of the drainage system is about 68 km including sewer systems from 300-1000 mm in diameter and discharged directly into Ben Tre Rivers, Ca Loc canal, Cai Ca canal, Kien Vang canal. A small part of the drainage system was built before 1975, and was upgraded in the period 1993-1999, mainly in main roads of wards 1, 2, 3, 4, 5, 7 and 8. The remaining part of central wards and commune has no complete drainage system. Drainage issues are solved case by case mainly for city central and market areas, it remains big challenges to the city authority.



### 2.4.5.2. Inundation status

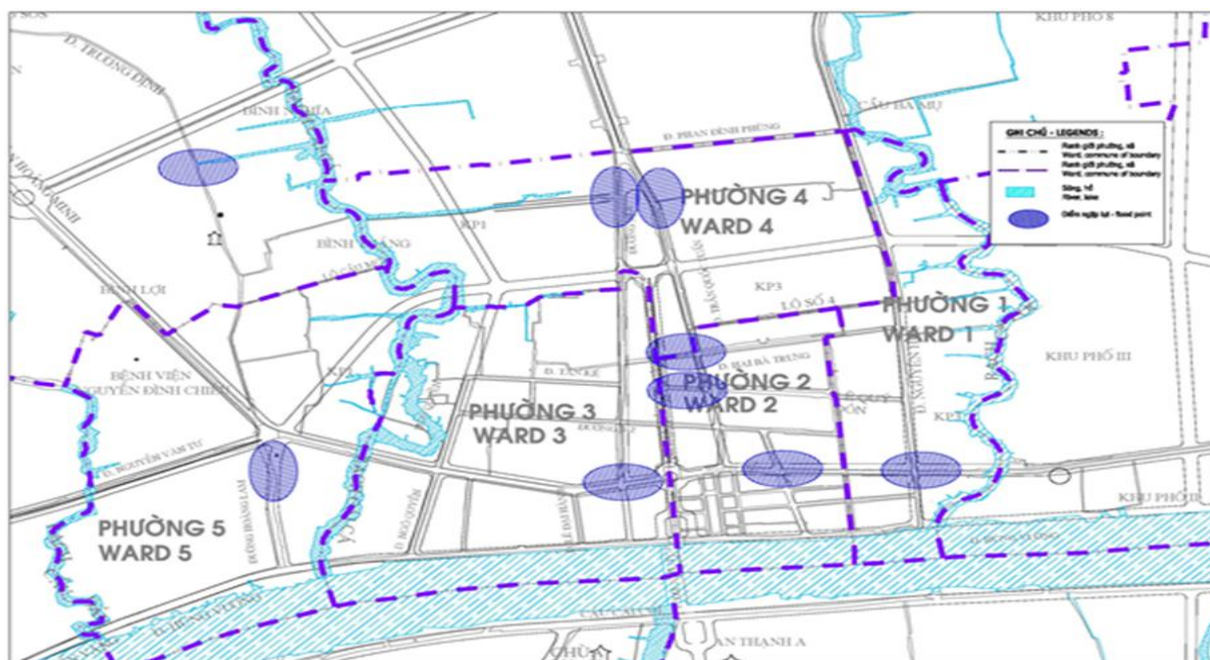
Some routes regularly flood when it rains. However, most are local water flooded for a short time 10-15 minutes and flooding from 0.1-0.2 m depth. The flood points do not cause any significant damage, but will increase the risk of infiltration of rainwater into the sewer lines in these areas to be built.

**Table 2.7: Statistical data on flooding spots in Ben Tre City**

No.	Locations	Flood time (after raining) (h)	Depth (m)
1	CMT8 street (from Le Dai Hanh – Dong Khoi street)	$\leq 0.25$ h	$0.1 \div 0.15$
2	Le Quy Don street (Tran Quoc Tuan – Dong Khoi street)	$\leq 0.25$ h	$0.1 \div 0.15$
3	Dong Khoi street (3/2 – Hai Ba Trung street)	$\leq 0.25$ h	$0.1 \div 0.15$
4	Tran Quoc Tuan street (From Phan Dinh Phung street - Ben Tre Television)	$\leq 0.25$ h	$0.1 \div 0.15$
5	30/4 street (from Phan Dinh Phung – My Hoa Chay alley)	$\leq 0.25$ h	$0.1 \div 0.15$
6	Nguyen Dinh Chieu street (from Nguyen Binh Khiem street – Ca Loc bridge)	$\leq 0.5$ h	$0.1 \div 0.2$
7	Hoang Lam street (belong to market at ward 5)	$\leq 0.25$ h	$\leq 0.1$
8	Truong Dinh street (From Nga Nam rotation – Ba Van Culvert)	$\leq 0.5$ h	$0.1 \div 0.15$
9	Vo Nguyen Giap street (from Tan Thanh crossroads – Mu rotation)	$\leq 0.5$ h	$0.1 \div 0.25$

Source: Ben Tre Water Company, 2016.

The flooded sites are shown in the following figure 2.4:



**Figure 2.4: Flooded points**

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

The data on the current status of the natural, social and economic conditions in the project area are very important for the evaluation and assessment of environmental impacts. Therefore, they will be described in detail below for each portfolio of the 04 components.

**Component 1:** Upgrading the tertiary infrastructure for four LIAs (LIA 1, LIA 2, LIA 6, LIA 7) in the following scope: expanding main alleys with the minimum width of 4 m and upgrading alley branches based on their state with the minimum width of 2 m; in addition to investing synchronous technical infrastructure in alleys such as water supply, drainage, lighting, green trees and dustbins; dredging 2.97 km of small canals and constructing stone embankment for them in the LIA.

***The upgrading portfolio of LIA 1***

LIA 1 is located in the total area of 18.36 ha in Ward 5. Its boundary is marked by Cau Dau ditch, Doan Hoang Minh Street, Hoang Lam Street and Hung Vuong road.

Currently the infrastructure in the area is very poor. The concrete alleys of 1.5-4 m wide have degraded, which serve people's traffic and living operations. The households are populous along alleys. Almost drainage and lighting in alleys have not been built. Wastewater and garbage from households in the LIA are directly discharged into small canals which are 1 - 2.5 m wide, causing serious pollution in these canals. Local authorities periodically organize dredging ditches and canals but it is only temporary solution, which can not solve the environmental pollution in the long term. The project will dredge 935 m of canals with depth of 0.2-0.3 m, construct stone embankment with length of 1.8 km. However, the alignment has not been clearly defined at the moment of preparing FS. After the project is completed, the drainage system in the LIA will be connected to the public drainage system of the City.

On the roads which bound LIA 1, houses are quite spacious and are mostly grade-II or grade-III and commercial houses or houses for rent or offices. Contrarily, houses in deep alleys in the LIA are mostly grade-IV with deteriorated metal roof and inhabitants here are mainly day workers and seasonal workers who have difficult economic conditions.

On the scope of the alleys belonging to the Upgrading Portfolio of LIA 1, there are several sensitive buildings as Kim Quang Pagoda, outdoor shrine as stated in details in Section 2.6.

The transport direction of material and waste is as follows: Nguyen Dinh Chieu Street→Hoang Lam Street→ Doan Hoang Minh →Nguyen Thi Dinh Street→Ben Tre Waste Treatment Plant.



The location of LIA 1



The current status of LIA1 alleys



A drainage ditch in LIA 1



The current status of some houses in LIA 1

### ***The upgrading portfolio of LIA 2***

LIA 2 is located in the total area of 31.12 ha in Ward 6, bordering on Doan Hoang Minh Street and residential areas along the section from Truong Dinh Street to Dong Van Cong Street.

Similarly to LIA 1, the infrastructure in LIA 2 does not meet people's demand. Effective drainage and lighting in alleys have not been built. The alleys are mostly soil alleys with the average width of 1.5 m. Inside the LIA, the population density is sparse and the land mostly includes vacant land interspersed with gardens and ponds. People concentrate in the path leading to the LIA. The labor structure mainly includes farmers, seasonal employees, day-workers, small traders etc.



Grade IV-houses prevail in LIA 2 with many hostels. Households directly discharge waste into canals which are 1-2.5 m wide, causing environmental pollution and worsening urban landscape. Similar to LIA 1, dredging this canal with length of 730 m, depth of 0.2-0.3 m and constructing stone embankment with length of 1.4 km. When the Project completes, the drainage system in the LIA will be connected to the City's general system.

Within LIA 2, there are not any sensitive PCR and public works.

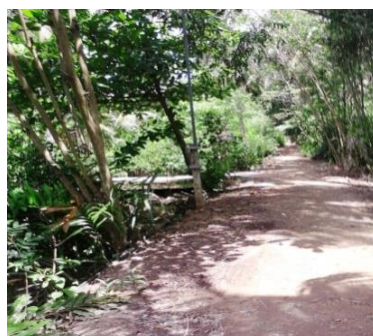
The transport direction of material and waste is as follows: Nguyen Dinh Chieu Street → Hoang Lam Street → Doan Hoang Minh Street → Nguyen Thi Dinh Street → Ben Tre Waste Treatment Plant.



The location of LIA 2



A concrete alley in LIA 2



A soil alley in LIA 2



A drainage ditch LIA 2

### ***The upgrading portfolio of LIA 6***

LIA 6 is located in the total area of 29.47 ha in Ward 8, bordering on Ben Tre river and Ca Loc canal. LIA 6 is the focal of residential areas and public buildings. Inhabitants here are mainly

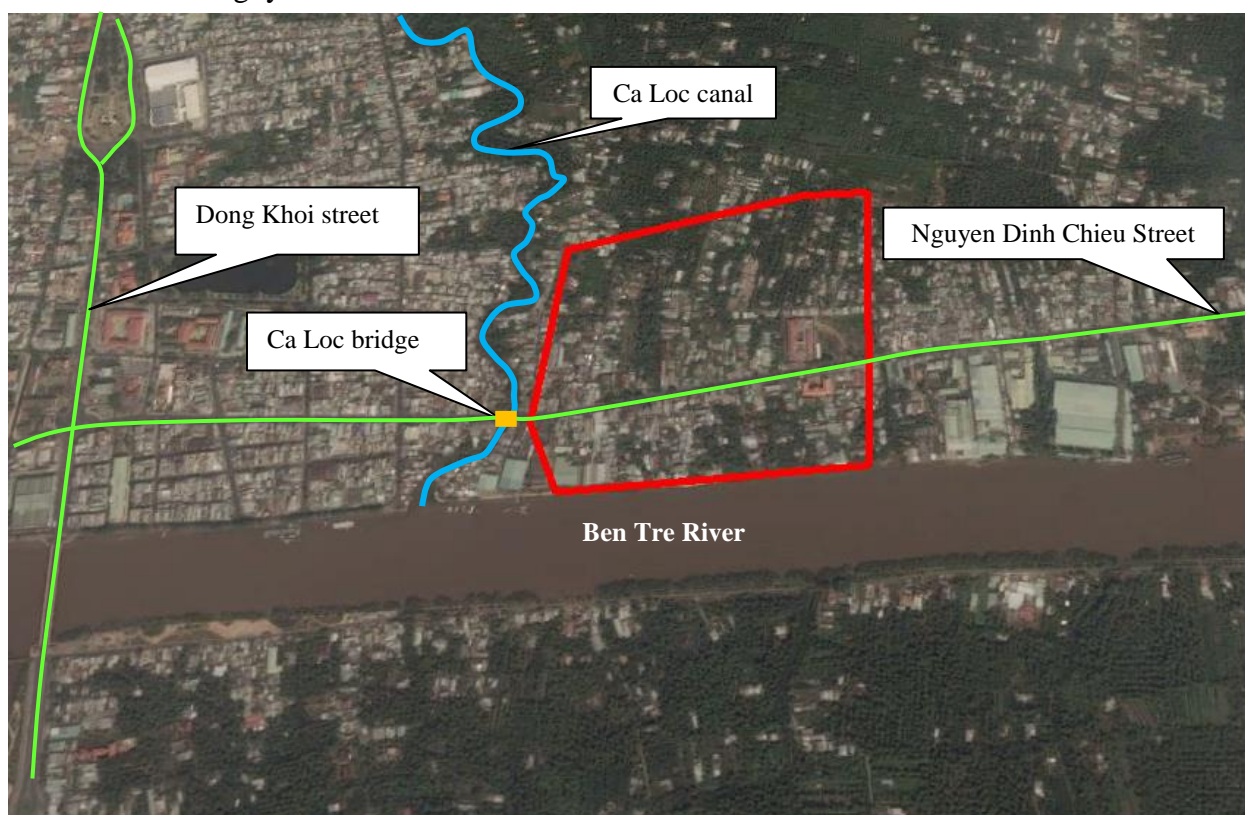
trading with agricultural and fishery products in Ben Tre market. Along the LIA is Ben Tre river, Ca Loc canal which receives wastewater from this area and neighboring areas through small canals which are 1 - 2.5 m wide in the LIA. The project will cover investment in dredging the canal with length of 854 m, depth of 0.2-0.3 m, constructing stone embankment with length of 1.6 km to ensure water drainage, environmental hygiene and urban landscape. Nguyen Dinh Chieu Street runs through LIA 6 about 600m (from Km00+625 to Km1+220) divided the LIA into 2 parts. This is the route for small traders to transport fishery and farm goods for Ben Tre market and is the transport route of raw material and waste in the Project's construction process.

The technical infrastructure of the LIA has been degraded. Concrete alleys are mixed with soil roads of 1.5 – 4 m wide, the lighting systems were temporarily mounted on low voltage pillars. The drainage systems have been degraded, which do not guarantee the drainage ability. When the Project completes, the drainage system in the LIA will be connected to the City's general system.

Along Nguyen Dinh Chieu Street, houses are spacious. The housing structure in the LIA includes mainly temporary, metal-roof, Grade-IV houses.

Within LIA 6, there are not any sensitive PCR and public works.

The transport direction of material and waste is as follows: Nguyen Dinh Chieu Street → Dong Khoi Street → Nguyen Thi Dinh Street → Ben Tre Waste Treatment Plant.



The location of LIA 6





The status of an alley in LIA 6



A drainage ditch khu LIA 6



Nguyen Dinh Chieu Street  
running through LIA 6

### ***The upgrading portfolio of LIA 7***

LIA 7 is located in the total area of 39.2 ha in Phu Khuong ward, bordering on Dong Khoi Street and Nguyen Hue road, N.18 Street.

According to the general premise of the proposed items, the ending point of Chin Te canal (from Km1+940 to Km2+500) and the beginning point of Dong Tay Avenue (from Km00+00 to Km0+560) are located in LIA 7.

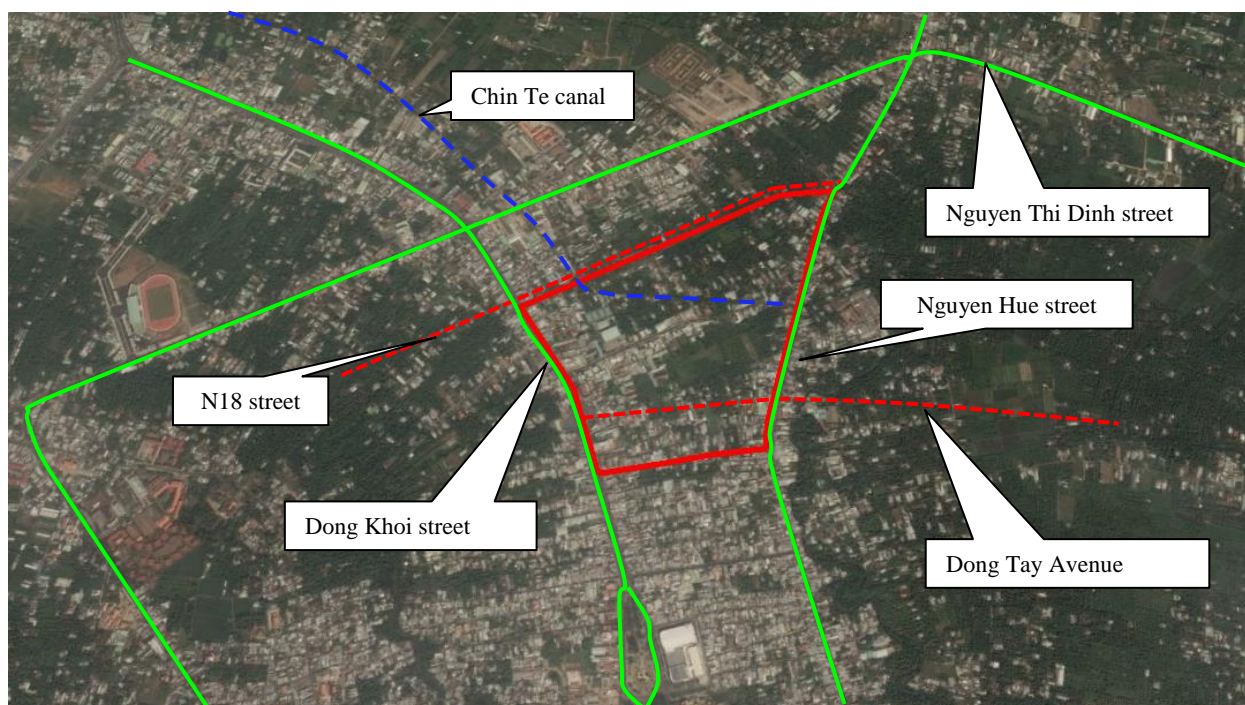
Similar to current status of other LIAs, LIA 7 also has small earth alleys interspersed with concrete ones with average width of 1.5 - 3.5 m. Most of these alleys are deteriorated and have no water drainage or lighting systems. Currently, wastewater is directly discharged into small canals in the LIA. The project will cover investment in water drainage system and dredging with length of 450 m, depth of 0.2 - 0.3 m as well as constructing stone embankment with length of 0.9 m for existing canals. When the Project completes, the drainage system in the LIA will be connected to the City's general system.

House structures are mainly Grade-III, Grade-IV alternating coconut land and lakes, ponds, canals. Inhabitants here are mainly small traders, day workers and seasonal workers to make a living.

Within LIA 7, there are not any sensitive PCR and public works.

The transport direction of material and waste is as follows: Nguyen Dinh Chieu Street → Dong Khoi Street → Nguyen Thi Dinh Street → Ben Tre Waste Treatment Plant.





The location of LIA 7



The status of an alley in LIA7



The status of an alley cutting Chin Te canal in LIA 7

**Component 2:** This component supports the improvement of the infrastructure network which links the LIA with the city downtown through the completion of roads and upgrading the drainage capacity for canals in the city center. The main investments include: building 04 Streets (Extended Ngo Quyen Street, Dong Tay Avenue, N6 Street and N18 Street) and improving 02 canals within the inner city (30/4 canal and Chin Te canal). The current status of the project area and the investment portfolio are described below.

#### ***Subcomponent 2.1: Chin Te canal***

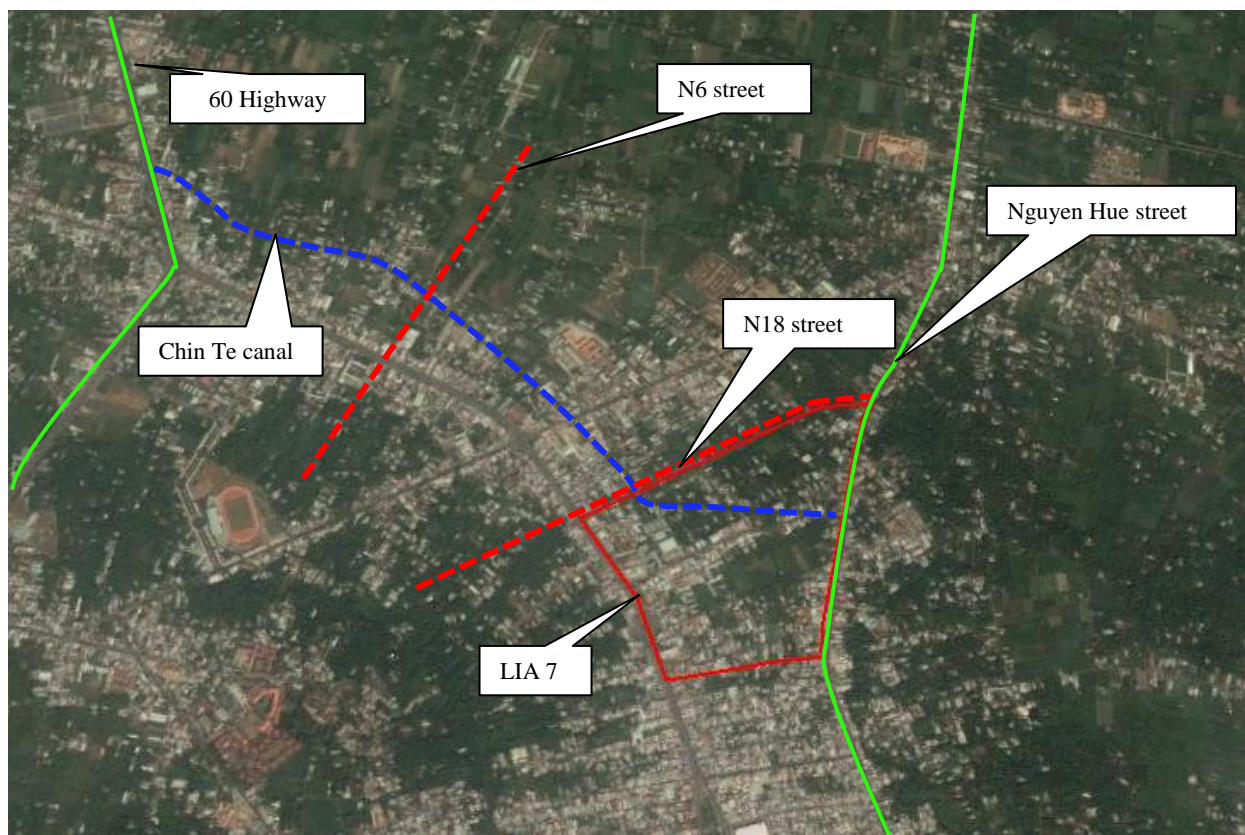
Chin Te canal is located in Zone 2 of Phu Tan ward and Phu Khuong ward. The section in the project area is 2.5 km long. The first point cuts Avenue 60 and ends at the intersection with Nguyen Hue road. Chin Te canal intersects N6 Street at Km1+70, Nguyen Thi Dinh Street at Km1+640 and Road N18 (boundary of LIA 7) at Km1+980. The canal is 3 – 4 m wide, which receives wastewater from households living both sides. Water is black and smells bad. On Chin Te canal at Km1+566.78 to Km1+664.50 is an existing concrete sewer line with length of approximately 97.7 m, width of about 3.5 m. At this location, embankment and operation road will not be constructed.



Along the canal are numerous houses (the largest is at the intersection with Nguyen Thi Dinh at Km1+450 to Km1+920), which are mainly hostels interspersed with houses and coconut land and crops. The traffic in the area is via small concrete bridges crossing canal. The bridge density on the canal is quite dense at the ending section of the canal (from Km2+070 to Km2+500). On average 2 households share a bridge (20-25 people's bridge on the canal).

There are no PCRs or sensitive receptors within scale of Chin Te canal.

The transport direction of material and waste is as follows: Nguyen Dinh Chieu Street → Dong Khoi Street → Nguyen Thi Dinh Street → Ben Tre Waste Treatment Plant.



The location of Chin Te canal



The current status of Chin Te canal



Small concrete bridges spanning the canal

### ***Subcomponent 2.2: Extended Ngo Quyen Street***

The Project will invest in building one section of Ngo Quyen Street, cutting from Tan Ke road to Doan Hoang Minh Street with the total length of 1.61 km and divided into two sections:

- Section 1: From Doan Hoang Minh Street to the planned intersection of N5 Street. The section dimension: L = 1.36 km long, B = 20.5 m wide (pavement width: 10.5 m, sidewalk width: 5 m on each side).

- Section 2: starting from the intersection with Road N5 and ending at the intersection with Tan Ke road. The section dimension: L = 0.25 km long, B = 18 m wide (pavement width: 8 m, sidewalk width: 5 m on each side).

Ngo Quyen Street passes Ward 3, Ward 4, Phu Tan ward and Phu Khuong ward.

The first point (Km0+770) mostly goes through garden interlacing houses. The ending point (Km0+770 to Km1+610) intersects with many alleys in Dong Khoi Street (Tram Bau alley, Thong Nhat alley, Cau Moi alley, etc.), where the population is dense. The current drainage is overflowing over natural altitude from high areas into low-lying areas or into dug-ditches in the reserve areas.

The living conditions in this area are relatively better than the living conditions in the LIAs. Houses are in permanent structure. The labor participates in many sectors but concentrates in trading, services, state employees, workers, etc.

Within scale of extended Ngo Quyen street, except for 25 graves sparsedly distributed along section 1 which will be displaced, there are no sensitive receptors.

The transport direction of material and waste is as follows: Nguyen Dinh Chieu Street → Dong Khoi Street → Doan Hoang Minh Street → Nguyen Thi Dinh Street → Ben Tre Waste Treatment Plant.







The status of the beginning section of Ngo Quyen Street



The status of the ending section of Ngo Quyen Street

### ***Subcomponent 2.3: Constructing linking branch roads***

#### ***N18 Street***

N18 street is proposed to be the feeder road connecting the city area located in Phu Tan and Phu Khuong wards, starting from extended Ngo Quyen street (under the project investment items) and ending at Nguyen Hue street. N18 street meets Dong Khoi street, and it is divided into 2 sections:

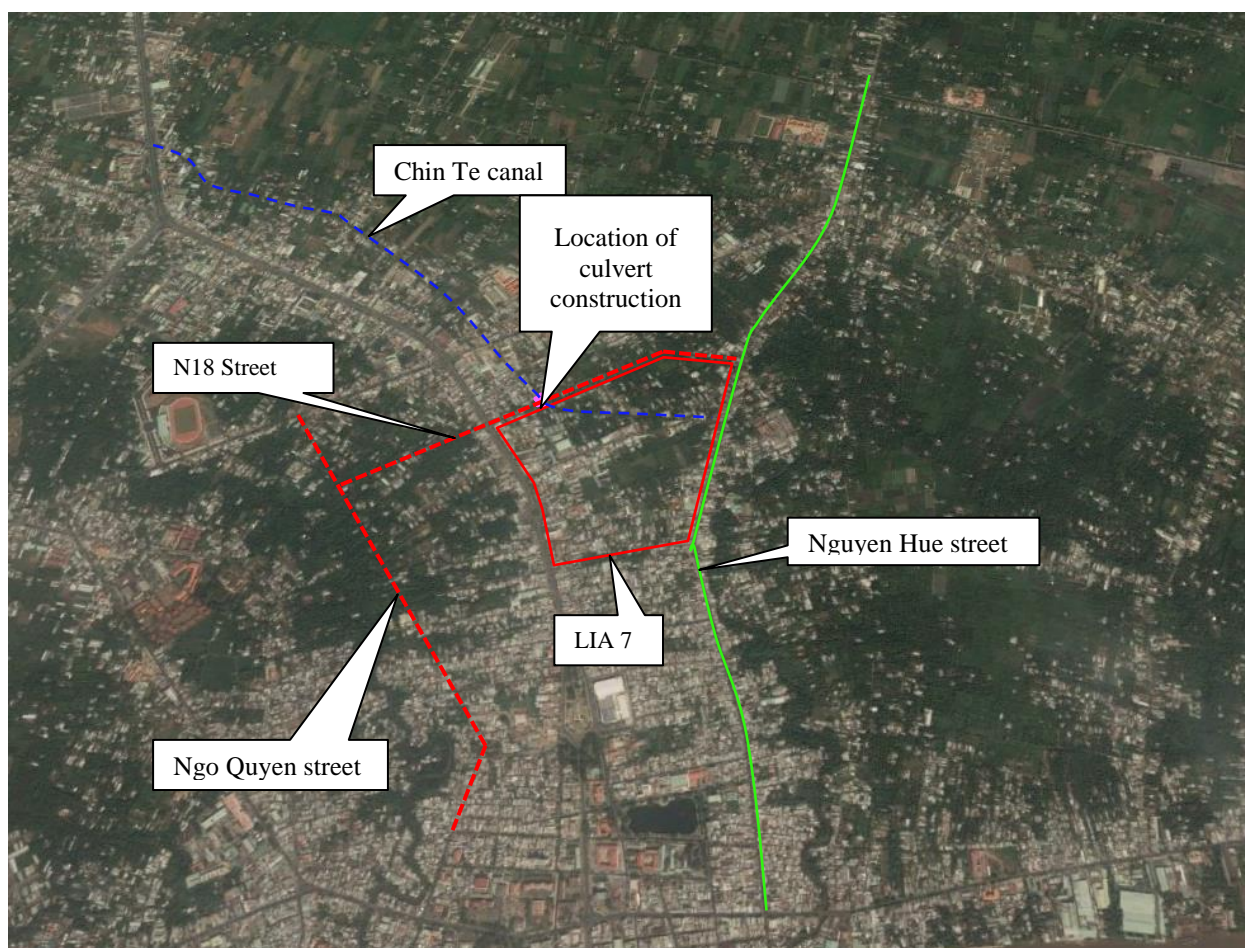
- Section 1 from Km0+00 to Km0+430. This section cuts Ngo Quyen reserve road.
- Section 2 from Km0+430 to Km1+320, this section is Northern boundary of LIA 7. The project will cover investment in constructing 02 culverts with length of 28 m, width of 2 m, height of 2 m at intersection with Chin Te canal (Km0+683.65).

The Project will invest in the construction of the scale: L = 1.32 km long, B = 24 m wide accompanied with the technical infrastructure.

Along the route are Grade-IV houses with metal roofs, which are interspersed with coconuts, bananas, decorative plants and other fruit trees. Close to houses are drains. The population is crowded, concentrating at the intersection between Dong Khoi Street (From Km0+440 to Km0+650).

On the scope of N18 Street, there are 24 graves will be displaced during road construction.

The transport direction of material and waste is as follows: Nguyen Dinh Chieu Street → Dong Khoi Street → Doan Hoang Minh Street → Nguyen Thi Dinh Street → Ben Tre Waste Treatment Plant.



The reserve N.18 Street area



Ending point of N.18 route  
with Nguyen Hue street



The burial site of tombs to  
berelocated

### *N6 Street*

N6 street is proposed to be the feeder road, connecting Ngo Quyen street with Dong Khoi street and Northeastern area of Ben Tre city located in Phu Tan ward, starting from Ngo Quyen street to the resettlement area. The project will invest in the construction of 1.31 km long, 17 m wide with full technical infrastructure.

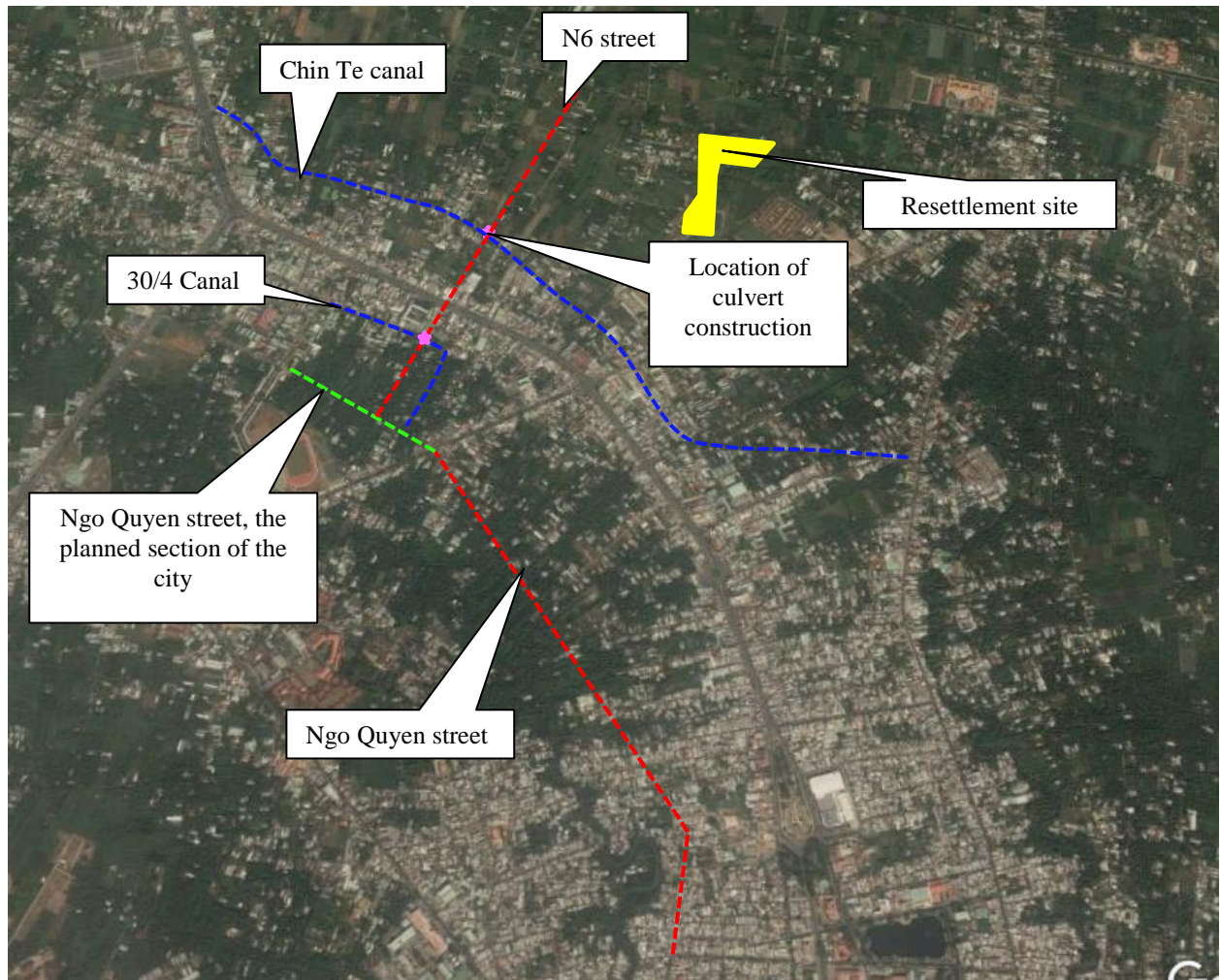
N6 street meets 30/4 canal at Km0+292.88. A box culvert with length of 19 m, height of 2 m and width of 3 m will be built to ensure flow cross section. At the same time, N6 street also meets Chin Te canal at Km0+665.83. 02 box culvert across the canal will be constructed at this intersection with length of 19 m, size 2x(2x2) m.

People focus in the intersecting section with Dong Khoi Street (From Km0+310 to Km0+570). The rest mainly includes coconut plantations interspersed with houses. There are no drainage and lighting system in the reserve area. Stormwater runs into current ditches and low-lying areas.

There are no PCR and sensitive receptors.



The transport direction of material and waste is as follows: Nguyen Dinh Chieu Street → Dong Khoi Street → Doan Hoang Minh Street → Nguyen Thi Dinh Street → Ben Tre Waste Treatment Plant.

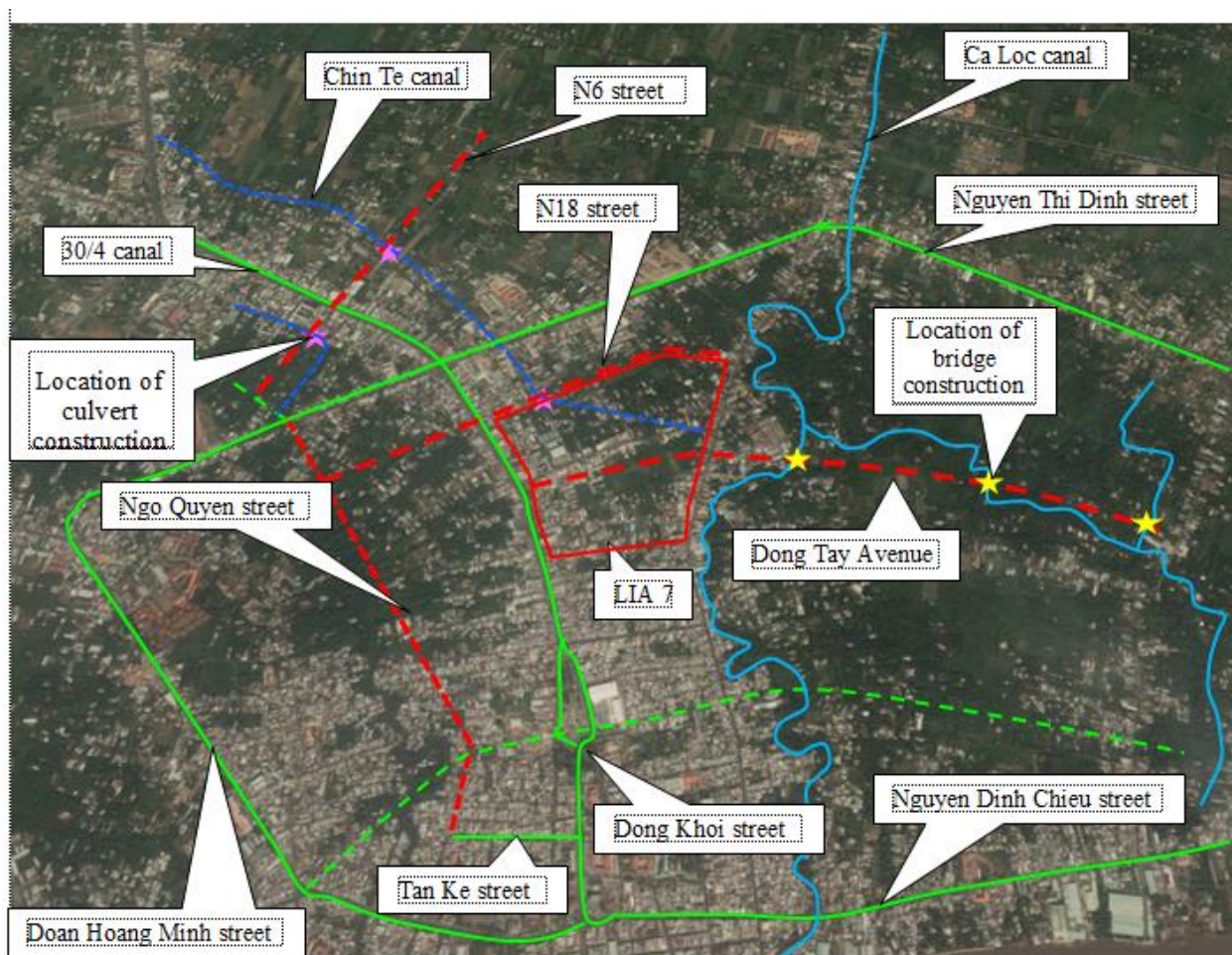


The reserve area of N6 Street



The status of N6 Street





Locations of road items under the project

#### ***Subcomponent 2.4: Dong Tay Avenue***

Dong Tay Avenue is proposed passing Phu Hung commune and Phu Khuong ward, beginning at Dong Khoi Street and ending at Thay Cai Street (D5 road). The Project will invest in the following construction scale: 2.15 km long and 41 m wide (pavement width: 10.5 m×2; separators: 4 m wide; sidewalks: 8 m on each side). On Dong Tay Avenue, 03 small bridges will be constructed across Ca Loc canal. Each bridge will includes two parallel sections with scale of each section as follows: at Km0+717,5 bridge's length of 18 m, width of 14 m; (ii) at Km1+443,5 bridge's length of 15 m, width of 14 m; (iii) at Km1+997,15 bridge's length 33 m, width 14 m.

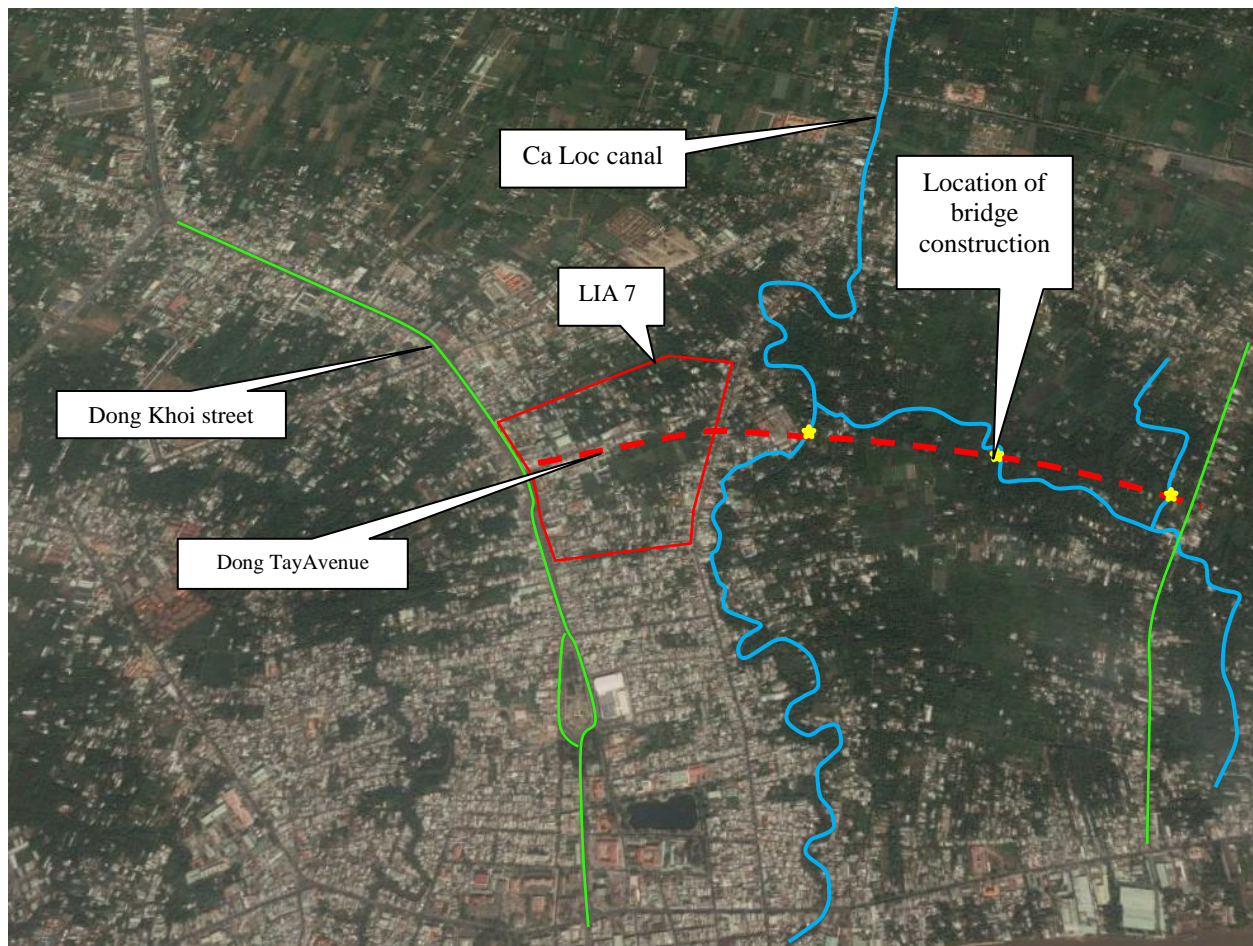
The current Dong Tay Avenue (from Km0+00 to Km0+560) is located in LIA 7 and is densely populated. Along the ending section (from Km0+560 to Km2+500) are mostly coconut land and houses.

People in the area mainly live on trading (households face the Avenue). Inside the Avenue, people live on agriculture.

The sensitive structures include: Ba Chua Xu temple (far from the project 30 m), Tinh Xa Ngoc Truoc pagoda (35 m away from the project). 42 graves will be displaced during road construction. The detailed description of this project is in Table 2.28, Section 2.6.

The transport direction of material and waste is as follows: Nguyen Dinh Chieu Street → Dong Khoi Street → Nguyen Thi Dinh Street → Ben Tre waste treatment plant.





The reserve roundabout area of Dong Tay Avenue



The status of the ending point of Dong Tay Avenue

### ***Subcomponent 2.5: 30/4 Canal***

The section passing the Project is 0.77 km long, starting from the resettlement site of Ao Sen - Cho Chua and ending at Doan Hoang Minh Street. The canal bed is 3 – 4 m wide. The canal is much polluted with water stagnant due to the construction of the stadium and the market, which block the water flow in the canal.

Canal 30/4 cuts N6 Street at Km0+355. The residential areas are distributed along both sides of the canal (the distance is from 1 – 5 m) with high density. The housing structure is mainly Grade-IV houses. From Km0+355 to Km0+700 along the canal is mainly vacant land interspersed with residential land. The transport in the area through access roads connects with the canal and small concrete bridges crossing the canal (about 4 roads).

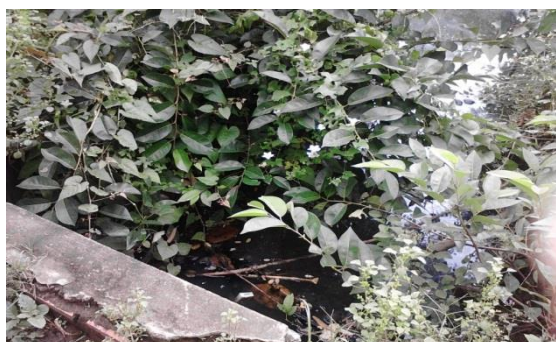
On the scale of Canal 30/4, there is a grave will be displaced.



The transport direction of material and waste is as follows: Nguyen Dinh Chieu Street → Dong Khoi Street → Doan Hong Minh road → Nguyen Thi Dinh Street → Ben Tre Waste Treatment Plant.



The location of 30/4 Canal



The status of the beginning point of 30/4 Canal



The status of the bend between 30/4 Canal

### Component 3: Resettlement Site

The project does not build infrastructure but buy ground to serve the resettlement demand of the displaced households due to land acquisition. The resettlement site is available in Phu Tan with the total area of 5.4 ha with full infrastructure.

On the scale of the Resettlement Site, there are not any sensitive PCR and public works.

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

### 2.6.1. Ben Tre Physical Cultural Resources

In Ben Tre city, there are 1 national-ranked and 2 provincial ranked monuments, including: “Accommodation and Activities of Pham Ngoc Thao Colonel” (Ward 3); Phu Tu temple and Bach Mai ancient trees (Phu Hung commune), An Hoi temple (Ward 2). A detailed description of these works are presented as follows.

- “Accommodation and Activity of Pham Ngoc Thao Colonel”: Monuments have a total area of 13,407.7m<sup>2</sup>, located at 146 Hung Vuong Street, Ward 3, Ben Tre city. This is one of the few houses built by the French in Ben Tre from the early twentieth century retained nearly intact ancient architectural Western arts and surrounding natural landscape. Buildings distance to the nearest item of the project about 500 m to Lia 1.
- Phu Tu temple and Bach Mai ancient trees: was ordained in 1910 (Khai Dinh II). It is located at Phu Hao, Phu Hung, Ben Tre city, Ben Tre province. It was built before 1904 with the total area is 9,695 m<sup>2</sup>. In the yard has Bach Mai ancient tree with a lifespan of over 300 years. It is an object of cultural heritage, as well as the intangible cultural, sticking to the spiritual life of local residents for many generations. With that meaning, dated 10/01/2008, Ben Tre Province People's Committee issued Decision No.75/QD-UBND recognized Phu Tu temple and Bach Mai ancient tree is historic provincial cultural and artistic architectural folk beliefs. In 2014, Bach Mai ancient tree recognized "national heritage". This site is 1.85 km away from the civil construction works of Dong Tay Avenue (Phu Hung commune).
- An Hoi temple is one of the oldest house in Ben Tre was built long ago (unknown year), located in Ward 2, Ben Tre city, Ben Tre province (the old name is An Duc Hamlet, Bao Huu district), distance to Nguyen Dinh Chieu street (expected routes used for transporting raw materials and waste disposal) about 58 m. During the construction phase An Hoi temple could be affected by dust and noise during transportation.



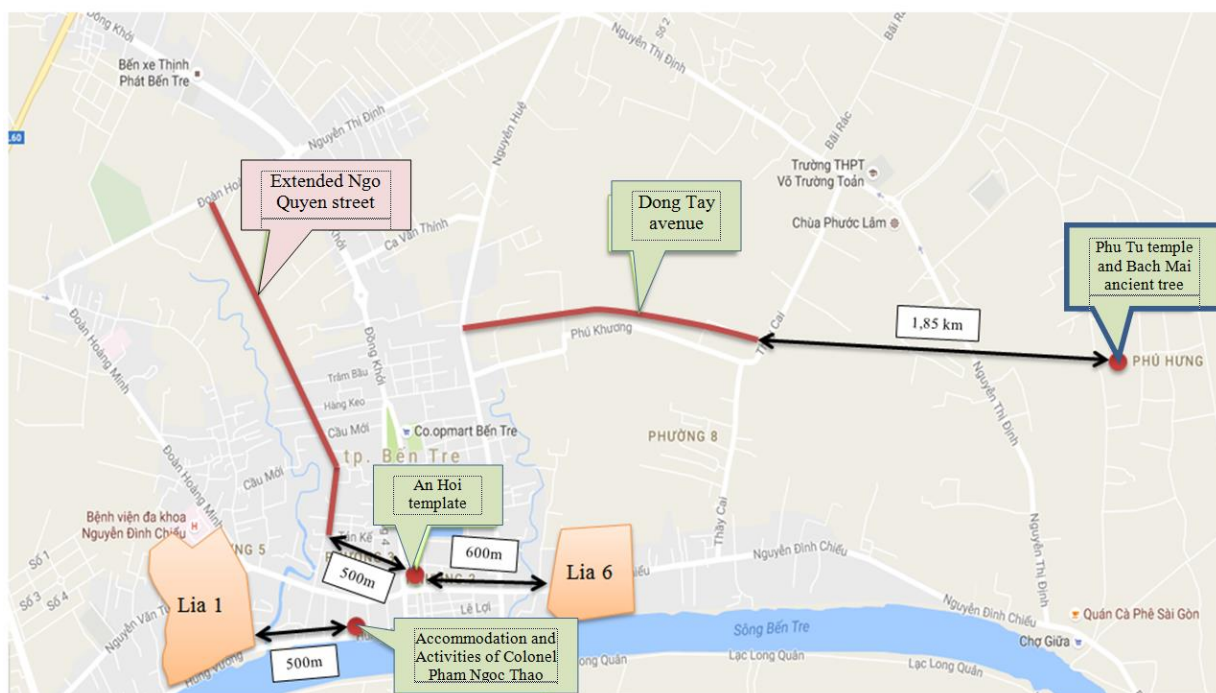
Accommodation and Activity of Pham Ngoc Thao Colonel”



Phu Tu Temple and Bach Mai Tree



An Hoi Temple








**Figure 2.5: Location of Physical Cultural Resources in the Subproject Area**








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






During the project implementation, there are about 92 graves needed to be relocated due to the construction of extended Ngo Quyen Street (25 graves); upgrading of investment Dong Tay Avenue (42 graves), upgrading of investment N18 Street (24 graves). According to the site survey, it is anticipated that some PCRs and sensitive points could be temporarily affected during the construction period. The list of sensitive PCRs and receptors in the project area is described in Table 2.8 below.







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


Name/Picture	Work location	Distance to the project (m)	Description
PCRs and sensitive points in the project area			
Component 1: Upgrading the tertiary infrastructure for four LIAs (LIA 1, LIA 2, LIA 6, LIA 7)			
 Kim Quang Temple	LIA 1	2	<ul style="list-style-type: none"><li>It is on the South West of LIA 1, faces to Hung Vuong Street with its back against Nguyen Van Tu Street.</li><li>Located in a high density of population in LIA 1.</li></ul>
 Shrine		3	<ul style="list-style-type: none"><li>It is located on the South West of LIA 1, low population density.</li><li>This shrine is for 5 Misses Ngu Hanh.</li></ul>
Component 2: Upgrading Priority Infrastructure (Chin Te canal, Extended Ngo Quyen Street, N6 Street, N18 Street, Dong Tay Avenue, 30/4 canal)			
 Ba Chua Xu Temple	Dong Tay Avenue	30	<ul style="list-style-type: none"><li>This small temple, is worship place for local people in Ben Tre City and surrounding areas.</li><li>It is often crowded on the 1st and the full moon days of the month.</li></ul>
 Ngoc Truoc Temple		35	<ul style="list-style-type: none"><li>It is a spiritual place for residents within the ward and the neighborhood of Dong Khoi Street.</li></ul>
 Graves	Extended Ngo Quyen Street	5-80	<ul style="list-style-type: none"><li>Graves are distributed along the reserve area of Ngo Quyen Street (the beginning section is near Doan Hoang Minh Street). The graves are located in household premises.</li><li>The area mainly includes coconut land, ponds and lakes, drains.</li></ul>

Name/Picture	Work location	Distance to the project (m)	Description
			People's houses are scattered.
 <p>Graves Area</p>	N18 Street	4-15	<ul style="list-style-type: none"> <li>The burial site is on the right of the beginning of the road (from Dong Khoi Street).</li> <li>Behind the graves are households and a small alley to Chin Te canal. Crowded residents.</li> </ul>
<b>Resettlement Site: None</b>			
<b>Transportation Routes: Dong Khoi Street, Nguyen Dinh Chieu Street, Hoang Lam Street, Doan Hoang Minh Street, Nguyen Thi Dinh Street</b>			
 <p>Ward 5 Health Station</p>	LIA 1, LIA 2	2	<ul style="list-style-type: none"> <li>Hoang Lam Street starts at Hung Vuong intersection and ends at Nguyen Van Tu Street intersection. The road width is about 8 m wide, the road structure is asphalt-concrete which is in good state. The density of traffic and population are relatively high.</li> <li>On Hoang Lam Street and on the right of LIA 1 area. There are small business households around. High traffic and residential density.</li> </ul>
 <p>Ong Temple</p>		20	<ul style="list-style-type: none"> <li>The temple is right at the intersection of Hoang Lam and Hung Vuong Street, faces to Hung Vuong Street and is on the left of Hoang Lam Street.</li> <li>This area is high density of population and traffic flow.</li> </ul>
 <p>Nga 5 Market</p>		6	Locates at the intersection of Doan Hoang Minh and Hoang Lam Street, faces LIA 1 area. High density of traffic and residential.
 <p>Bach Van Temple</p>	LIA 2, Ngo Quyen Street, N18 Street, N6 Street, 30/4 canal	6	<ul style="list-style-type: none"> <li>The temple is located Doan Hoang Minh Street, East side of LIA 2.</li> <li>Doan Hoang Minh Street is the main route in Ben tre city. The road width is 20 m wide. The asphalt concrete structure is quite well.</li> <li>It closes to houses and high traffic flow area.</li> </ul>



Name/Picture	Work location	Distance to the project (m)	Description
 <p>Nguyen Dinh Chieu Hospital</p>		3	Is on the North of LIA 2 area, faces Doan Hoang Minh Street. The density of residential and traffic near the hospital is high.
 <p>Tran Van An Traditional Medicine Hospital</p>		8	Faces to Doan Hoang Minh and opposite to LIA 2 are, high density of people moving in and out of the hospital.
 <p>An Hoi Temple</p>	LIA 1, 2,6,7, Extended Ngo Quyen Street, Dong Tay Avenue, N18, N6, Chin Te canal, 30/4 canal	3	<ul style="list-style-type: none"> <li>The Temple faces to Nguyen Dinh Chieu Street.</li> <li>There is one bus station in front of the temple, opposite to Vien Minh Pagoda.</li> <li>Local populations are mostly officers and traders.</li> </ul>
 <p>Ward 8 Health Station</p>		8	<ul style="list-style-type: none"> <li>Located in front of Nguyen Dinh Chieu Street. Nguyen Dinh Chieu Street is approximately 8 m wide with good asphalt concrete structure. The traffic and the population density is quite high.</li> <li>Locates in a concentrated area of schools and the administrative offices of the City, such as Ben Tre Party Committee Ben Tre – Ward 8, Ward 8 Elementary School, etc. The Health Station is about 8m to the edge of Nguyen Dinh Chieu Street. On the route of Nguyen Dinh Chieu, the traffic density and the residential along with factories are relatively high.</li> </ul>
 <p>Rang Dong Kindergarten</p>		8	<ul style="list-style-type: none"> <li>Located on Nguyen Dinh Chieu Street. The inhabitants here are very crowded and are mainly small traders.</li> <li>Opposite to Ward 8 Primary School. Rang Dong Kindergarten is also 8m from the edge of Nguyen Dinh Chieu Street.</li> </ul>

Name/Picture	Work location	Distance to the project (m)	Description
 Ward 8 Primary School		10	Is next to Ward 8 Health Station and opposite to Rang Dong Kindergarten, 10m to the edge of Nguyen Dinh Chieu Street.
 Ben Tre Agro-Market		65	<ul style="list-style-type: none"> <li>The market has two sides, one turns on Nguyen Dinh Chieu Street and far from the Street about 65m; another turns on Ben Tre River, far from the river 20 m. The traffic flow is quite crowded.</li> <li>Being on the South West of LIA 6 area, the market is the food supply for citizens in ward 8 and its neighbors.</li> </ul>
 Vocational School in Ben Tre	N6 Street, N18 Street, Dong Tay Avenue, Extended Ngo Quyen Street, LIA 6, LIA 7, 30/4 canal, Chin Te canal	5	<ul style="list-style-type: none"> <li>Dong Khoi is Ben Tre city's main Street and the base of many offices and schools. The traffic density and houses on the Street is quite high. This is the asphalt Street of about 30m wide with the tree separator.</li> <li>Faces to Dong Khoi Street. Surrounding area is business with various scale.</li> </ul>
 Nguyen Dinh Chieu High school		5	<ul style="list-style-type: none"> <li>Located in front of Nguyen Dinh Chieu Street. The traffic density is quite high.</li> <li>Is opposite to HD bank, Ben Tre branch.</li> </ul>
 Ben Tre secondary school		3	<ul style="list-style-type: none"> <li>It is located at the intersection of Dong Khoi and 3/2 Street, faces to Dong Khoi Street.</li> <li>Surrounding areas are government offices and public works: DONRE is on the right, DONRE is just behind.</li> </ul>
 Ben Tre market		11	<ul style="list-style-type: none"> <li>Located at Ward 3, Dong Khoi Avenue.</li> <li>Ben Tre river is on the left side. Ben Tre 1 bridge is about 13.5 m wide.</li> </ul>

Name/Picture	Work location	Distance to the project (m)	Description
 Vo Truong Toan school	LIA 1,2,6,7, Extended Ngo Quyen Street, Dong Tay Avenue, N6 Street, N18 Street, 30/4 canal, Chin Te canal	11	<ul style="list-style-type: none"> <li>▪ The school is located on Nguyen Thi Dinh Street. The road width is 7 m wide. The traffic and population density is not high. There are houses interspersed with gardens.</li> <li>▪ Located near Phu Hung Commune People's Committee and the intersection of Lo Thay Cai and Nguyen Thi Dinh so the traffic density in the region is relatively high. Vo Truong Toan Secondary School is about 10 m from the edge of Nguyen Thi Dinh.</li> </ul>

## 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 practice includes the description, identification and comparison of design alternatives which are important to support the decision-making choice of construction activities. 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 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 summarize 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. ASSESSING “WITHOUT PROJECT” AND “WITH PROJECT”

This section analyzes the alternatives - “Without project” and “With project”

- (i) **“Without Project”**: In the case of not implementing the subproject, 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 will 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 (Chin Te canal, 30/4 canal) will continue to pose traffic jams and cause serious environmental pollution and the spread of epidemic diseases.
  - In addition, the city of Ben Tre 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 Ben Tre 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 Ben Tre City, becoming resilient to climate change impacts and to mitigate vulnerabilities due to sea level rise, flood risks, and landslides, etc.

The results of analysis are shown in Table 3.1.

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

Major Environmental and Social Issues	WITHOUT PROJECT	WITH PROJECT
<b>Environmental issues</b>		
<i>Air Pollution</i>	<p>Air pollution is caused by the following sources:</p> <ul style="list-style-type: none"> <li>- Uncollected garbage and the backlog of solid wastes leading to the accumulation of garbage and causing bad odor in low-income areas (LIAs);</li> <li>- Incomplete and deteriorated roads, especially the internal roads in LIAs, causing traffic congestion is also an additional reason for air pollution.</li> </ul>	<p>The project aims to solve problems of environmental pollution, include:</p> <ul style="list-style-type: none"> <li>- The upgrading and expansion of alleys in LIAs will enable the accessibility of trucks for collecting garbage daily to avoid the backlog that causes environmental pollution;</li> <li>- Upgraded and renovated alleys and roads will increase efficient connectivity of transport links, which minimizes congestion during rush hours;</li> <li>- The implementation of the Project will also cause environmental negative impacts on ambient air quality due to construction activities. However, these effects are short term and will cease when the construction phase is completed.</li> </ul>
<i>Water Pollution</i>	Canal water is seriously polluted by the direct discharge of domestic wastes and effluent from squatter households along the canals.	The quality of surface water will be improved by relocating squatters and households living along canals, and dredging canals for better flow conditions.
<i>Landslide</i>	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.
<i>Drainage Capacity</i>	Urban areas are still flooded by upstream floods, high tides and heavy rains.	Reducing flooding caused by rains and tides by installing drainage systems in 04 LIAs, 04 roads and upgrading Chin Te and 30/4 canals.
<i>Climate Change Adaptation</i>	<p>Ben Tre City is severely affected by climate change consequences, including: abnormal changes in water flow regime, which results in severe floods in the wet weather; freshwater shortage, droughts and salt intrusion in the dry season; etc.</p> <p>Landslide events often occur and are complicated mainly in urban residential areas and main transport routes that</p>	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.

	damage people's property and lives.	
<b>Social issues</b>		
<i>Land Acquisition and Resettlement</i>	Not affected by land acquisition and resettlement.	About 2,189 households are estimated to be affected, including 2,086 partially affected households and 103 fully affected households.
<i>Disturbance of daily community activities</i>	No impacts on the lives and activities of local people in Ben Tre city and community relationships.	Livelihoods and daily activities of local people as well as community's relations will be affected by relocation and construction activities.
<i>Accessibility of social infrastructure</i>	Local communities (LIAs) suffer from risks and incidents such as fires, natural disasters, diseases, etc. due to the limited accessibility to technical and social infrastructure.	Improved technical infrastructure (traffic, drainage, lighting, etc.) will enable the connectivity between areas and among areas of the region. Losses of lives and property will be minimized due to risks and incidents.
<i>Health and Sanitation Improvement</i>	Environmental sanitation conditions are exacerbated due to flooding and poor water quality which increase in epidemic disease.	Improved environmental sanitation conditions will minimize the spread of diseases, especially for households living along Chin Te and 30/4 canals.
<i>Increasing Land Value</i>	Low land value	Upgrading and renovation of roads will lead to the formulation of new residential areas and social infrastructure. This means that the value of land in these areas will be multiplied many times higher than the original value. Built embankments of Chin Te and 30/4 canals will enable open space and better landscape.
<i>Urban Landscape</i>	Poor urban landscape without infrastructure improvement	Encroached households will be relocated, creating open space along the river banks with riverside landscape architecture, public spaces, planting and restoration of traditional architecture.
<i>Benefits</i>	None	About 40,000 and 152,078 people are direct and indirect beneficiaries. Additionally, living condition of households along canals will be stable.



### **3.2. “WITH PROJECT” ALTERNATIVES**

This section will provide alternative analysis of technical options for the Project’s components, including: (i) Upgrading tertiary infrastructure in LIAs (Component 1) and (ii) Renovating Chin Te and 30/4 Canals (Component 2). There is no alternative analysis for the investment items of road construction of Component 2 (sub-components 2.1, 2.2 and 2.3) 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 Section 3.1.

#### **3.2.1. Component 1: Upgrading Tertiary Infrastructure in Low Income Areas (LIAs)**

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 system, 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 4 m 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 4 m will be prioritized; small alleys will be improved in accordance 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	<b>Description</b>	<ul style="list-style-type: none"> <li>Expanding all alleys in LIAs with 4 m wide. The expansion will be made toward both sides from the current centerline.</li> <li>Technical infrastructure will be installed coupled with road expansion, including: elevation and surface concrete, installation of sewerage and lighting systems, and trees).</li> </ul>	<ul style="list-style-type: none"> <li>Upgrading and improving existing alleys/lanes with current width of 2 – 3 m.</li> <li>Installing technical infrastructure, including: water supply, drainage and lighting systems, and trees.</li> </ul>	<ul style="list-style-type: none"> <li>Widening main alleys with minimum width of 4 m will be prioritized; small alleys will be improved based on current status with the width is more than 2 m.</li> <li>Installing technical infrastructure, including: elevating and surfacing with concrete, installing drainage and lighting systems and trees.</li> </ul>
2	<b>Technical assessment</b>	<ul style="list-style-type: none"> <li>The 4 m wide alley is adequate to arrange technical facilities which enable the traveling of fire-fighting trucks and ambulances.</li> <li>It is difficult for construction activities due to compensation and site clearance.</li> <li>Good landscape, wide alley and easy travel.</li> </ul>	<ul style="list-style-type: none"> <li>The narrowness of alley width is difficult to arrange technical infrastructure and obstruct the travelling of fire trucks and ambulances.</li> <li>It is easy for construction activities as in line with the current baseline.</li> <li>Poor landscape because the alleys are narrow.</li> </ul>	<ul style="list-style-type: none"> <li>The 4m wide alley is adequate to install technical facilities which enable the traveling of fire trucks and ambulances.</li> <li>Small lanes and alleys can be easily connected with main roads.</li> <li>Ensuring landscape and public amenities.</li> </ul>
3	<b>Social assessment</b>	<ul style="list-style-type: none"> <li>Ensuring the sustainability of residential areas with the future growth.</li> <li>Minimizing traffic accidents since alleys are expanded and better visibility.</li> <li>Improving living conditions of local people because of convenient and easy accessibility to social infrastructure services.</li> <li>Causing disturbance of daily</li> </ul>	<ul style="list-style-type: none"> <li>The city future development orientation is not secure.</li> <li>Living conditions of local people are not much improved due to the alleys are still narrow.</li> <li>Construction activities will be easy because of not having many site clearance works.</li> <li>No disturbance of local daily activities because of not having compensation and site clearance.</li> </ul>	<ul style="list-style-type: none"> <li>The city future development orientation is not secure.</li> <li>Living conditions of local people are not much improved due to the alleys are still narrow.</li> <li>Less disturbance of local daily activities because number of affected households is minimized.</li> <li>Construction and operation activities will be easier.</li> <li>Conflicts and grievance will be</li> </ul>

No.	Content	Option 1	Option 2	Option 3
		<p>activities for local people due to great volume of compensation and site clearance.</p> <ul style="list-style-type: none"> <li>It could result in conflicts and compensation complaints during the pre-construction phase.</li> </ul>	<ul style="list-style-type: none"> <li>Conflicts and grievance will be minimized as construction works are in line with current baselines.</li> </ul>	<p>minimized since construction works are in line with current baseline.</p>
4	<b>Environmental sustainability</b>	<ul style="list-style-type: none"> <li>Urban environmental hygiene and sanitation conditions are improved substantially.</li> <li>Urban flooding is eliminated because stormwater runoff and wastewater will be collected.</li> <li>Domestic solid wastes will be collected thoroughly due to the expansion of alleys.</li> <li>Demolition of buildings, construction of alleys, drainage and lighting systems will cause negative environmental impacts (noise, dust, debris and construction solid wastes).</li> </ul>	<ul style="list-style-type: none"> <li>Environmental hygiene and sanitation conditions are improved substantially.</li> <li>Urban flooding will no longer occur because stormwater and wastewater will be collected.</li> <li>Environmental problems are not totally eliminated because of narrow alleys limiting garbage collection.</li> <li>Without site clearance, there is no environmental effect of noise and dusts.</li> </ul>	<ul style="list-style-type: none"> <li>Urban environmental hygiene and sanitation conditions are improved substantially.</li> <li>Flooding is eliminated because stormwater and wastewater will be collected</li> <li>Domestic solid wastes will be thoroughly collected due to the expansion of alleys.</li> <li>Demolition of buildings, construction of alleys, drainage and lighting systems will cause negative environmental impacts (noise, dust, debris and construction solid wastes).</li> </ul>
5	<b>Investment effectiveness</b>	<ul style="list-style-type: none"> <li>The price of land and house will be rapidly boosted.</li> <li>Compensation and resettlement costs are higher due to more affected households.</li> <li>High cost for a large volume of construction works.</li> </ul>	<ul style="list-style-type: none"> <li>Land and house values are not much boosted because of insignificant improvement of small alleys.</li> <li>Compensation and resettlement costs are minimized.</li> <li>Low costs for construction.</li> <li>High effectiveness of investment because of short alleys.</li> </ul>	<ul style="list-style-type: none"> <li>House and land values increase rapidly.</li> <li>Compensation and resettlement costs are higher due to more affected households. However, these costs are higher than Option 2 and lower than that of Option 1.</li> <li>Construction cost will be higher than that of Option 2 but lower than Option 1.</li> </ul>
	<b>Selection</b>	<p>In terms of social, environmental and effective aspects, the analysis shows that:</p> <ul style="list-style-type: none"> <li>Option 1 has the highest cost of investment and land clearance because of widening all alleys in LIAs with minimum width of 4m.</li> </ul>		

No.	Content	Option 1	Option 2	Option 3
		<p>Hence, option 1 is not selected.</p> <ul style="list-style-type: none"><li>▪ Option 2 has the lowest cost of investment and land clearance. However, this option does not thoroughly address environmental problems, i.e uncollected solid waste remains due to narrow alleys limiting the accessibility of collection trucks.</li><li>▪ 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.</li></ul> <p>Thus, <b><u>Option 3 is selected.</u></b></p>		

### 3.2.2. Component 2: Renovating Urban Canals – Chin Te canal and 30/4 canal

As indicated in Table 1.1 (Chapter 1), the Project will invest on the renovation of the urban canal system of Ben Tre City. According to the project owner, 2 urban canals were chosen to be the project investment items due to the necessity of urban environmental improvement of the city's inner area. These canals are Chin Te canal (Sub-component 2.1) and 30/4 canal (Sub-component 2.5) whose existing conditions are described below:

- Chin Te Canal stretches over the geographical location of Phu Khuong and Phu Tan wards. It used to be an irrigation canal for agricultural areas of Phu Khuong, Phu Tan wards and Son Dong commune. Due to urbanization coupled with low public awareness, the canal has been seriously polluted by solid wastes and domestic wastewater. This affects more than 238 households along the canal. Presently, the canal water is black and bad odor.
- 30/4 Canal is an earthwork drainage canal for Phu Khuong ward. The canal is currently deposited, polluted and bad odor that affect living conditions and human health problems of local people. Further, both canal's banks are earthwork which subject to be eroded due to heavy rains. Side roads of the canal are too narrow which poses traveling difficulties for the people.

Given with this context, the proposed construction works of canal renovation include dredging, embankment in association with landscaping, and constructing a 2.5 m wide road for improving sanitation and living conditions of local people on both sides.

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

- Option 1: Vertical embankment with coarse stone;
- Option 2: Vertical embankment with reinforced concrete wall.

The analysis of these three technical alternatives is presented in Table 3.3.

**Table 3.3: Technical Alternatives Comparison and Selection of Canal Embankment**

	OPTION 1	OPTION 2
Description	Vertical embankment with coarse stone	Vertical embankment with reinforced concrete wall.
Technical	<ul style="list-style-type: none"> <li>- Stability is acceptable but lower than that of option 2. Landslide may reoccur because the roof structures have lower bearing strength than that of option 2.</li> <li>- Construction duration is shorter than that of option 2. Simple construction solution.</li> <li>- Suitable with small canal cross-section because of small occupied area.</li> <li>- Convenient for operation and maintenance.</li> </ul>	<ul style="list-style-type: none"> <li>- Highest stability. Structures are sustainable.</li> <li>- High construction volume, long construction duration and complicated construction solution.</li> <li>- Suitable with small canal cross-section because of small occupied area.</li> <li>- Convenient for operation and maintenance.</li> </ul>
Environmental	<ul style="list-style-type: none"> <li>- Flow is not narrowed down because of vertical embankment.</li> <li>- Environmental impacts during construction phase (dust, noise, vibration, waste) are at medium level.</li> </ul>	<ul style="list-style-type: none"> <li>- Flow is not narrowed down because of vertical embankment.</li> <li>- Environmental impacts during construction phase (dust, noise, vibration, waste) are at high level.</li> </ul>
Social	<ul style="list-style-type: none"> <li>- Impacts of land acquisition and resettlement are low</li> </ul>	<ul style="list-style-type: none"> <li>- Impacts of land acquisition and resettlement are low.</li> </ul>



Investment cost	- Low construction costs.	- High construction costs.
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Based on analyzed aspects, options 1 and 2 have similar strong and weak points. However, option 1 is suitable with current status of the canal with low construction cost and environmental impacts lower than that of option 2, so option 1 is selected as investment option.

### 3.2.3. Component 3: Resettlement Area

There is no alternative analysis for this Component due to the resettlement area is available with full investment of infrastructure (water supply, drainage and electrical systems). However, its location and planning are also taken into account of consideration when selecting as follows:

(i) Location:

The resettlement area is located in Nguyen Thi Dinh street, Phu Tan ward, Ben Tre City, 1 km from the central city. It is about 700 m away from Phu Khuong traffic cross-section and 800 m away from Tu Dien traffic roundabout in which it borders with army and residential area in the Eastern side; planned residential area in the West; residential area and existing asphalt road (connecting with Nguyen Thi Dinh street); and a transport route to new bus station of Tu Dien.

(ii) Planning:

The detailed planning (Scale 1:500) of Phu Tan Resettlement Area was approved by the People's Committee of Ben Tre province, Decision No. 01/2011/QD-UBND dated 25 January 2011. It is invested and owned by Ben Tre Construction Material Jointstock Company. The area is planned for residential and resettlement purpose in Ben Tre City.

(iii) Infrastructure:

As approved by Ben Tre People's Committee, Phu Tan Resettlement Area is consistent with general and detailed planning scheme. The area closes to transport network, convenient and easy for traveling to the central part of City. Particularly, it is situated in a planned region with following advantageous aspects:

- Hung Phu residential area is invested with full technical and social infrastructure, which is next to the resettlement area and will create additional favorable conditions for the region;
- Existing 22 KV power line, water supply and drainage systems on Nguyen Thi Dinh street (on the southern side).
- Phu Dien Bus station and infrastructure system will be in place;
- Surrounding areas are agricultural land, ponds and no physical cultural resources or conservation architecture, and therefore, no compensation is required.

## **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 Ben Tre 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, and controllable and will cease upon completion of the construction phase. This chapter presents the type, level and scale of impacts caused by construction activities of each project component.

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

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

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

#### **4.1.1. Potential Positive Impacts**

The implementation of the project “Vietnam Urban Upgrading - subproject Ben Tre City, Ben Tre Province” will bring positive impacts on living standards, environmental conditions and basic infrastructure services in the project area. These positive impacts are summarized as follows:

- Additional economic, social, environment and aesthetic benefits from the construction of linear parks along Chin Te and 30/4 canals/embankment i.e. open space for recreation of local people.
- Minimize inundation through upgrading existing drainage systems: The project will improve the existing drainage capacity, while taking into account of future planning. The upgrading and renovation of roads accompanied by technical infrastructure, especially the

drainage system, plays 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 project also enable the city authority to achieve objectives set in urban upgrading and planning along with on-going projects in Ben Tre city in particular, and Ben Tre province in general.

- Renovate urban landscape, enhance the quality of life: The deployment of Project “Vietnam Urban Upgrading - subproject Ben Tre City, Ben Tre Province” will contribute to urban rehabilitation, making opportunites for the development and for the poors, 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 project, 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 Ben Tre City.
- Improve environmental sanitation: This can be achieved by relocating residential HHs encroaching land along canals and channels, building a wastewater collection system, and dredging canals and ditches. Also, the upgradation and rehabilitation of alleys and the installation of waste bins would considerably reduce indiscriminate dumping of garbage in LIAs.
- Enrich the urban land fund: The investment in building new traffic routes would entail the development of residential areas and social infrastructure along such routes. This is synonymous with an increase in the urban land fund in these areas.

#### **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 some negative environmental and social impacts, which are unavoidable. However, these negative impacts are predominantly generated by civil construction works of Components 1, 2 and 3, namely the proposed construction works on upgrading and renovating technical infrastructure.

Many of the environmental and social impacts are reversible, temporary, localized and controllable. These impacts can be minimized by mitigation measures through adopting appropriate construction methods; good environmental and social management; good performance of site specific mitigation measures; and appropriate public consultation with local communities and project affected persons (PAP). 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 timescale. The type and scale of the potential impacts of the project are identified in each component and 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: Level of Negative Impacts of the Project's Construction Works**

Component	Physical			Biological		Social				Others	
	<i>Air, noise, vibration</i>	<i>Land, soil, water</i>	<i>Solid waste, sludge</i>	<i>Forest, Natural habitats</i>	<i>Fishes, aqualife</i>	<i>Land acquisition and resettlement</i>	<i>Indigenous peoples</i>	<i>Physical Cultural Resources, the sensitive points</i>	<i>Livelihoods, community disturbance</i>	<i>Local flooding, traffic, safety</i>	<i>Off-site impacts</i>
<b>Component 1: Upgrading tertiary infrastructure in LIAs</b> (LIA 1, LIA 2, LIA 6, LIA 7): on a total area of 118.15 ha, affecting 1,256 HHs, in which: 1,250 partially AHs and 6 completely affected HHs. Major tasks include: upgrading and enlarging alleys; dredging channels; building drainage system;; installing lighting system; planting trees; and placing waste bins along alleys.											
<ul style="list-style-type: none"><li>- Upgrading LIA 1: a total area of 18.36 ha, located in Ward 5; 549 affected households in which 547 partly affected, 02 fully affected. 1,903 m<sup>2</sup> of affected residential land and 879 m<sup>2</sup> agricultural. Sensitive sites in LIA 1 include Kim Quang temple and Shrine.</li><li>- Upgrading LIA 2: a total area of 31.12 ha, located in Ward 6; 226 partly affected households. 82 m<sup>2</sup> of affected residential land and 2,370 m<sup>2</sup> agricultural. No PCRs and sensitives receptors in the area.</li><li>- Upgrading LIA 6: a total area of 29.47 ha, located in Ward 8; 232 affected households in which 229 partly affected, 03 fully affected. 815 m<sup>2</sup> of affected residential land and 1,874 m<sup>2</sup> agricultural. No PCRs and sensitives receptors in the area.</li><li>- Upgrading LIA 7: a total area of 39.20 ha, located in Phu Khuong Ward; 249 affected households in which 248 partly affected, 01 household relocated. 713 m<sup>2</sup> of affected residential land and 4,602 m<sup>2</sup> agricultural land. No PCRs and sensitives receptors in the area.</li></ul>											
Pre - Construction	N	N	N	N	N	L	N	L	M	N	N
Construction	M	M	L	L	L	N	N	L	M	M	M
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	<ul style="list-style-type: none"><li>- Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2<sup>nd</sup> note below)</li><li>- Pre-construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement (see 4.2)</li><li>- Construction stage: (i) Localzed flooding; (ii) Offensive odor from sediment dredging small canal in LIAs; (iii) Road traffic disturbances and increased traffic risks; (iv) Healt and safety risk to the community; (v) Impacts to PCRs and sensitives receptors: Kim Quang temple, Shrine.</li><li>- Operation stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe; (iii) Environmental sanitation at waste sites.</li></ul>										
<b>Component 2: Upgrading primary and secondary priority infrastructure:</b> upgrading, rehabilitating, and building 04 streets (Ngo Quyen Street Extension, Dong-Tay Avenue, N6 Street and N18 Street); upgrading and rehabilitating 02 canals (Chin Te Canal and 30/4 Canal) in inner-city areas: affecting 933 HHs, in which: 836 partially AHs and 97 completely affected HHs.											
<b>Sub-Component 2.1: Renovation of Chin Te Canal</b> <ul style="list-style-type: none"><li>- Scope of investment: renovation length of 2.5 km, including: dredging and enlarging canal; constructing operational road of 3 m in width and 2.4 km in length; building drainage system; and building tree-planting cells and landscaping trees on one sidewalk;</li><li>- Land acquisition and resettlement: 179 affected households in which 177 partially AHs; 02 completely affected HHs; 669 m<sup>2</sup> of affected residential land and 5,954 m<sup>2</sup> agricultural.</li><li>- No PCRs and sensitives receptors in the area.</li></ul>											
Pre Construction	N	N	N	N	N	L	N	N	L	N	N



Component	Physical			Biological		Social				Others	
	Air, noise, vibration	Land, soil, water	Solid waste, sludge	Forest, Natural habitats	Fishes, aqualife	Land acquisition and resettlement	Indigenous peoples	Physical Cultural Resources, the sensitive points	Livelihoods, community disturbance	Local flooding, traffic, safety	Off-site impacts
Construction	M	M	M	L	L	N	N	M	L	L	M
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	Impacts during this phase are identified as medium and can be minimized by mitigations measures in ECOPs (refer the note 2 below) - Pre – Construction: (i) Land acquisition and resettlement; (ii) Impacts from Unexploded Ordnance (UXO). - Construction: (i) Impacts from odor and management of 3,750 m <sup>3</sup> of dredged sludge; (ii) Impacts due to transportation of the dredged sediments; (iii) Risk of subsidence during construction; (iv) Impacts on residential access and traffic; (v) Risk of damage to the existing infrastructure; (vi) Localized flooding - Operation: (i) Pollution from indiscriminate dumping garbage into canals; (ii) Risk of slumping of embankments and operational road during use.										
<b>Sub-Component 2.2: Constructing Ngo Quyen Street Extension</b> - Scope of investment: street 1.61 km in length and 18 – 20.5 m in width, with adequate technical infrastructure including: sidewalks; drainage system; green trees; lighting system on both sides of the street; - Land acquisition and resettlement: 223 affected households in which 155 partly affected, 68 fully affected; 7,272 m <sup>2</sup> of affected residential land and 23,054 m <sup>2</sup> agricultural; - Infrastructure: sidewalks, drainage system, green trees; lighting system on both sides; - Removal of 25 graves; no existing sensitive works in Ngo Quyen street.											
Pre - Construction	N	N	N	N	N	H	N	M	M	N	N
Construction	M	M	M	N	N	N	N	N	L	L	M
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	Impacts during this phase are identified as medium and can be minimized by mitigations measures in ECOPs (refer the note 2 below) - Pre – Construction: (i) Land acquisition and resettlement; (ii) Impacts from Unexploded Ordnance (UXO) - Construction: impacts to PCRs and sensitive sites. - Operation: (i) Risks of local inundation owing to inadequate O/M; (ii) Traffic safety risks.										
<b>Sub-Component 2.3: Constructing branch roads linking the City’s main streets</b> - Scope of investment: N18 Street of 1.32 km in length and 24 m in width; N6 Street of 1.31 km in length and 17 m in width, with adequate technical infrastructure, including: sidewalks; drainage system; green trees; lighting system on both sides of the street; - Land acquisition and resettlement: 236 affected households in which 229 partially Ahs, 07 completely affected HHs; 1,655 m <sup>2</sup> of affected residential land and 48,615 m <sup>2</sup> agricultural. - Infrastructure: sidewalks, drainage system, green trees; lighting system on both sides; - Removal of 24 graves on N18 Street, no graves on N16 Street; no existing sensitive works on these 2 streets.											
Pre - Construction	N	N	N	N	N	L	N	M	M	N	N
Construction	M	M	M	N	N	N	N	M	M	L	M

Component	Physical			Biological		Social				Others	
	<i>Air, noise, vibration</i>	<i>Land, soil, water</i>	<i>Solid waste, sludge</i>	<i>Forest, Natural habitats</i>	<i>Fishes, aqualife</i>	<i>Land acquisition and resettlement</i>	<i>Indigenous peoples</i>	<i>Physical Cultural Resources, the sensitive points</i>	<i>Livelihoods, community disturbance</i>	<i>Local flooding, traffic, safety</i>	<i>Off-site impacts</i>
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	Impacts during this phase are identified as medium and can be minimized by mitigations measures in ECOPs (refer the note 2 below) - Pre – Construction: (i) Land acquisition and resettlement; (ii) Impacts from Unexploded Ordnance (UXO) - Construction: Impacts on Physical Cultural Resources - Operation: (i) Risks of local inundation owing to inadequate O/M; (ii) Traffic safety risks										
<b>Sub-Component 2.4: Constructing Dong-Tay Avenue</b> - Scope of investment: street of 2.15 km in length and 41m in width, with adequate technical infrastructure, including: sidewalks; drainage system; green trees; lighting system on both sides of the street; - Land acquisition and resettlement: 236 affected households in which 216 partly affected, 20 fully affected; 1,624 m <sup>2</sup> of affected residential land and 79,171 m <sup>2</sup> agricultural; - Infrastructure: sidewalks, drainage system, green trees; lighting system on both sides; - Removal of 42 graves. Sensitive spots: Ba Chua Xu Temple and Ngoc Truoc Temple.											
Pre - Construction	N	N	N	N	N	M	N	M	M	N	N
Construction	M	M	M	N	N	N	N	M	L	L	M
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	Impacts during this phase are identified as medium and can be minimized by mitigations measures in ECOPs (refer the note 2 below) - Pre – Construction: (i) Land acquisition and resettlement; (ii) Impacts from Unexploded Ordnance (UXO) - Construction: (i) Impact on water flow; (ii) Impact on water quality of Ca Loc canal at Km0+717.5; Km1+443.5; and Km1+997.15; (iii) Impacts on PCRs and sensitive sites. - Operation: (i) Risks of local inundation owing to inadequate O/M; (ii) Traffic safety risks										
<b>Sub-component 2.5: Renovation of 30/4 Canal</b> - Scope of investment: renovation length of 0.7 km, including: dredging and enlarging canal; constructing concrete roads after embankments of 3 m in width and 0.7 km in length; and building tree-planting cells and landscaping trees on one sidewalk; - Land acquisition and resettlement: 59 partially AH; 530 m <sup>2</sup> of affected residential land and 2,899 m <sup>2</sup> agricultural. - No PCRs and sensitives receptors in the area.											
Pre - Construction	N	N	N	N	N	L	N	L	N	N	N
Construction	M	M	M	L	L	N	N	N	M	M	M
Operation	L	L	L	N	N	N	N	N	N	L	N
Remark	Impacts during this phase are identified as medium and can be minimized by mitigations measures in ECOPs (refer the note 2 below) - Pre – Construction: (i) Land acquisition and resettlement; (ii) Impacts from Unexploded Ordnance (UXO). - Construction: (i) Impacts from malodor and management of 1,155 m <sup>3</sup> of dredged sludge; (ii) Impacts due to transportation of the dredged sediments;										

Component	Physical			Biological		Social				Others	
	<i>Air, noise, vibration</i>	<i>Land, soil, water</i>	<i>Solid waste, sludge</i>	<i>Forest, Natural habitats</i>	<i>Fishes, aqualife</i>	<i>Land acquisition and resettlement</i>	<i>Indigenous peoples</i>	<i>Physical Cultural Resources, the sensitive points</i>	<i>Livelihoods, community disturbance</i>	<i>Local flooding, traffic, safety</i>	<i>Off-site impacts</i>
	(iii) Risk of subsidence during construction; (iv) Impacts on residential access and traffic; (v) Localzed flooding - Operation: (i) Pollution from indiscriminate dumping garbage into canals; (ii) Risk of slumping of embankments and operational road during use.										
<b>Component 3: Resettlement site</b>											
- Acquisition of the resettlement areas background with full technical infrastructure completed by the private sector											
- Resettlement area will be located in Phu Tan ward with a total area of 5.4 ha.											
Operation	L	L	L	L	L	N	N	N	L	L	N
Remark	- Operation: (i) Domestic wastewater; (ii) Solid waste.										
Notes: (1) The following criterias are used to assess the impact level: No (N) -no impact; Low (L) - low, local impact, can recover, temporary; Medium (M) – small constructions in the urban/sensitive areas, medium-scaled constructions with moderate impact and most of them can recover, minimize, and easy to manage, locally, temporary; High (H) – medium-scaled constructions in small urban/sensitive areas, large-scaled projects with significant impact (social and/or environmental aspects) are unable to recover and claim; Both the M and H should be supervised and mitigation measures are needed to implement as well as improve institutional capacity for adequate protection. (2) The small and medium-scaled constructions, most of impacts are local, temporary, and can be mitigated through the application of technology and good construction management with close surveillance, monitoring and close consultation with the local community.											

### 4.1.3. 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 LIAs; 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

##### *Land acquisition and resettlement*

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 02 households will be relocated under the component 1. The detailed impact assessment for land acquisition and resettlement under this component is given in Section 4.2 – Social Assessment.

##### *Risk of 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

Implementation of aforesaid activities will cause site-specific impacts including (i) Localized flooding; (ii) Impacts due to dredged sediment from water drainage canal in LIAs; and (iii) Impacts on PCRs and other sensitive receptors in the residential areas.

##### **A. Generic Impacts during Construction**

Construction phase including the following activities: dredging 2.97 km of small canals in LIAs; 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 628 households having affected structures with total land acquisition of 5,514 m<sup>3</sup>. The structures within acquisition scope in the LIA include mainly residential 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:

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

Where: E: Emission coefficient (kg/ton)



k: Particle structure with average value ( $k = 0.35$  with particle size  $<10\mu\text{m}$  – particle structure table (k) page 13.2.4-4 AP 42 (US EPA, 1995);

U: average wind speed (m/s) (dry season  $u_d = 3$  m/s and rainy season  $u_r = 1.2$  m/s);

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

→  $E_d = 0.03752$  kg/ton;  $E_r = 0.01040$  kg/ton

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

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

Item	Volume of excavating and backfilling (m <sup>3</sup> )	Construction stage (Quarter)	Dust load (kg/day)	
			Dry season	Rainy season
LIA 1	2,496	3	1.87	0.52
LIA 2	1,555	2	1.75	0.49
LIA 6	783	1	1.76	0.49
LIA 7	680	1	1.53	0.42

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

From the above pollution loads from dust, by applying Sutton model with a wind speed of 3.0 m/s and Northeast - East prevailing wind direction in the dry season, a wind speed 1.2 m/s and Southwest - West prevailing wind direction in the rainy season, and a distance of 10-150 m from generating sources, height of 1.5-18 m, the concentration of pollutants created by demolition can be calculated as follows:

- For LIA 1: Dust concentrations vary between 0.17-1.61 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.17-0.56 mg/m<sup>3</sup> (rainy season) (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>).
- For LIA 2: Dust concentrations vary between 0.16-1.5 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.15-0.53 mg/m<sup>3</sup> (rainy season).
- For LIA 6: Dust concentrations vary between 0.15-1.51 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.15-0.52 mg/m<sup>3</sup> (rainy season).
- For LIA 7: Dust concentrations vary between 0.15-1.32 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.14-0.57 mg/m<sup>3</sup> (rainy season).

The data indicate of 10 m from the construction site, dust concentration would exceed the permissible limits by 1.6-5.4 times. Dust concentration would exceed permissible limits by 1.3 – 1.5 times within distances of about 50 m and would meet the said limits within 150 m. Within this distance, existing households along the alleys under construction, workers at construction sites, traffic participants along the alleys and 2 PCRs in 4 LIAs will be affected: Kim Quang Temple and Shirne. 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, given 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:  $\rightarrow E_d = 0.0272 \text{ kg/ton}$ ;  $E_r = 0.0076 \text{ kg/ton}$  [ $k = 0.35$ ; dry season  $u_d = 3 \text{ m/s}$ ; rainy season  $u_r = 1.2 \text{ m/s}$ ;  $M$  (average humidity) = 14 %]. The loads of dispersed dust generated by excavation can be forecasted as follows (Table 4.3):

**Table 4.3: Dust generated due to excavation activities – Component 1**

Item	Volume of excavating and backfilling (m <sup>3</sup> )	Construction stage (Quarter)	Dust load (kg/day)	
			Dry season	Rainy season
LIA 1	5,013	12	0.6	0.17
LIA 2	4,915	11	0.64	0.18
LIA 6	3,396	10	0.48	0.13
LIA 7	2,265	10	0.32	0.09

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

From the above pollution loads from dust, by applying Sutton model with a wind speed of 3.0 m/s and Northeast - East prevailing wind direction in the dry season, a wind speed 1.2 m/s and Southwest - West prevailing wind direction in the rainy season, and a distance of 10-40 m from generating sources, height of 1.5-10 m, the concentration of pollutants created by excavation can be calculated as follows:

- For LIA 1: Dust concentrations vary between 0.18-0.62 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.17-0.42 mg/m<sup>3</sup> (rainy season) (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>).
- For LIA 2: Dust concentrations vary between 0.17-0.64 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.16-0.42 mg/m<sup>3</sup> (rainy season).
- For LIA 6: Dust concentrations vary between 0.16-0.52 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.15-0.35 mg/m<sup>3</sup> (rainy season).
- For LIA 7: Dust concentrations vary between 0.15-1.39 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.15-0.28 mg/m<sup>3</sup> (rainy season).

The data indicates that at the distance of 5 m from the construction site, dust concentration would exceed the permissible limits by 1.2-1.5 times. Dust concentration would exceed permissible limits by 1.1 times within distances of 30 m and would meet the said limits within 40 m. Within this distance, existing households along the alleys, workers at construction sites, traffic participants along the alleys will be affected. See Table 4.5 for scope and affected objects.

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

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

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

The average transport distance is 20 km. The total passages of trucks and the generated dust loads in the process of transportation are calculated as follows.

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

Construction Item	Transported volume (m <sup>3</sup> )	Transport time (months)	Number of vehicles (trip/day)	Volume of waste (trip/day)	Transport time (months)	The number of vehicles (trip/day)	Total vehicle (trip/day)
LIA 1	6,887.22	4	10	5,629	3	10	20
LIA 2	5,524.51	4	8	4,626	3	8	16
LIA 6	3,956.48	3	8	2,906	2	8	16
LIA 7	2,625.74	2	8	2,096	1	12	20

At 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 0.17 mg/m<sup>3</sup> (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>); CO contents 5.32 mg/m<sup>3</sup> (compared with 30 mg/m<sup>3</sup>); NO<sub>x</sub> contents 0.04 mg/m<sup>3</sup> (compared with 0.2 mg/m<sup>3</sup>); SO<sub>2</sub> contents 0.03 mg/m<sup>3</sup> (compared with 0.35 mg/m<sup>3</sup>).
- For LIA 2: Dust concentrations 0.16 mg/m<sup>3</sup>; CO contents 5.52 mg/m<sup>3</sup>; NO<sub>x</sub> contents 0.04 mg/m<sup>3</sup>; SO<sub>2</sub> contents 0.03 mg/m<sup>3</sup>.
- For LIA 6: Dust concentrations 0.15 mg/m<sup>3</sup>; CO contents 5.75 mg/m<sup>3</sup>; NO<sub>x</sub> contents 0.05 mg/m<sup>3</sup>; SO<sub>2</sub> contents 0.03 mg/m<sup>3</sup>.
- For LIA 7: Dust concentrations 0.15 mg/m<sup>3</sup>; CO contents 5.98 mg/m<sup>3</sup>; NO<sub>x</sub> contents 0.04 mg/m<sup>3</sup>; SO<sub>2</sub> contents 0.03 mg/m<sup>3</sup>.

#### Dust:

In general, the loads of dust generated in the process of transporting excavated earth are forecast as being not substantial and would be distributed evenly along transportation routes, between 0.15 and 0.17 mg/m<sup>3</sup>. According to calculations, the dust concentration would not exceed the national standards on ambient air quality (QCVN 05: 2013/BTNMT) 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 Dong Khoi Avenue, Nguyen Thi Dinh street, Nguyen Dinh Chieu street, Cach Mang Thang 8 street, Doan Hoang Minh street 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 ground leveling, excavation, backfilling and transportation is thereby assessed as being medium.

#### Exhaust gases:

The concentration of exhaust gases generated from transport activities meets QCVN 05:2013/BTNMT - National technical regulation on ambient air quality. The calculation is applied with the quantity of vehicles is 16 – 20 trips/day and all material is transported once, whereas the quantity of vehicles is much fewer since the task is divided into many packages. Thus, level of impact is low.

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

Construction item	Affected object	Distance from work (m)
Upgrading LIA 1	<u>In the project area</u> : residential area along alleys, workers at construction site and 02 PCR: Kim Quang Temple, Shirne. <u>On transportation route</u> : inhabitants, passengers, PCRs and sensitive sites along the route: Ward 5 Health Station, Ong Temple, Nga 5 Market, Vo Truong Toan school, An Hoi Temple, Ward 8 Health Station, Ward 8 Primary School, Ben Tre Agro-Market.	2-65
Upgrading LIA 2	<u>In the project area</u> : residential area along alleys, workers at construction site. <u>On transportation route</u> : inhabitants, passengers, PCRs and sensitive sites along the route: Ward 5, Ong Temple, Nga 5 Market, Bach Van Temple, Nguyen Dinh Chieu Hospital, Tran Van An Traditional Medicine Hospital, An Hoi Temple, Ward 8 Health Station, Ward 8 Primary School, Ben Tre Agro-Market, Vo Truong Toan school.	2-65
Upgrading LIA 6	<u>In the project area</u> : residential area along alleys, workers at construction site. <u>On transportation route</u> : inhabitants, passengers, PCRs and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Rang Dong Kindergarten, Ward 8 Primary School, Ben Tre Agro-Market, Vocational School in Ben Tre, Nguyen Dinh Chieu High school, Ben Tre secondary school, Ben Tre market, Vo Truong Toan school.	3-65
Upgrading LIA 7	<u>In the project area</u> : residential area along alleys, workers at construction site. <u>On transportation route</u> : inhabitants, passengers, PCRs and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Rang Dong Kindergarten, Ward 8 Primary School, Ben Tre Agro-Market, Vocational School in Ben Tre, Nguyen Dinh Chieu High school, Ben Tre secondary school, Ben Tre market, Vo Truong Toan school.	3-65

➤ **Impacts on water environment**

***Stormwater runoff***

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

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

In which:

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

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

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

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

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

Name of works	Area of stormwater drainage (m <sup>2</sup> )	Runoff coefficient	Rainfall (l/s)
LIA 1	15,600	0.4	7.28
LIA 2	14,805	0.2	3.46
LIA 6	5,874	0.4	2.74
LIA 7	7,550	0.4	3.52

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

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

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

Source: 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 waste water generated from the activities of workers in the construction sector is not significant and cannot be adjusted. Water demand for each worker stated in 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 Item	Amount of workers (person)	Irregulated coefficient (K)	Amount of wastewater discharged (m <sup>3</sup> /day)
LIA 1	20	2.5	2.25
LIA 2	20	2.5	2.25
LIA 6	10	2.5	1.13
LIA 7	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 following Table 4.9:

**Table 4.9: Domestic Wastewater Quality**

Pollutants	Concentration	QCVN 14:2008/BTNMT (Column B)
pH	5 – 9	5 - 9
BOD <sub>5</sub>	450 – 540	50
TSS	700 – 1450	100
Nitrat (NO <sub>3</sub> <sup>-</sup> )	50 – 100	50
Tổng coliform	10 <sup>6</sup> – 10 <sup>9</sup>	5,000

Source: Hoang Hue, 2000

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

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

### ➤ Impact from solid Waste

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

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

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

Construction Item	Construction solid waste (m <sup>3</sup> )	Domestic solid waste (kg/day)
LIA 1	3,133	10
LIA 2	3,071	10
LIA 6	2,123	5
LIA 7	1,416	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 32 (including 14 trucks). The amount of waste grease and oil generated in the construction site therefore averages  $(12 \times 7 \text{ liters/time})/3 \text{ months} = 28 \text{ liters of oil/month}$ . In addition, the subproject would also generate an estimated amount of 20 kg of oily rags and containers per month.

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

➤ **Road traffic disturbances and increased traffic risks in LIAs**

As described in Section 2.5, the existing alleys in the LIAs are very small and narrow, with a width of only 1.5 – 3.5 m on average. Local residents have had to face with lots of difficulty travelling and circulating through these areas. With the development of Project's construction stage, the traffic scope will be even narrower when construction sites take up much of the space. Residents in LIAs, especially those living in the alleys with construction operation under way, are bound to suffer from much more traveling inconvenience. Contractors are therefore to take effective measures to limit these impacts to secure residents' travel and circulation needs.

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

The project construction will increase the number of vehicles, especially trucks carrying raw materials (26 trips) for the construction, and waste (8 trips). The increase in the number of projects means that there is potential to affect the general situation of regional transportation routes, because Doan Hang Minh, Dong Khoi, Nguyen Thi Dinh and Nguyen Dinh Chieu route are among the main roads in Ben Tre city.

In addition, the increase in the number of heavy truck traffic on the roads also increases the risk of:

- Causing traffic accidents to passengers;
- The increase in density of transport will increase the risk of accident.
- Dust and noise generated by the operation of the transport vehicles can affect the health of people living along the street and road users.
- Increasing traffic may also lead to the roads' degradation, creating potholes, which are more likely to cause accidents on the road, especially at night.

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

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

Population density in LIA 1 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 1 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 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 65 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 LIAs; (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.

#### ***Localized flooding***

The building and upgrading of the alleys would trigger such operations as gathering materials, equipment and machinery at site, and concretizing the alley surfaces. These would obstruct or narrow down the flow or reduce the self-infiltration capacity of the drainage surface. Moreover, the existing alleys in the LIAs are relatively small and narrow, with no drainage systems. Therefore, during rainy days, flooding in the LIAs will be more serious. According to results obtained on stormwater runoff, the rainfalls at respective LIAs will be 7.28 l/s, 3.46 l/s, 2.74 l/s, and 3.52 l/s (corresponding to rainfall depths of 10 – 15 cm). Therefore, residential houses close to alleys under construction may be flooded as the number of temporary and low-lying houses account for a great percentage in these LIAs.

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.

#### ***Sediments generated from dredging small canals in LIAs***

The LIAs have dense networks of small canals and ditches crossing through the residential areas, which drain stormwater and domestic wastewater from the households nearby. After a long time being used as a sewer system, the canals and ditches have a layer of sediment, which needs to be dredged to improving the drainage capacity.

Within LIAs, there is a total length of 2.97 km ditches and canals which will be dredged, generating an estimated 7,794 m<sup>3</sup> of sediment. As presented in Chapter 2, the analysis showed that these sediments are not contaminated with heavy metals, yet they could contain organic substances, dissolved organic substances (BOD<sub>5</sub>, COD), nutrients (N, P), pathogens (*E. coli*, total faecal coliform, and bacteria, etc.) In addition, these organic compounds generate bad odors and nuisance for the public caused by H<sub>2</sub>S gas (with odor of rotten eggs); other compounds such as indole, skatole, cadaverine and mercaptan emitted under anaerobic conditions which can cause odor even more irritable than H<sub>2</sub>S. Thus, during the dredging process, sediment or sludge will only be kept at construction sites for about 24-48 hours.

The dredging, temporary storage, and transportation of the sludge could cause bad odor, nuisance, leakage and unsanitary conditions to the residents nearby and along the transportation routes. However, the dredging activities will be scheduled over a short period and the amount of generated sediment is small, therefore the impact is localised, temporary and low.

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

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

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

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

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

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

Items	Length of transportation routes (km)	Transportation routes	Affected objects
LIA 1	10	Nguyen Dinh Chieu Street → Hoang Lam → Doan Hoang Minh → Nguyen Thi Dinh	Inhabitants, passengers, PCRs and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Ben Tre Agro-Market, Rang Dong Kindergarten, Ward 8 Primary School, Nguyen Dinh Chieu Highschool, Ward 5 Health Station, Ong Temple, Nga 5 Market, Bach Van Temple, Nguyen Dinh Chieu Hospital, Tran Van An Traditional Medicine Hospital, Vo Truong Toan school.
LIA 2	10	Nguyen Dinh Chieu Street → Hoang Lam → Doan Hoang Minh → Nguyen Thi Dinh	Inhabitants, passengers, PCRs and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Ben Tre Agro-Market, Rang Dong Kindergarten, Ward 8 Primary School, Nguyen Dinh Chieu Highschool, Ward 5 Health Station, Ong Temple, Nga 5 Market, Bach Van Temple, Nguyen Dinh Chieu Hospital, Tran Van An Traditional Medicine Hospital, Vo Truong Toan school.
LIA 6	8	Nguyen Dinh Chieu	Inhabitants, passengers, PCRs and sensitive



		Street→ Dong Khoi → Nguyen Thi Dinh	sites along the route: An Hoi Temple, Ward 8 Health Station, Ben Tre Agro-Market, Rang Dong Kindergarten, Ward 8 Primary School, Nguyen Dinh Chieu Highschool, Vocational School in Ben Tre, Ben Tre secondary school, Ben Tre market, Vo Truong Toan school.
LIA 7	8	Nguyen Dinh Chieu Street→ Dong Khoi → Nguyen Thi Dinh	Inhabitants, passengers, PCRs and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Ben Tre Agro-Market, Rang Dong Kindergarten, Ward 8 Primary School, Nguyen Dinh Chieu Highschool, Vocational School in Ben Tre, Ben Tre secondary school, Ben Tre market, Vo Truong Toan school.

### ***Impacts on PCRs and sensitive works***

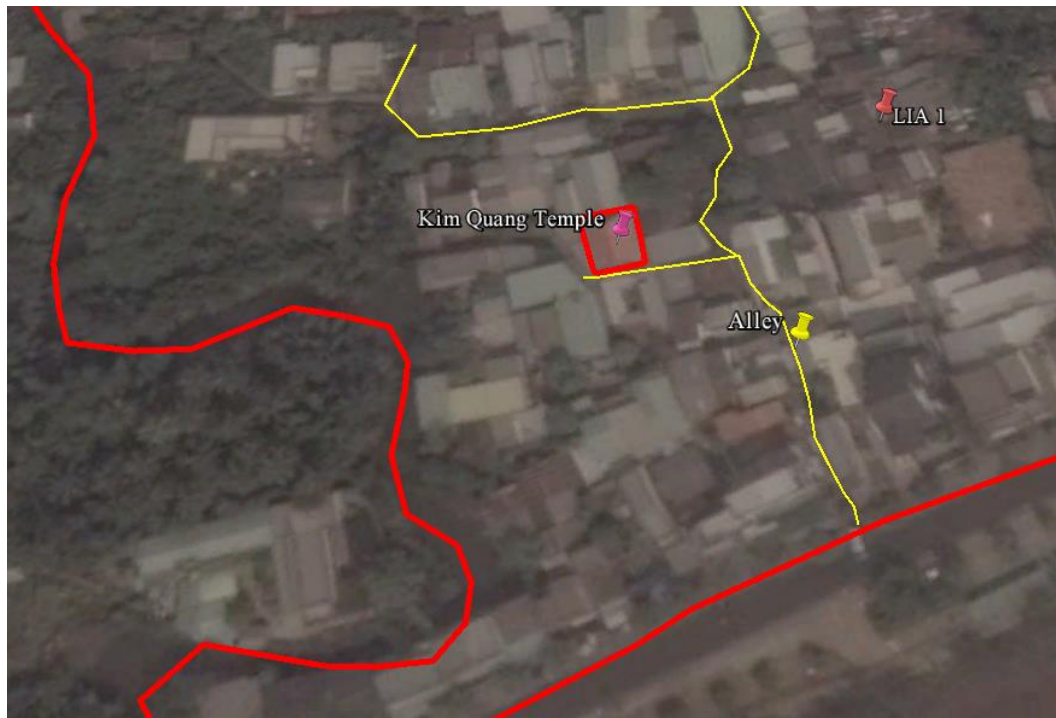
For religious works: Kim Quang Temple (from 2 m to alley); Shirne (from 3 m to alley) in LIA 1: Constructing alleys, dredging canals and transporting fuel, materials and waste will have negative impacts on aforesaid entities because: i) Hindrance to access to the pagoda, cemetery; ii) Increase in dust, 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 because of construction during rainy days; vi) Conflicts between workers and visitors to the pagoda, cemetery.

However, 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.

### ***Vibration impact and collapse risk to PCRs.***

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 impact can cause the structures within 5m from emission sources to sink, crack or collapse.

Kim Quang Temple (from 2 m to alley); Ngu Hanh Shirne (from 3 m to alley) in LIA 1 in LIA 5 are located within the radius of 5 m, so they can be affected. However, the scope of constructing these alignments is relatively small (2-3.5 m), so the aforesaid equipment is not mobilized. The equipment to be use mainly includes manual, portable equipment, so vibration is insignificant. At the same time, excavation and embankment will not be implemented adjacent to structures' edge, It is assessed that the risk on structure collapse due to vibration is negligible. For precautionary, the mitigation measures to prevent, avoid or compensate for this risk on infrastructure collapse will be included in the ESMP as the requirements for the contractors during the construction process.



Kim Quang Temple



Ngu Hanh Shrine

#### ***4.1.3.3. Component 1 - Impact during Operation***

##### ***The impact on the environment while maintaining drainage systems***

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 so 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 emission gas. 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. Component 2 - Priority Primary and Secondary Infrastructures**

This component aim to improve water quality, drainage capacity and sanitation conditions around the canals of the inner area of Ben Tre city (Chin Te and 30/4 canals) by dredging, embankments and construction of routes on 2 sides. The component also build streets (constructing Ngo Quyen Street, Dong Tay Avenue, N6 Street, and N18 Street) 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 took place in the pre-construction phase of all items under component 2 are the same and include the following works:

- UXOs and mines clearance.
- 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 933 households, including 836 partly affected households, 97 relocated households, and 128 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 activities of housing demolition, earthwork, transportation, material handling, operation of

construction machinery, etc. However, these effects are not continuous and take place in a short time, most of the impacts are temporary.

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

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

Before carrying out the construction work, clearance activities will be done. Accordingly, the structure within the scope of land acquisition will be demolished. Waste arising from this activity is debris with estimated volume 5,794 m<sup>3</sup>.

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

Dust emission coefficient is determined in accordance with guidelines of environmental assessment sourcebook (World Bank, 1991) and AP 42 for Stationary Point and Area Sources (US EPA, 1995):  $E_d = 0.03752$  kg/ton,  $E_r = 0.01040$  kg/ton. Based on pollution coefficient E and compliance with the subproject work progress, the loads of dispersed dust generated by demolition can be forecasted as follows (Table 4.12):

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

Construction Items	Demolition volume (m <sup>3</sup> )	Estimated Time (month)	Dust load (kg/day)	
			Dry season	Rainy season
Extended Ngo Quyen street	966	2	1.09	0.3
Dong Tay Avenue	1,290	3	0.97	0.27
N6 Street	784	1	1.77	0.49
N18 Street	792	1	1.78	0.49
Chin Te Canal	1,500	3	1.13	0.31
30/4 Canal	462	1	1.04	0.29

*Note: Unit weight of debris: 1.1 tons/m<sup>3</sup>*

From the above pollution loads from dust, by applying Sutton model with a wind speed of 3.0 m/s and Northeast - East prevailing wind direction in the dry season, a wind speed 1.2 m/s and Southwest - West prevailing wind direction in the rainy season, and a distance of 10-100 m from generating sources, height of 1.5-30 m, the concentration of pollutants created by demolition can be calculated as follows:

- For Extended Ngo Quyen street: Dust concentrations vary between 0.13-0.96 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.12-0.35 mg/m<sup>3</sup> (rainy season) (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>).
- For Dong Tay Avenue: Dust concentrations vary between 0.17-0.91 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.17-0.37 mg/m<sup>3</sup> (rainy season).
- For N6 Street: Dust concentrations vary between 0.15-1.51 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.15-0.53 mg/m<sup>3</sup> (rainy season).
- For N18 Street: Dust concentrations vary between 0.15-1.51 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.14-0.52 mg/m<sup>3</sup> (rainy season).
- For Chin Te canal: Dust concentrations vary between 0.18-1.05 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.18-0.42 mg/m<sup>3</sup> (rainy season).
- For 30/4 canal: Dust concentrations vary between 0.17-0.97 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.17-0.39 mg/m<sup>3</sup> (rainy season).

**Remarks:** The above calculation results show that the contents of generated dust do not considerably exceed permissible limits provided for in QCVN 05:2013/BTNMT, specifically:



- *Dry season*: dust concentrations exceed permissible limits by 3-5 times within a distance of 10 m, lower down to 1.1-1.3 times within 60 m and meet permissible limits within 60-100 m.
- *Rainy season*: dust concentrations exceed permissible limits by 1.2-1.8 times within 10 m and meet permissible limits within 40-60 m.

Generated dust can therefore be said to settle quickly and remain in the air within a very short period of time. In the rainy season, with increased rainfall and humidity, suspended dust will settle more quickly. Dust dispersion will then be considerably limited with dust concentrations decreasing by 2.5 times compared with those in the dry season, resulting in much mitigated impacts. Those to be affected by localized impacts in the area will be residents along the routes, the PCRs, sensitive works (at a distance of 5 – 80 m) and road-users passing by demolition sites. Moreover, as the duration of dust generation will be only about 2 – 4 weeks at each demolition position, this impact will be temporary, lasting within a short period of time, and can be assessed to be moderate.

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

According to the project schedule, project construction is expected from August, 2021 to September 2018 (5 years); Project construction will be divided into several packages and will be implemented at different timelines. Dust generated by excavation and backfilling activities under Component 2 is calculated in the same way as component 1. Based on [1] → pollution coefficient  $E_d = 0.0272$  kg/ton;  $E_r = 0.0076$  kg/ton. 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 Item	Earthworks volume (m <sup>3</sup> )	Estimated Time (months)	Load of dust generated (kg/day)	
			Dry season	Rainy season
Extended Ngo Quyen street	37,956	13	4.16	1.15
Dong Tay Avenue	101,373	15	9.64	2.67
N6 street	25,552	10	3.64	1.01
N18 street	36,432	10	5.2	1.44
Chin Te canal	31,875	18	2.53	0.7
30/4 canal	5,198	12	0.62	0.17

At a distance of 10-200 m from generating sources, height of 1.5-80 m, the concentration of pollutants created by earthworks can be calculated as follows:

- For Extended Ngo Quyen street: Dust concentrations vary between 0.13-3.33 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.12-1.01 mg/m<sup>3</sup> (rainy season) (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>).
- For Dong Tay Avenue: Dust concentrations vary between 0.17-7.6 mg/m<sup>3</sup> (dry season); Dust concentrations vary between 0.17-2.23 mg/m<sup>3</sup> (rainy season).
- For N6 Street: Dust concentrations vary between 0.15-2.96 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.15-0.93 mg/m<sup>3</sup> (rainy season).
- For N18 Street: Dust concentrations vary between 0.14-4.15 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.14-1.25 mg/m<sup>3</sup> (rainy season).
- For Chin Te canal: Dust concentrations vary between 0.18-2.13 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.18-0.72 mg/m<sup>3</sup> (rainy season).
- For 30/4 canal: Dust concentrations vary between 0.17-0.64 mg/m<sup>3</sup> (dry season); dust concentrations vary between 0.17-0.3 mg/m<sup>3</sup> (rainy season).



The data distance of 10 m from construction positions, the concentrations of dust generated from operations of upgrading and rehabilitating streets are higher than those generated from categories of upgrading and rehabilitating canals.

In the dry season, dust concentrations from construction operations for roads exceed permissible limits by 9 – 25 times and by 2.13 – 7 times from construction operations for canal rehab. Dust concentrations meet permissible limits from a distance of 200 m.

In the rainy season, dust concentrations from construction operations for roads exceed permissible limits by 3.1 – 7.4 times and by 2.4 times from construction operations for canal rehab. Dust concentrations meet permissible limits from a distance of 60 – 150 m.

Within these distances, those impacted by dust will be residents living along Ngo Quyen Street Extension, Dong-Tay Avenue, N6 Street, N18 Street, 30/4 Canal and Chin Te Canal. PCRs and sensitive works in the construction area for these items will also be affected (See details in Section 2.6).

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***

The project uses two main material transport directions:

- ✓ *River Direction:* The barges will transport materials taken from the mines in My Thanh An, Binh Phu, My Thanh commune, etc., then move towards the direction from Ben Tre river towards the construction, the average transport distance according to actual survey is 5 km.

The process of transporting raw materials above also generate dust by the action of wind and shielding carelessly. However, within the passing river basin, there are very few people living, in addition the water surface area is an effective dust holding environment so the dust can not diffuse widely, the diffusion range impact is narrowed, pollution from dust due to barge is negligible.

- ✓ *Road Direction:* Sand and stone will be shipped from the material yard of Viet-Trung Private Enterprise (Address: 16B Street Area No. 1, Ward 8, Ben Tre City) by truck of 15 tons volume (bucket volume of 12.5 m<sup>3</sup>) to the construction with 5 km distance; the remaining materials will be purchased at the materials yards/stores close to the project, in the area of Ben Tre city, with a maximum distance of about 3-5 km.

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

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

Construction Item	Volume of sand, soils and stones (m <sup>3</sup> )	Transport time (months)	Number of vehicles (trip/day)	Material volume (tons)	Transport time (months)	Number of vehicles (trip/day)	Waste disposal volume (m <sup>3</sup> )	Transport time (month)	The number of vehicles (turn/date)	Total vehicles (trip/day)
Extended Ngo Quyen Street	13,485.33	6	12	243.42	1	2	19,944	9	12	26
Dong Tay Avenue	36,677.34	10	20	591.44	2	2	51,976	12	24	46
N6 Street	8,330.47	5	8	153.45	0.5	2	13,560	6	12	22
N18 Street	13,087.77	5	14	229.31	1	2	16,698	7	12	28
Chin Te canal	9,023.23	4	12	515.22	2	2	6,188	4	8	22
30/4 canal	1,807.11	3	4	158.69	0.5	2	1,906	1	10	16

At a 5-20 m from generating sources, height of 1.5-15 m, the concentration of pollutants created by transportation operations can be calculated as follows:

- For Extended Ngo Quyen street: Dust concentration 0.13 mg/m<sup>3</sup> (compared with permissible standard limits of 0.3 mg/m<sup>3</sup>); CO content 5.22 mg/m<sup>3</sup> (compared with 30 mg/m<sup>3</sup>); NO<sub>x</sub> content 0.05 mg/m<sup>3</sup> (compared with 0.2 mg/m<sup>3</sup>); SO<sub>2</sub> content 0.03 mg/m<sup>3</sup> (compared with 0.35 mg/m<sup>3</sup>).
- For Dong Tay Avenue: Dust concentration 0.19 mg/m<sup>3</sup>; CO content 5.93 mg/m<sup>3</sup>; NO<sub>x</sub> content 0.06 mg/m<sup>3</sup>; SO<sub>2</sub> content 0.04 mg/m<sup>3</sup>.
- For N6 Street: Dust concentration 0.15 mg/m<sup>3</sup>; CO content 5.86 mg/m<sup>3</sup>; NO<sub>x</sub> content 0.05 mg/m<sup>3</sup>; SO<sub>2</sub> content 0.04 mg/m<sup>3</sup>.
- For N18 Street: Dust concentration 0.14 mg/m<sup>3</sup>; CO content 5.86 mg/m<sup>3</sup>; NO<sub>x</sub> content 0.05 mg/m<sup>3</sup>; SO<sub>2</sub> content 0.04 mg/m<sup>3</sup>.
- For Chin Te canal: Dust concentration 0.18 mg/m<sup>3</sup>; CO content 5.72 mg/m<sup>3</sup>; NO<sub>x</sub> content 0.03 mg/m<sup>3</sup>; SO<sub>2</sub> content 0.03 mg/m<sup>3</sup>.
- For 30/4 canal: Dust concentration 0.17 mg/m<sup>3</sup>; CO content 5.08 mg/m<sup>3</sup>; NO<sub>x</sub> content 0.03 mg/m<sup>3</sup>; SO<sub>2</sub> content 0.03 mg/m<sup>3</sup>.

Dust:

In general, the loads of dust generated in the process of transporting are forecast as being not substantial and would be distributed evenly along transportation routes, between 0.13 and 0.19 mg/m<sup>3</sup>. According to calculations, the dust concentration would not exceed the national standards on ambient air quality (QCVN 05: 2013/BTNMT). However, it must be noted that the amount of dust generated is large owing to the mobilization of machinery and vehicles on the construction site. At some points of time, relatively large amounts of dust may abruptly increase when a large number of machines and vehicles are mobilized for necessary construction tasks.

The main transport routes for materials transportation would be Dong Khoi avenue, Nguyen Thi Dinh street, Nguyen Dinh Chieu street, Cach Mang Thang 8 street, Doan Hoang Minh street and some other internal transport 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 subproject impacts of dust would be visible. The receptors affected by dust would be the residents living along the routes. Dust pollution would hinder businesses and services located along the routes leading to a drop in the number of customers. However, these impacts can be fully controlled and minimized if all necessary mitigation measures would be carried out during construction. The impact level of dust during ground leveling, excavation, backfilling and transportation is thereby assessed as being medium.

Exhaust gases:

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

**a2. Noise**

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

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

Equipments/Vehicles	Distance to noise source(m)					
	15	50	100	200	300	400
Truck	96 - 99	85 - 88	79 - 82	73-76	70-73	67-70
Roller	74-79	64-68	58-62	52-56	48-53	45-50
Compactors	76-81	66-70	60-64	54-58	50-55	47-52
Graders	85-88	75-78	69-72	63-66	59-62	56-59
Concrete mixers	85	75	69	63	59	56
Bulldozers	80-86	70-76	64-70	58-64	54-60	51-58
Generator	74-90	64-80	58-74	52-68	48-64	45-61
Excavators	74-90	64-79	58-73	52-67	48-64	45-61
Plastic spreader	85-89	75-79	69-73	63-67	59-63	56-60
<b>QCVN 26:2010/BTNMT (From 6h-21h) - common areas</b>	<b>70</b>					

**Remarks:** The noise levels from most means operating within distances less than 100 m exceed permissible limits provided for in QCVN 26:2010/BTNMT – *National technical regulation on noise* (70 dBA for normal areas, from 6h – 21h). These levels would affect workers present at site, residents along the routes, PCRs & sensitive works within the mentioned distance (see Table 4.18 below).

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

**a3. Vibration**

Refer to the vibration level of the vehicle, machinery and equipment in the report of Transit Noise And Vibration Impact Assessment (US, FTA, 2006), the level of vibration of vehicles, machinery and equipment are presented in the following 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 6h to 21h) - Normal area
1	Truck	86	<b>75 dB</b>
2	Bulldozers / brushed machine	87	
3	Excavators	94	
4	Roller	94	
5	Pile machine	93	

Source: US FTA, 2006.

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

**Table 4.17: Component 2 - Vibration level by 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 / brushed machine	83	80	78	76	74	73	71	70	69	68
3	Excavators	90	87	85	83	81	80	78	77	76	75
4	Roller	90	87	85	83	81	80	78	77	76	75
5	Pile machine	89	86	84	82	80	79	77	76	75	74
QCVN 27:2010/BTNMT, (From 6:00 to 21:00) - Normal areas		<b>75 dB</b>									

**Remarks:** At distances beyond 30 meters compared to the vibration, the vibration of all equipment reaches QCVN 27: 2010/BTNMT - common area from 6:00 – 21:00. Within these distances, the following impacts will be put into consideration:

*Impacts on surrounding environment*

Vibration generated during the operation of the pile drivers and rollers is transmitted in wave form on the ground, causing definite impacts on the surrounding environment. The impact from vibration will be severe especially to high-rise buildings or underground construction works on a soft geologic layer. Within the implementation scope of the Project sub-components, the structural conditions of construction works along the routes are as follows:

- In the group of items of canal rehab (30/4 Canal and Chin Te Canal): 90 % of the houses along the channels are houses made of corrugated iron sheets, temporary houses or Grade IV houses; and there is no high-rise construction work or underground work;
- In the group of items of constructing streets (Ngo Quyen Street Extension, Dong-Tay Avenue, N6 Street, N18 Street): 85 % of the houses are houses made of corrugated iron sheets or Grade 4 houses, with the remaining being houses of Grade II and Grade III.

In general, in the Project area there is no high-rise building or underground construction work. The impacts from vibration on the communities will be almost unavoidable in the Project area as both sides of the streets and canals are densely inhabited. However, the impacts from vibration will be brief, localized and controllable. The impacts are therefore assessed to be moderate.

The Table below will summarize the affected subjects and the scope of impact from pollution sources generated from construction operations for various items under Component 2.

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

Construction Item	Affected object	Distance (m)
Extended Ngo Quyen street	<ul style="list-style-type: none"> <li>- <u>In the project area</u>: residential area along route, workers at construction site.</li> <li>- <u>On transportation route</u>: inhabitants, passengers, PCRs and sensitive sites along the route: Bach Van Temple, Nguyen Dinh Chieu Hospital, Tran Van An Traditional Medicine Hospital, An Hoi Temple, Ward 8 Health Station, Rang Dong Kindergarten, Ward 8 Primary School, Ben Tre Agro-Market, Vocational School in Ben Tre, Nguyen Dinh Chieu High school, Ben Tre secondary school, Ben Tre market, Vo Truong Toan school</li> </ul>	3-65
Dong Tay Avenue	<ul style="list-style-type: none"> <li>- <u>In the project area</u>: residential area along route, workers at construction site. Ba Chua Xu Temple, Ngoc Truoc Temple.</li> <li>- <u>On transportation route</u>: inhabitants, passengers, PCRs and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Rang Dong Kindergarten, Ward 8 Primary School, Ben Tre Agro-Market, Vocational School in Ben Tre, Nguyen Dinh Chieu High school, Ben Tre secondary school, Ben Tre market, Vo Truong Toan school</li> </ul>	3 – 65
N6 Street	<ul style="list-style-type: none"> <li>- <u>In the project area</u>: residential area along route, workers at construction site.</li> <li>- <u>On transportation route</u>: inhabitants, passengers, PCRs and sensitive sites along the route: Bach Van Temple, Nguyen Dinh Chieu Hospital, Tran Van An Traditional Medicine Hospital, An Hoi Temple, Ward 8 Health Station, Rang Dong Kindergarten, Ward 8 Primary School, Ben Tre Agro-Market, Vocational School in Ben Tre, Nguyen Dinh Chieu High school, Ben Tre secondary school, Ben Tre market, Vo Truong Toan school</li> </ul>	3 –65
N18 Street	<ul style="list-style-type: none"> <li>- <u>In the project area</u>: residential area along route, workers at construction site.</li> <li>- <u>On transportation route</u>: inhabitants, passengers, PCRs and sensitive sites along the route: Bach Van Temple, Nguyen Dinh Chieu Hospital, Tran Van An Traditional Medicine Hospital, An Hoi Temple, Ward 8 Health Station, Rang Dong Kindergarten, Ward 8 Primary School, Ben Tre Agro-Market, Vocational School in Ben Tre, Nguyen Dinh Chieu High school, Ben Tre secondary school, Ben Tre market, Vo Truong Toan school</li> </ul>	3 – 65
Chin Te canal	<ul style="list-style-type: none"> <li>- <u>In the project area</u>: residential area along route, workers at construction site.</li> <li>- <u>On transportation route</u>: inhabitants, passengers, PCRs and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Rang Dong Kindergarten, Ward 8 Primary School, Ben Tre Agro-Market, Vocational School in Ben Tre,</li> </ul>	3 – 65



Construction Item	Affected object	Distance (m)
	Nguyen Dinh Chieu High school, Ben Tre secondary school, Ben Tre market, Vo Truong Toan school	
30/4 canal	<ul style="list-style-type: none"> <li>- <u>In the project area</u>: residential area along route, workers at construction site.</li> <li>- <u>On transportation route</u>: inhabitants, passengers, PCRs and sensitive sites along the route: Bach Van Temple, Nguyen Dinh Chieu Hospital, Tran Van An Traditional Medicine Hospital, An Hoi Temple, Ward 8 Health Station, Rang Dong Kindergarten, Ward 8 Primary School, Ben Tre Agro-Market, Vocational School in Ben Tre, Nguyen Dinh Chieu High school, Ben Tre secondary school, Ben Tre market, Vo Truong Toan school</li> </ul>	3 – 65

### ➤ Impact on Water Quality

#### Impact by Stormwater runoff

Stormwater in the construction area with a flow depending on climatic factors in the region. On the basis on the surface area of the Project, the flow coefficient, and rainfall intensity already defined in Chapter 2, the total stormwater runoff on the construction sites for the items under Component 2 is presented in the Table below:

**Table 4.19: Component 2 –Flow rate of stormwater generated from the Project**

Item	Storm water drainage area (m <sup>2</sup> )	Flow coefficient	Rainwater flow rate (l/s)
Extended Ngo Quyen Street	28,800	0.2	5.1
Dong Tay Avenue	18,450	0.4	6.5
N6 Street	57,500	0.4	20.3
N18 Street	22,500	0.4	7.9
Chin Te Canal	15,000	0.4	5.3
30/4 Canal	24,000	0.4	8.5

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

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

#### Impact on surface water quality

Mud dredging operations alter the surface water quality negatively, especially on area of dredging water surface. Accumulated sediment are mainly sand, organic matter, carcasses of aquatic plants, and especially heavy metals. The process of dredging disturbs and releases these components into the environment and expand their spreading radius. However, the analysis of heavy metal concentrations in sludge performed in Chapter 2 shows us the permitted threshold. Therefore, the impact of heavy metals diffusion in water is considered as negligible.

A quite important impact caused by dredging operations is increasing levels of suspended solid in water. This impact is particularly severe if the water is used for salt production purposes and aquaculture because they directly affect the quality of salt as well as the habitat of aquatic species. Chin Te, 30/4 canals have a single unique function that is to drainage. On the other side, within a radius of 5 km from the beginning to the end of the canal that the project will

implement, there is no aquaculture activities as well as salt producing activities so this impact is determined to not cause any impact.

#### The impact from leachate

Total amount of dredged sediment from Chin Te canal and 30/4 canal are 99,750m<sup>3</sup>. After being dredged, the mud will be gathered along the canal to reduce the volume and moisture before being transported for disposal. At this time, the mud is a thick liquid, so that it will generate leachate with high SS concentration. This impact is not serious because the suspended solid is sediment dredged from the canal so it does not change the composition of canal water. However, it is necessary to apply measures to lead the leachates into settling holes before recirculating the flow to the canal in order to reduce pollution loads to surface water quality.

#### Impact on soil and groundwater quality

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

#### Waste water from construction activities

Construction wastewater is mainly spilled water of mixing concrete and curb ground washing water after finishing pouring concrete. The amount of water spilled from concrete mixing in fact is not much, when falling and it will infuse directly into the soil. Curb ground wash water after pouring the concrete that actually is the activity of increasing cohesiveness in concrete materials, will be absorbed directly into the surface so it does not arise. Such waste water from construction activities are negligible sources.

#### Domestic Wastewater of Construction Workers

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

**Table 4.20: Component 2 - Domestic wastewater generated**

Construction Item	No. Of workers	Irregulated coefficients (K)	Amount of wastewater discharged (m <sup>3</sup> /day)
Extended Ngo Quyen Street	30	2.5	3.38
Dong Tay Avenue	40	2.5	4.5
N6 Street	20	2.5	2.25
N18 Street	20	2.5	2.25
Chin Te Canal	45	2.5	5.06
30/4 Canal	25	2.5	2.81

Domestic wastewater contains mainly excreted substances with components of high organic waste. In particular, urine with BOD<sub>5</sub> of about 8.6 g/l and feces with BOD<sub>5</sub> of about 9.6 g/100g. Therefore, feces and urine discharged directly into the ground would be a significant source of pollution to soil and water environment in the project area. Therefore, investors and contractors shall apply measures to minimize the impact of this.

However, during the construction stage, a number of measures have been and are being carried out by contractors on site to mitigate impacts from domestic wastewater, including:

- Employing the local workforce to size down the number of workers at the camps (thus limiting the volume of domestic wastewater);
- Placing portable toilets.

Impacts from domestic wastewater can therefore be minimized through contractors' measures. In addition, the volume of such generated domestic wastewater will not be very substantial and will be present only during construction times; therefore, the impact is assessed to be moderate.

#### ➤ 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 – Quantity of solid waste from construction stage**

Construction Item	Construction waste (m <sup>3</sup> )	Domestic solid waste (kg/day)
Extended Ngo Quyen Street	19,944	15
Dong Tay Avenue	51,976	20
N6 Street	13,560	10
N18 Street	16,698	10
Chin Te Canal	6,188	22.5
30/4 Canal	1,906	12.5

Data in Table 4.21 is total amount of solid waste of each item. In fact, the generating amount is much lower because the construction items are partly carried out. This is not hazardous waste and is collected within 48 hour by Ben Tre 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 250 (including 48 trucks and 202 construction means). The amount of waste grease and oil generated in the construction site therefore averages  $(250 \times 7 \text{ liters/time})/3 \text{ months} = 583 \text{ liters of oil/month}$ . In addition, the subproject would also generate an estimated amount of 80 kg of oily rags and containers per month.

#### ➤ Impacts on ecological

As Chapter 2 has shown, the aquatic ecosystem of 30/4 and Chin Te canal is poor and do not have the diversity of species as well as any endangered species according to the Red Book of Vietnam and IUCN. The present species mainly include benthic creatures such as eels, loaches; crustaceans such as snails, shrimp; and all kinds of perch, black carp, etc. and plankton species of animals and plants in nutrient-rich environments. Dredging activities affect the lives of aquatic species, including:

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

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

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

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

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

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

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

Based on the above statistics and the nature of the sediments in Chin Te and 30/4 canal belongs to the type of canals mud with the ecosystems recovery after dredging is predicted at around 6 months.

#### ➤ **Impacts on traffic infrastructure**

As calculated in the assessment of impacts on air environment and the road construction process, the number of vehicles transporting dredged material from the construction site to the dump as well as materials for construction from the supplier to the site is not much (12 vehicles turn for construction of Ngo Quyen extended road, 20 turns for construction of the Dong Tay Avenue, 8 turns for construction of N6 road and 4 turns for construction of 18 road). However, because most transport vehicles are heavy machines and the project areas occupy several residential routes, the impacts on traffic infrastructure are inevitable. The impact of this activity takes place during the construction process, and mainly concentrates in the construction sector. Transport

time serving the construction of Chin Te canal is about 12 months and 30/4 canal is 4 months. Thus, the impact is naturally short-term and constant so it should be assessed at a lower level.

➤ **Impacts on waterway traffic**

The material for construction activities is transported by both waterway and land, estimating there will be about 36 barge trips / month serving for transporting construction materials. Thus, there will be an increase in the number of barge transporting on Tien River and Ben Tre River. This increase may cause some impact as below:

- Increase risk of waterway accidents;
- Increase the risk of bridge collapse on Tien 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 04 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 04 roads, Chin Te canal and 30/4 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 during Construction**

Component 2 invest in renovating 30/4 and Chin Te canal, and 04 inner city routes. The special impacts also arise under each category.

### ***b1. Impacts from the renovation of 30/04 and Chin Te canal (Subcomponent 2.1 and 2.5)***

As Chin Te Canal and 30/4 Canal function mainly as drainage canals, the construction measure to be applied will be dry-land dredging for each segment of 50 – 100 m. Contractors will use piles/sand bags to block the flow at both ends of a segment, then drain water out with pumps and carry out dry-land dredging to the designed level. Dredged sludge will be transported by 1-15-ton trucks to a sanitary landfill. The site-specific impacts arising from these activities would be: i) Odors from the dredged material; ii) Impacts due to transportation of the dredged sediments; iii) Risk of subsidence during construction; iv) Impacts on residential access and traffic; v) Risk of damage to the existing infrastructure; vi) Localized flooding.

#### ***Odors from the dredged material.***

It is noted that households distribute along the canals at a very close distance from 1 m to 8 m. Thus, local people would be affected by unsanitary dredged sediments that emit bad smell or leachate sludge water. Total amount of dredged sediment is 4,905 m<sup>3</sup> from Chin Te Canal and 30/4 Canal.

Households along Chin Te and 30/4 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 Km1+450 to Km1+920 (for Chin Te canal), intersecting N6 Street at Km0+355 (for 30/4 canal) 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 Chin Te and 30/4 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 Chin Te and 30/4 canals, specifically from Km1+450 to Km1+920 (for Chin Te canal) and intersecting N6 Street at Km0+355 (for 30/4 canal) 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*

Actual survey shows that along two sides of Chin Te and 30/4 canal are existing public roads with width from 2-4 m, concrete structure, the status quo is in good state. However, at some segments, people have encroached the canal causing narrowing the canals and public roads. Households on the canal using temporary bridges of 1.5 m wide concrete to connect to the external sector. Specifically, from Km2+070 to Km2+500 of Chin Te Canal, there are about 20-25 temporary concrete bridge; on 30/4 Canal, there are 4 temporary bridges from Km0+00 to Km0+355.

During the rehabilitation of the canals, these temporary bridges will be demolished. Such demolition will cause some trouble to people's travel. However, demolition work of the bridges will not be carried out at the same time performed segment after segment instead. Moreover, during construction, contractors will build temporary bridges and roads. The impact is assessed to be negligible.

Travel and circulation on the roads along the canals will also be affected during the rehabilitation of the canals. Construction means and equipment will also take up some existing space, hence narrowing down the roads. Accordingly, in the narrow range, the state of traffic will be slower compared to the initial state. This effect only occurs in a short time so the impact range is significantly limited.

### *Risk of damage to the existing infrastructure*

Chin Te canal runs under 1 main street of Ben Tre city (Nguyen Thi Dinh) as mentioned above. At these junction, there are reinforced concrete box culverts of 97.7 m long and 3.5 m wide at Km1+566.78 to Km1+664.50. 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*

Chin Te Canal and 30/4 Canal have important roles to play in draining water from the Project area. Yet, the existing drainage capacity of these canals is much limited as they have been blocked by sediments and encroached by local people. Moreover, flooding during dredging operations is much likely to happen as construction equipment and machines will take up some of the space and the flow of the canals will be blocked by segments (of about 50 – 100 m). When the flow is obstructed, the water in the canal would overflow onto both sides, causing localized flooding in the areas along the canals, specifically in the densely-populated area from Km1+450 to Km1+920 on Chin Te Canal and from the starting point of 30/4 Canal (adjacent to

the Resettlement Site of Ao Sen – Cho Chua) to Km0+355. This risk will be all the more severe during the rainy season. Contractors are to devise plans to redirect the flow or install pumps to address temporary flooding for residents along the canals.

*Impacts on Physical Cultural Resources*

Impacts from relocated graves: Construction of 30/4 canal will displace 1 grave, 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.

***b2. Impacts from road construction activities***

***Site-specific Impacts during upgrading and expanding the existing Ngo Quyen street (Sub-component 2.2)***

The construction of Ngo Quyen roads will include: upgrading/constructing road with infrastructure along the route, such as drainage systems, lighting and green area. The anticipated site-specific impacts is impacts to PCRs.

*Impacts on Physical Cultural Resources*

Impacts from relocated graves: Construction of Ngo Quyen roads will displace 25 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 medium.

***Site-specific impacts during the construction of linking branch roads (N6 and N18 streets, Subcomponent 2.3)***

*Impacts on Physical Cultural Resources*

Impacts from relocated graves: Construction of N6 and N18 streets will displace 24 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 medium.

***Site-specific Impacts during the construction of connecting roads (Sub-component 2.3) and Dong Tay Avenue (Sub-component 2.4)***

Civil construction works include: (i) construction of new roads and installing technical infrastructure facilities such as sewerage, lighting and greenery; (ii) construction of concrete culverts and bridges. These construction activities will have negative impacts on i) Impact on water flow; ii) Impacts on water quality and flow due to construction of the bridge; and iii) Impacts on PCRs and other sensitive receptors.

*Impact on water flow due to construction of Dong Tay Avenue*

Arrangement of bridges at the intersections: There will be 6 bridges on Dong-Tay Avenue at the 3 intersections with Ca Loc canal (2 concrete bridge units to be built at Km0+71.5, each of 18 m in length and 14m in width; 2 concrete bridge units to be built at Km1+443.5, each of 15 m in length and 14m in width; 2 concrete bridge units to be built at Km1+997.15, each of 33 m in length and 14m in width). The natural drainage opening of the channel flow will be narrowed down at the bridge piers. However, this impact is assessed to be low as:

- For bridges 15 m in length, there will be 1-2 bridge piers; then, the calculated wet cross-sections will be reduced by  $7.14 \text{ m}^2/210 \text{ m}^2$  (piers of 14 m in length and 0.5 m in width);
- For bridges 18 m in length, there will be 1 bridge pier; then, the calculated wet cross-sections will be reduced by  $7 \text{ m}^2/252 \text{ m}^2$  (piers of 14m in length and 0.5 m in width);
- For bridges 33 m in length, there will be 2 bridge piers; then, the calculated wet cross-sections will be reduced by  $7.14 \text{ m}^2/460 \text{ m}^2$  (piers of 14 m in length and 0.5 m in width).

Thus, compared with the canal cross-section, the wet cross-section will not be considerably reduced. In addition, at the place of narrowed flow, the flow will follow surrounding directions in the channel without any obstruction. The impact is therefore assessed to be negligible.

#### *Impact on water quality of Ca Loc canal due to construction of the bridge*

The construction of the 15-33 m long bridge would mainly increase the amount of suspended solids in Ca Loc 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  $20 \text{ m}^3/\text{day}$ . Since Ca Loc canal functions as drainage, the impact can be assessed moderate.

#### *Impacts on Physical Cultural Resources and sensitive receptors*

*Impacts from relocated graves:* Construction of Dong Tay Avenue will displace 42 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. Impact is medium.

*Impacts on religious works:* Ba Chua Xu temple (30 m away from the subcomponent) and Tinh Xa Ngoc Truoc pagoda (35 m away from the subcomponent) 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 (1<sup>st</sup>, 15<sup>th</sup> 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.

#### *Vibration impact and collapse/cracking risk to PCRs*

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 within radius of 30 m. Impact levels are identified by distance from the works to sources of pollution. Specifically, within a radius of 5 m, vibration could cause risks on structure collapse, cracking. Out of this 5 m distance, the risk on cracking and collapse due to vibration is not likely to happen. As all the PCRs listed above are more than 30 m distant from the construction site i.e. Ba Chua Xu temple (30 m distant) and Tinh Xa Ngoc Truoc pagoda (35 m distant), the risk on structure collapse and cracking on those PCRs are negligible.

**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 30/4 canal	9.5	Nguyen Dinh Chieu Street → Dong Khoi → Doan Hoang Minh → Nguyen Thi Dinh	Inhabitants, passengers, PCRs and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Ben Tre Agro-Market, Rang Dong Kindergarten, Ward 8 Primary School, Nguyen Dinh Chieu Highschool, Vocational School in Ben Tre, Ben Tre secondary school, Ben Tre market, Bach Van Temple, Nguyen Dinh Chieu Hospital, Tran Van An Traditional Medicine Hospital, Vo Truong Toan school.	3 - 65
Rehabilitating Chin Te canal	8	Nguyen Dinh Chieu Street → Dong Khoi → Nguyen Thi Dinh	- Inhabitants, passengers, PCRs and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Ben Tre Agro-Market, Rang Dong Kindergarten, Ward 8 Primary School, Nguyen Dinh Chieu Highschool, Vocational School in Ben Tre, Ben Tre secondary school, Ben Tre market, Vo Truong Toan school.	3 – 65
Extended Ngo Quyen street	9.5	Nguyen Dinh Chieu Street → Dong Khoi → Doan Hoang Minh → Nguyen Thi Dinh	- Inhabitants, passengers, PCRs and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Ben Tre Agro-Market, Rang Dong Kindergarten, Ward 8 Primary School, Nguyen Dinh Chieu Highschool, Vocational School in Ben Tre, Ben Tre secondary school, Ben Tre market, Bach Van Temple, Nguyen Dinh Chieu Hospital, Tran Van An Traditional Medicine Hospital, Vo Truong Toan school	3 – 65
Dong Tay Avenue	8	Nguyen Dinh Chieu Street → Dong Khoi → Nguyen Thi Dinh	- Inhabitants, passengers, PCRs and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Ben Tre Agro-Market, Rang Dong Kindergarten, Ward 8 Primary School, Nguyen Dinh Chieu Highschool, Vocational School in Ben Tre, Ben Tre secondary school, Ben Tre market, Vo Truong Toan school	3 – 65
N6 street	9.5	Nguyen Dinh Chieu Street → Dong Khoi → Doan Hoang Minh → Nguyen Thi Dinh	- Inhabitants, passengers, PCRs and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Ben Tre Agro-Market, Rang Dong Kindergarten, Ward 8 Primary School, Nguyen Dinh Chieu Highschool, Vocational School in Ben Tre, Ben Tre secondary school, Ben Tre market, Bach Van Temple, Nguyen	3 – 65



Construction item	Distance (m)	Transportation routes	Affected object	Distance (m)
			Dinh Chieu Hospital, Tran Van An Traditional Medicine Hospital, Vo Truong Toan school	
N18 Street	9.5	Nguyen Dinh Chieu Street → Dong Khoi → Doan Hoang Minh → Nguyen Thi Dinh	- Inhabitants, passengers, PCR's and sensitive sites along the route: An Hoi Temple, Ward 8 Health Station, Ben Tre Agro-Market, Rang Dong Kindergarten, Ward 8 Primary School, Nguyen Dinh Chieu Highschool, Vocational School in Ben Tre, Ben Tre secondary school, Ben Tre market, Bach Van Temple, Nguyen Dinh Chieu Hospital, Tran Van An Traditional Medicine Hospital, Vo Truong Toan school	3 – 65

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 potentially 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 and the change of microclimate conditions, 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, inaeesthetics 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 of Chin Te Canal and 30/4 Canal, there may be risks of pollution and obstruction of the flow owing to indiscriminate dumping of waste into the water from HHs residing along the canals. The following are possible causes:

- The HHs cannot change their deep-rooted habits in domestic life;
- The canal surface water will be re-encroached;

- There is a lack of effective management by local government authorities in promoting a civilized urban lifestyle.

However, with the presence of operational roads along the canals, re-encroachment of the canal surface will not be likely to take place. At the same time, local government authorities will have to devise propaganda measures so as to raise the locals' awareness of protecting environmental sanitation and to penalize those who indiscriminately dump their waste into the canals.

### ***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 Ben Tre city: Ngo Quyen street connect with Doan Hoang Minh street, Dong Tay Avenue connects with Dong Khoi street, linking branch roads connects with Dong Khoi street and Nguyen Hue 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. Component 3 - Resettlement Area**

Resettlement area is located on Phu Tan ward, with a total area of 5.4 ha. This component supports the construction of resettlement areas for those who are affected and displaced by the project, which includes construction of technical infrastructure such as roads, electric, water supply, etc. and the accompanying social infrastructure such as culture houses, health centers, kindergartens. This will help for households affected because the project does not disturb residential activities and the access to the best living conditions will be immediately available when the project is implemented. Proposed resettlement areas under the project acquired the background constructed by private units with complete infrastructure systems so the impact from Component 3 is negligible. Therefore, we only assess the impact of the operational phase of this component.

### ***Impacts from domestic wastewater***

Domestic wastewater generated by the projects such as water from toilets, water from the washbasin, water from the shower, the water from the kitchen and the floor washing faucet. The amount of waste water equal to 100 % of usual water. So the amount of waste water arising from the resettlement area is about 225 m<sup>3</sup>.

The amount of waste water from households, as well as schools, health centers, etc. are connected to the general drainage system of the city and led to the wastewater treatment plant in Ben Tre City for treatment.

### ***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 1,500 kg/day.
- Solid waste arising from the streets is approximately 1,352 kg/day (generating factor is 0.05 kg/m<sup>2</sup>/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 flooding due to inadequate O&M***

When roads 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, inaeesthetics 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.

### **4.2. CUMULATIVE IMPACT ASSESSEMENT**

Cumulative impact under consideration is defined as two or more individual effects that, when considered together, are considerable or which compound or increase other environmental impacts. The cumulative impact from several projects result from the incremental impacts of the proposed subproject when added to other closely related, and reasonably foreseeable, future projects. The impacts that do not result in part from the subproject will not be discussed.

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

#### ***Geographic Scope***

Cumulative impacts are assessed for related projects within a similar geographic area. This geographic area may vary, depending upon the issue area discussed and the geographic extent of the potential impact. Geographically, the proposed subproject is located in Ben Tre 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 IMPACT ASSESSMENT**

The project is expected to have significant positive social impacts in Ben Tre City for people living in the project area by upgrading urban infrastructure (roads, drainage, water supply and sanitation, public facilities, and power supply) based on community priorities. The project covers 8 wards of Ben Tre city and will bring benefits to 152,078 people.

Upgrading tertiary infrastructure will bring many benefits to residents in LIAs like: improving environmental condition, living condition, bringing access to social service and raising land value. Beneficiaries from the upgrading of tertiary infrastructure are 1,835 households living in the LIAs of the project, especially poor and social policy households.

Besides positive impact, the project also brings negative impacts like: land acquisition, resettlement, loss of livelihood, social illness...

#### 4.3.1. Positive impacts

Upgrading infrastructure will bring many benefits for people in the province in general and people in low-income areas in particular, in Table 4.24:

**Table 4.24: Positive Social Impacts in the Project Area**

Component	Description of Impacts	Beneficiaries
<b>General Impacts for all Components</b>		
All components	Employment opportunities during the construction phase for unskilled workers	For all unskilled workers in the project area
	Improving infrastructure and urban landscape.	For all citizen
<b>Specific impacts for each Component</b>		
Component 1 Upgrading tertiary infrastructure in LIAs 1, 2,6,7	Infrastructure upgrading in LIAs will improve living conditions for all HH in LIAs. Especially: (1) wastewater will be collected, (2) improving environmental condition.	1,835 Households (7,200 persons) including 72 poor 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	1,835 Households (7,200 persons) including 72 poor 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.
<b>Component 2</b>		
Road	The connection of internal traffic systems and inter-district road will facilitate the traveling and transportation of goods in the area, promoting the trade and promoting sustainable economic development. In addition, improvement of existing traffic system will also help to improve connectivity of traffic network, decrease traffic capacity for main roads, reduce consumption of fossil fuel and save traveling time.	For all citizen
	Value of land and house will increase accordingly.	People living along street/lane front houses.
	Construction of sewage system helps to improve drainage capacity for the city, improve environmental sanitation.	For all citizen
Canal	Dredging Chin Te, 30/4 canal systems helps to improve sanitation in the area, increase water drainage in flood and rainy season, improve living condition for people living on the both banks of the canal.	For all citizen

#### 4.3.2. Negative impacts

##### *Land acquisition*

Impact of land acquisition on individual land and public land in 8 project wards. The total area of the land recovered components: 244,442 m<sup>2</sup>, in which:

- Residential land: 15,263 m<sup>2</sup>;
- Agricultural land: 169,418 m<sup>2</sup>,
- Public land: 59,761 m<sup>2</sup>.

The area of land to be acquired to serve the project, including two types: (i) temporary land acquisition for constructing auxiliary works for construction like the material gathering area, workmen's huts, waste dumps ...; (ii) Permanent land acquisition for constructing work items of the project. For farming households, land is the most important asset, losing land means losing tools for making living, leading to shocks for people. In addition, their circumstances will be changed if they receive compensation or assistance to change job. Therefore, even though households with land acquisition get compensation and full support from the project, they may still get great disturbance for jobs and economic activities of their family.

### ***Impact on livelihood***

The project will bring negative impacts on livelihood. Impact on business households along the transport route, construction and relocated business households: relocation may affect the income and livelihood of the household doing business. For those who do small business, hairdressing, nailing ... when being relocated in another place, maybe they will get difficulties to maintain their previous jobs (due to market, location... ). 45 HHs having their trading/business affected permanently (will be relocated), which including 10 HHs with business license and 35 HHs that do not own license, 25 businesses to be temporarily affected.

### ***Gender Issues***

The project brings many risks, specially for women:

- Men and women often experience the impacts of land acquisition and resettlement in different forms and to different extents by nature of their gendered roles in society. Women tend to bear greater burdens in loss of livelihood and disruption to social networks.
- Female-headed households (number) face additional challenges associated with resettlement, especially when they are reliant on extended family and social networks for the care and socialization of children.
- Women are also more susceptible to the risks of HIV/AIDS infection compared to men.
- Women are often managing home based business to be relocated.

### ***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.

### ***Impacts in Traffic System***

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

### ***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. INDUCED IMPACT**

The existing land use along the 04 road, 02 canal (Extended Ngo Quyen road, N6 road, N18 road, Dong Tay Avenue, Chin Te and 30/4 canals) alignments under Component 2 residential, agricultural, and garden land. When these new roads are built and operated, land use along the total road, canal alignments of 6.39 km, 3.2 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. ENVIROMENT

#### 5.1.1. General principals

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 technical design, site clearance, ground leveling, construction, and restoration) and operation phases. Given that most of the key impacts will occur due to civil works and transportation of construction/waste materials, many of the potential negative impacts on physical, biological, and social environment could be mitigated through a set of general measures that are typically applied to most of construction subprojects to minimize impacts such as noise, dust, water, waste, etc. Since there are specific impacts, this chapter also address the site-specific measures both during the construction and operation phases.

#### 5.1.2. Measures to be integrated into the detailed technical design

The following measures will need to be included in the detailed technical designs of the works items during subproject implementation.

##### **Component 1: Upgrading tertiary infrastructure in 4 LIAs**

- 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 04 routes* (Ngo Quyen road – Subcomponent 2.2, Constructing linking branch roads (N6, N18)– Subcomponent 2.3, Dong Tay Avenue–Subcomponent 2.4)

- The design of the route has been calculated on the basis of surveys on hydrologic regimes (flood levels, flow regimes, etc.), topography and geology of the area to ensure the safety and effective operation of the route.
- The technical designs of the streets are to comply with Circular No. 01/2016/TT-BXD dated Feb 01, 2016 on promulgating the National Technical Regulation on technical infrastructure works; and Circular No. 21/2014/TT-BXD dated Dec 29, 2014 on promulgating the National Technical Regulation on construction works to ensure access for disabled people to use.
- The roads will have drainage systems and energy-saving lighting systems ensuring aesthetic beauty; traffic signs will be placed and green tree cells will be arranged along the roads.
- The surface of the road will be designed not to raise its elevation to avoid possible water run off to the households along the two sides of the roads.
- The wastewater drainage system should be designed as a closed sewage system with connection points to be later connected directly to HHs' drainage systems (generally, one standby connection point for 5 HHs).
- The electrical boxes, mainholes, green cells should be designed to be located between each two households.
- Positions of placing public waste bins along the streets are to be included in the design.
- Detailed design will consider adequate temporary drainage to avoid potential flooding during construction.

**ii. *Rehabilitating Chin Te and 30/4 canals (Subcomponent 2.1 and 2.5)***

- 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 Chin Te and 30/4 canals to improve the landscape.

**5.1.3. Mitigation measures during preparation phase**

***Mitigation Measures for Land Acquisition***

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

The subproject is expected to affect on **244,442 m<sup>2</sup>** land owned by **2,189** households and 46 units as the People's Committees/ management organizations, including **15,263.2 m<sup>2</sup>** of residential land; **169,418 m<sup>2</sup>** of agricultural land; **2,794 m<sup>2</sup>** of land managed by the organization; **56,967 m<sup>2</sup>** of public land owned by the Commune/ward PCs as specialized land, canals and transport land. There are 2,189 households impacted with land and fixed assets by the subproject, of which 2,066 households are partly affected and 103 households are totally affected and have to relocate. Among the affected households, there are 163 vulnerable households (policy beneficiary HHs, poor HHs, etc.) as well as 40 affected business households. 92 will need to be relocated. 01 resettlement for site clearance for Ben Tre city subprojects in Phu Tan Ward.

The estimated cost for the Resettlement Action Plan of the subproject is approximately 243,359,600 VND (equivalent to 10,999,801 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 Ben Tre province and the policies determined by the World Bank. The Detailed mitigation measures for land acquisition are provided in the RP of the subproject.

#### For relocation of 92 graves

- There are 92 graves of the Catholics families will need to be relocated for construction under Component 2 (Ngo Quyen street: 25 graves; Dong Tay Avenue: 42 graves; N18 streer: 24 graves) and 30/4 canal (1 graves).
- Compensation for the relocation 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 (6,000,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways.
- During implementation PMU will make early announce to the households whose graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to the affected household as required in the subproject RP and ESMP.

#### **Mitigation of UXO Risks**

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

#### **5.1.4. Mitigation measures during construction phase**

##### **5.1.4.1. Mitigation Measures for Generic Impacts**

As part of the Environmental and Social Management Plan (ESMP) for the subproject these general measures have been translated into a standard environmental specifications to be incorporated into the bidding and contract documents. These are referred to as Environmental Codes of Practice (ECOPs), and they will be applied to mitigate typical impacts of the subproject's civil works under Component 1, 2 and 3. Section 6.1 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 contract documents (BD/CD) annexes. The scope and content of the ECOPs is as follows:

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

The measures identify typical mitigation measures for the following aspects:

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

#### ***5.1.4.2. Site-Specific Mitigation Measures during Construction***

Site-specific mitigation measures during construction of Ben Tre subproject investments are presented in the Table 5.1 below.



**Table 5.1: Site-specific mitigation measures**

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
<b>1.</b>	<b>Component 1: Upgrading tertiary infrastructure in low-income areas in LIAs (LIA 1, LIA 2, LIA 6 and LIA 7)</b>	
<b>a.</b>	Localized flooding - Residents within LIAs 1,2,6,7.	<ul style="list-style-type: none"> <li>- Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work.</li> <li>- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction.</li> <li>- The Contractors must apply the specific construction methods, and flood prevention and control alternatives during construction period or the flow diversion alternatives to ensure the drainage in the location.</li> <li>- The contractors must set up temporary drainage at the construction site and ensure that they are cleared of mud and other obstructions, such as:               <ul style="list-style-type: none"> <li>• Building drainage works along/across the site during backfilling and ground leveling.</li> <li>• Digging drainage ditches/drains suiting practical conditions of the streets.</li> </ul> </li> <li>- Building drainage works along/across the site during backfilling and ground leveling.</li> <li>- Provide drainage ditches/drains suiting practical conditions of the streets.</li> <li>- Deploying standby pumps and other equipment items in case of needed drainage.</li> <li>- Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations.</li> <li>- Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area.</li> </ul>
<b>b.</b>	Odor and management of 7,794 m <sup>3</sup> sediments generated from small canal dredging in LIAs. - Residents along canal. - People commuting along transportation route.	<u>At the sites</u> <ul style="list-style-type: none"> <li>- On-site location for temporary gathering of sludge must be to the tail end of the wind, far from residential areas and sensitive works.</li> <li>- Sediment dredged from channels would give off stinking odors of such gases as CH<sub>4</sub>, H<sub>2</sub>S, and mercaptans. To mitigate the impact from malodor of dredged sediment, it is therefore imperative to provide face masks, boots and gloves for workers who will work directly with this source of waste.</li> <li>- Dredged 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.</li> <li>- 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.</li> </ul>

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
		<ul style="list-style-type: none"> <li>- EM (Effective Microorganisms) deodorants are to be sprayed every day. These deodorants are able to remove offensive odors from H<sub>2</sub>S and mercaptans.</li> </ul> <p><i>Management of dredged sediments from the canals:</i></p> <ul style="list-style-type: none"> <li>- The Dredged Materials Management Plan (DMMPs) for have for the dredged works has been prepared. The DMMP is described in detailes in Annex 2.</li> <li>- According to the analyses, the sediments from the canal dredging work are not hazardous, with heavy metals lower than the acceptable limits. However, the dredging soils and sediments have high amount of organic compounds and pathogenic microorganisms (e.g. <i>Ecoli</i>) 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 Ben Tre WTP.</li> <li>- Ensure that detailed design scope for the chanel dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor's dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts</li> <li>- Prior to construction, the contractors shall a specific DMMP based on the updated DMMP. The contractor's DMMPs shall be submit by Construction Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary gathering of dredged materials, and control of polluting material during temporary gathering and transportation, pollution control, and risks at disposal sites.</li> </ul> <p><i>For the transportation</i></p> <ul style="list-style-type: none"> <li>- Clean up the transport vehicles before leaving construction site. Do not load to a height of 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.</li> <li>- Do not park vehicles in the roads longer than necessary. Do not allow construction vehicles and materials to encroach upon the pavements.</li> <li>- Maintain the required speed limit and do not overuse horn.</li> <li>- Preriodically registry and supervise the quality of transport vehicles as required by the government regulations.</li> <li>- Comply with the traffic safety regulations while participating traffic.</li> <li>- Clean up wastes dropped off on road.</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading.</li> </ul>

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
c.	<p>Social disturbance and increased traffic risks</p> <ul style="list-style-type: none"> <li>- Impacts on traffic within LIAs by narrow alleys</li> <li>- Impacts on traffic along connecting streets</li> <li>- Social disturbance in Ward 5 (LIA 1), Ward 6 (LIA 2), Ward 8 (LIA 6), Phu Khuong Ward (LIA 7)</li> </ul>	<p><u>For impacts on traffic within LIAs</u></p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- Construction operations are to be successively performed by alley segment. Extensive construction operations on the entire route should be avoided.</li> <li>- For major alleys with a width of over 4m, construction should be carried out on one half of the road surface, leaving the other half for traffic traveling.</li> <li>- Construction operations are to be limited during rush hours.</li> <li>- Construction warning signs and traffic instruction signs are to be set up to ward off road users from entering or passing by the construction site.</li> <li>- Temporary vehicle-keeping spots must be established to serve road users within LIAs during construction days.</li> <li>- Clean up the transport vehicles before leaving construction site. Do not load to a height of 10cm higher than the truck body so as not to spill out and scatter materials onto roads, giving rise to dust and endangering road users.</li> <li>- Do not park vehicles in the roads longer than necessary. Maintain the required speed limit and do not overuse horn.</li> <li>- Comply with the traffic safety regulations while participating traffic.</li> <li>- Clean up wastes dropped off on road.</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading of construction materials, equipment, and wastes.</li> <li>- Reinstall the road surface if occurring the damages during construction.</li> </ul> <p><u>For impacts on traffic along connecting streets</u></p> <p>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 bypass 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.</p> <p><u>For impacts on social disturbance</u></p> <ul style="list-style-type: none"> <li>- Prioritized recruitment and employment of the workforce available in the locality;</li> <li>- Carrying out procedures on declaring the personnel present at construction sites;</li> <li>- Setting up workshops on construction site rules &amp; regulations for officers and workers;</li> <li>- Contractors' sanction measures against violations of construction site rules &amp; regulations.</li> </ul>

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
d.	Damage to water supply and communication systems (along alleys in LIAs (10.74 km)	<ul style="list-style-type: none"> <li>- Inform the water supply management and communication companies of the construction activities and their potential impacts such the risks of breakage other damages to the water supply pipeline at least 01 month before start of the construction;</li> <li>- Set up barriers around the construction area of water supply pipeline;</li> <li>- Use smaller excavation machine and Larsen pile driving method of construction to avoid breaking or disposition the water pipeline;</li> <li>- Deploy a qualified technical staff to supervise construction activities near the pipeline and communication cables;</li> <li>- In the case of breaking the pipeline or the communication information system cables, it is necessary to suspend the construction activities and immediately inform the water supply and communication companies and the local authority of the incident.</li> </ul>
e.	Impact on PCRs and sensitive receptors: Kim Quang Pagoda (from 2 m to alley) and Outdoor Shrine (from 3 m to alley) in LIA 1.	<ul style="list-style-type: none"> <li>- 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.</li> <li>- The contractor shall coordinate with local authorities (leaders of local wards or communes) for agreed schedules of construction activities at sensitive times (e.g., religious festival days). Avoid construction activities during religious events every first and 15th days of the lunar month and during festival days if possible.</li> <li>- Prohibit gathering of construction materials within 100m in front of the pagoda/church and monastic.</li> <li>- Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagoda.</li> <li>- The contractor shall provide safety measures as installation of fences, barriers warning signs, lighting system against traffic accidents as well as other risk to local people and goes to pagoda.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas.</li> <li>- Truck drivers shall restrict honking in areas close to the pagoda area.</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the pagoda.</li> <li>- The construction method shall include the measures to protect the foundation of the fence/gate, main building of the pagoda/shrine, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage.</li> <li>- In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken structures as agreed with the pagoda/shrine.</li> </ul>
2.	<b>Component 2: Upgrading primary and secondary infrastructure priorities</b>	
2.1.	<b>Subcomponent 2.1, 2.5: Rehabilitating Chin Te va 30/4 canal</b>	

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
a.	<p>Odors from 4.905 m<sup>3</sup> the dredged sediment</p> <ul style="list-style-type: none"> <li>- People living in the densely populated area from Km1+450 to Km1+920 (Chin Te canal) and intersecting N6 Street-30/4 canal at Km0+355.</li> </ul>	<p><i>To control impacts by dredged sludge:</i></p> <ul style="list-style-type: none"> <li>- The Dredged Materials Management Plan (DMMPs) for have for the dredged works has been prepared. The DMMP is described in detailes in Annex 2.</li> <li>- According to the analyses, the sediments from the canal dredging work are not hazardous, with heavy metals lower than the acceptable limits. However, the dredging soils and sediments have high amount of organic compounds and pathogenic microorganisms (e.g. Ecoli) thus should not be used directly for agricultural purpose. It is recommended that the sediments could be dewatered and kept at least 03 months to allow partial biodegradation of organic substances and removal of microbial organisms. The sediments could then be used for perennial crops or planting tree for urban landscape purpose, based on the actual needs of local people. Otherwise, it will be transported and disposed at Ben Tre WTP.</li> <li>- Ensure that detailed design scope for the chanel dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor's dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts</li> <li>- Prior to construction, the contractors shall a specific DMMP based on the updated DMMP. The contractor's DMMPs shall be submit by Construction Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary gathering of dredged materials, and control of polluting material during temporary gathering and transportation, pollution control, and risks at disposal sites.</li> </ul> <p><i>To control impacts by odors from dredging process:</i></p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- Malodor in the dredged sediment is odors of the various gases as CH<sub>4</sub>, H<sub>2</sub>S, 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.</li> <li>- The dredged sediment to be collected along the work sites and need to be covered by HDPE fabric to limit sediment water leaking into the soil and surrounding, and transported for disposal within 48 hours. The management plan on dredged materials (see Annex DMMP) will be prepared to instruct the contractors to manage the waste source.</li> <li>- Uncontrolled disposal of the dredged sediment is prohibited. The waste source must be managed properly under the supervision of PMU and construction supervision consultant.</li> <li>- Spraying EM (Effective Microorganisms) every day. The deodorant can eleminate malodors from H<sub>2</sub>S and Mercaptan.</li> </ul>
b.	Impacts due to transportation of the dredged sediments: Residences along	<ul style="list-style-type: none"> <li>- Clean up the transport vehicles before leaving construction site. Do not load to a height of 10 cm higher than the truck body so as not to spill out and scatter the dredged sediment onto roads, giving rise to</li> </ul>



No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
	the transportation route	<p>offensive odor, dust, and endangering road users.</p> <ul style="list-style-type: none"> <li>- Do not park vehicles on the roads longer than necessary. Do not allow construction vehicles and materials to encroach upon the pavements.</li> <li>- Maintain the required speed limit and do not overuse horn.</li> <li>- Periodically registry and supervise the quality of transport vehicles as required by the government regulations.</li> <li>- Comply with the traffic safety regulations while participating traffic.</li> <li>- Clean up wastes dropped off on road.</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading.</li> </ul>
c.	Risk of subsidence during construction (from Km1+450 to Km1+920 (Chin Te canal) and intersecting N6 Street at Km0 +355 (for 30/4 canal)	<ul style="list-style-type: none"> <li>- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure sustainability and stability of the embankment;</li> <li>- 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.</li> <li>- Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work.</li> <li>- Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to CSC and the authorities concerned for approval by the construction contractors.</li> <li>- Heavy-duty machinery and equipment must not be gathered near canal banks.</li> <li>- Regularly check and monitor the risk of landslides to plan for possible reinforcement.</li> <li>- Avoid or limit dredging in the rainy season.</li> <li>- Construction of side slope is made in accordance with the design</li> <li>- 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.</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the affected households or the local communities.</li> </ul>
d.	<p>Affecting residential access and traffic</p> <ul style="list-style-type: none"> <li>- 25 temporary bridges from Km2+070 to Km2+500 (for Chin Te canal).</li> <li>- 4 temporary bridges from Km0+00 to Km0+355.</li> </ul>	<ul style="list-style-type: none"> <li>- 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.</li> <li>- Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work.</li> <li>- 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.</li> </ul>

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
		<ul style="list-style-type: none"> <li>- 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.</li> <li>- Temporary bridges are to be dismantled with the successive method; simultaneous dismantling or demolition must be avoided.</li> <li>- Cover the incomplete trenches under construction at end of the working day.</li> <li>- Provide night lighting system with luminously painted fence and night lamp.</li> <li>- Machinery and equipment can be gathered only on one canal side.</li> <li>- Traffic instruction signs are to be erected to direct road-users into replacement traffic roads.</li> <li>- Deploy staff to guide the traffic during rush hours.</li> <li>- Immediately address 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.</li> </ul>
e.	<p>Damaged infrastructure facilities at intersections</p> <p>On Chin Te canal at Km1+566.78 to Km1+664.50.</p>	<ul style="list-style-type: none"> <li>- Dredging inside the box culverts must not be performed with heavy-duty motorized equipment such as excavators, scoops, etc.</li> <li>- 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.</li> <li>- It will be strictly prohibited to place equipment, machines or materials inside the existing box culverts.</li> <li>- 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.</li> <li>- Workers need to quickly clear dropped debris inside the culvert.</li> </ul>
f.	<p>Local flooding during the dredging process (from Km1+450 to Km1+920 on Chin Te canal and Km0+00 to Km0+355 on 30/4 canal)</p>	<ul style="list-style-type: none"> <li>- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction.</li> <li>- The Contractors must apply the specific construction methods, and flood prevention and control alternatives during construction period or the flow diversion alternatives to ensure the drainage in the location.</li> <li>- The contractors must set up temporary drainage at the construction site and ensure that they are cleared of mud and other obstructions, such as: (i) building drainage works along/across the site prior to dredging operations; (ii) Digging drainage ditches/drains suiting practical conditions.</li> <li>- Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area.</li> <li>- Deploying standby pumps and other equipment items in case of extreme weather events</li> <li>- Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations.</li> </ul>

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
g.	Impacts on PCRs and sensitives receptors: Relocated 01 graves (30/4 canal)	<p><u>Relocation of graves:</u></p> <ul style="list-style-type: none"> <li>- Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation, reburial and other related costs which are necessary to satisfy customary religious requirements. Compensation in cash will be paid to each affected family or to the affected group as a whole as is determined through a process of consultation with the affected community. The level of compensation will be decided in consultation with the affected families/communities. All costs of excavation, relocation and reburial (5,765,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways.</li> <li>- During implementation the Subproject Owner will make early announce to the households whose graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to the affected household as required in the subproject RP and ESMP.</li> </ul>
<b>2.2</b>	<b>Subcomponent 2.2: Upgrading and expanding the existing Ngo Quyen street</b>	
a.	Impacts on PCRs - Relocated 25 graves	<ul style="list-style-type: none"> <li>- Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation, reburial and other related costs which are necessary to satisfy customary religious requirements. Compensation in cash will be paid to each affected family or to the affected group as a whole as is determined through a process of consultation with the affected community. The level of compensation will be decided in consultation with the affected families/communities. All costs of excavation, relocation and reburial (5,765,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways.</li> <li>- During implementation the Subproject Owner will make early announce to the households whose graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to the affected household as required in the subproject RP and ESMP.</li> </ul>
<b>2.3.</b>	<b>Subcomponent 2.3, 2.4: Construction of connecting roads (N6, N18) and Dong Tay Avenue</b>	
a.	Impact on water flow  - Intersections with Ca Loc canal (3 bridges on Dong - Tay Avenue at the 3 intersections with Ca Loc Channel and 02 culverts on N18, 01 culvert on N6).	<ul style="list-style-type: none"> <li>- Building materials and waste must not be gathered at positions close to canal.</li> <li>- At the close of each working day, building materials must be carefully covered to prevent rainwater from washing away materials into the canals.</li> <li>- In case of materials and waste falling into the canals during construction, contractors are to promptly have workers tidy them up.</li> <li>- Contractor will enter into contracts with URENCO for collecting waste every day.</li> <li>- The construction of sewers and bridges on canals must be sped up compared with the normal progress and contractors must carry out construction operations in line with the planned progress schedule.</li> </ul>
b.	Impact on water quality and water flow	<ul style="list-style-type: none"> <li>- A construction plan of detailed measures and schedule is to be worked out for the building/laying of</li> </ul>

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
	<p>of Ca Loc canal due to construction of the bridge</p> <ul style="list-style-type: none"> <li>- Intersections with hydraulic canals (03 small bridges on Dong Tay Avenue).</li> </ul>	<p>sewers and bridges at the intersections with the canal.</p> <ul style="list-style-type: none"> <li>- In the final segment of the drainage ditch temporarily connected to the canal, there will be a settlement pit for suspended matter to retain sludge, pollutants and waste in the water before it is discharged into the canal. This settlement pit will be emptied and tidied up every day by workers.</li> <li>- Before operation, all construction means and machines will be carefully checked in terms of technical parameters as well as operational performance to limit possible spills of oil, grease or fuel.</li> <li>- Construction operations during high tides should be limited.</li> <li>- Construction supervision staff at site must carry out strict management of workers during construction processes in order to limit materials and waste from spilling into the canal.</li> <li>- No machine &amp; equipment maintenance is to be carried out in areas close to the canal.</li> <li>- The construction unit should speed up the progress to cut down the radius of pollution transmission.</li> </ul>
c.	<p>Impacts on PCRs and sensitives receptors: Relocated 42 graves of Dong Tay Avenue, 24 graves of N18 street; Ba Chua Xu temple (30 m to Dong Tay Avenue) and Ngoc Truoc Pagodas (35 m to Dong Tay Avenue).</p>	<ul style="list-style-type: none"> <li>- Relocation of graves:</li> <li>- Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation, reburial and other related costs which are necessary to satisfy customary religious requirements. Compensation in cash will be paid to each affected family or to the affected group as a whole as is determined through a process of consultation with the affected community. The level of compensation will be decided in consultation with the affected families/communities. All costs of excavation, relocation and reburial (5,765,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways.</li> <li>- During implementation the Subproject Owner will make early announce to the households whose graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to the affected household as required in the subproject RP and ESMP.</li> <li>- For Ba Chua Xu temple (from 30 m) and Ngoc Truoc Pagodas (35 m):</li> <li>- 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.</li> <li>- The contractor shall coordinate with local authorities (leaders of local wards or communes) for agreed schedules of construction activities at sensitive times (e.g., religious festival days). Avoid construction activities during religious events every first and 15th days of the lunar month and during festival days if possible.</li> <li>- Prohibit gathering of construction materials within 100m in front of the pagoda/church and monastic.</li> <li>- Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagoda.</li> <li>- The contractor shall provide safety measures as installation of fences, barriers warning signs, lighting system against traffic accidents as well as other risk to local people and goes to pagoda.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of</li> </ul>

No.	Sensitive receptors and Site-Specific impacts	Site-specific mitigation measures
		<p>the pagodas.</p> <ul style="list-style-type: none"> <li>- Truck drivers shall restrict honking in areas close to the pagoda area.</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the pagoda.</li> <li>- The construction method shall include the measures to protect the foundation of the fence/gate, main building of the pagoda/temple, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage.</li> <li>- In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken structures as agreed with the pagoda/temple.</li> </ul>
e.	<p>Damaged infrastructure facilities at intersections</p> <ul style="list-style-type: none"> <li>- On Chin Te canal at Km1+566.78 to Km1+664.50.</li> </ul>	<ul style="list-style-type: none"> <li>- Dredging inside the box culverts must not be performed with heavy-duty motorized equipment such as excavators, scoops, etc.</li> <li>- 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.</li> <li>- It will be strictly prohibited to place equipment, machines or materials inside the existing box culverts.</li> <li>- 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.</li> <li>- Workers need to quickly clear dropped debris inside the culvert.</li> </ul>

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

During construction, under component 1, 2, 3: a number of streets and roads will be affected by transportation of construction materials and waste as indicated in Table 5.2 below.

**Table 5.2: Material and waste transport routes**

Construction area	Expected length (km)	Planned transportation route
<b>Component 1</b>		
LIA 1	11.5	Nguyen Dinh Chieu Street→Hoang Lam Street→ Doan Hoang Minh →Nguyen Thi Dinh Street→Ben Tre waste treatment plant.
LIA 2	11.5	Nguyen Dinh Chieu Street→Hoang Lam Street → Doan Hoang Minh Street → Nguyen Thi Dinh Street → Ben Tre waste treatment plant.
LIA 6	8.5	Nguyen Dinh Chieu Street →Dong Khoi Street → Nguyen Thi Dinh Street → Ben Tre waste treatment plant.



Construction area	Expected length (km)	Planned transportation route
LIA 7	8.5	Nguyen Dinh Chieu Street →Dong Khoi Street → Nguyen Thi Dinh Street → Ben Tre waste treatment plant.
<b>Component 2</b>		
Rehabilitating Chin Te canal (Subcomponent 2.1)	8.5	Nguyen Dinh Chieu Street →Dong Khoi Street → Nguyen Thi Dinh Street →Ben Tre waste treatment plant.
Construction of extended Ngo Quyen street (Subcomponent 2.2)	10.5	Nguyen Dinh Chieu Street →Dong Khoi Street →Doan Hoang Minh Street →Nguyen Thi Dinh Street →Ben Tre waste treatment plant
Construction of connecting roads (Subcomponent 2.3)	10.5	For N6: Nguyen Dinh Chieu Street →Dong Khoi Street →Doan Hoang Minh Street →Nguyen Thi Dinh Street →Ben Tre waste treatment plant.
Construction of Dong Tay Avenue (Subcomponent 2.4)	8.5	Nguyen Dinh Chieu Street →Dong Khoi Street → Nguyen Thi Dinh Street →Ben Tre waste treatment plant.
Rehabilitating 30/4 canal (Subcomponent 2.5)	10.5	Nguyen Dinh Chieu Street →Dong Khoi Street →Doan Hong Minh road →Nguyen Thi Dinh Street →Ben Tre waste treatment plant.

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 Impact Under Component 1**

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

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

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

##### Traffic safety

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

##### Waste management

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

#### **Measures to Mitigate 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 Chin Te and 30/4 Canals 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 Chin Te and 30/4 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 site-specific impacts for Component 3**

***Component 3 - Operation Stage***

Mitigation of impact from waste water

- Households in the resettlement sites have to build the toilets with septic tank in accordance with regulations of the Government, the wastes from the toilets must be primarily treated in the septic tanks of each household before discharging into the public drainage system. In this case, the pollutant load has to be reduced by additional 30-40% BOD<sub>5</sub>/COD after treatment in the septic tank. The wastewater will be then connected to the wastewater collection and treatment system of Ben Tre Waste Treatment Plant (funded by ADB ODA).
- Sewer systems should be designed as closed sewer system.
- Daily cleaning and scrapping are required at the drainage manhole to avoid clog.
- Regularly carry out the dredging to limit the accumulation and deposition of organic compounds.

Mitigation of impact from solid waste

- Management Board of the resettlement areas must sign a contract for collection and transportation of municipal waste with URENCO or private waste collectors to transfer garbage emissions from resettlement areas;
- Disposition of garbage cans along the internal transport line in resettlement areas. - Specification of trash can must meet the provisions of the construction according to the QCVN 07: 2010/BXD particular: i) the capacity of the trash can will be 100 liters and not exceeding 1 m<sup>3</sup>; ii) the trash can must be covered; iii) 1 trash can every 100m; 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 Subproject and the associated projects are mostly positive. The negatives cumulative impacts are minor to moderate and can be addressed individually at the project level.

### **5.3. TIGATION 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 effects 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 the 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 livelihood**

During the construction period, temporary impacts on business could also lead to loss of income. The following measures should apply:

- 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.
- Ensure the access to the shops during construction;
- Unofficial business activities will be allowed to temporarily move to another location;
- Regularly inform the schedule and construction time for all people. The bulletin will be installed at the construction site;
- Project Preparation Unit/Environmental survey unit will provide hotline contact with the local community to respond to the complaints of the community.
- Construction activities need to be informed to households 2 weeks before implementation.

Relocated business, farmers losing productive land will have their income permanently affected. As part of the RP, income restoration program (IRPs) will be developed and supported under the consultant contract for detailed design. The main proposed income restoration activities are:

- Vocational Training;
- Access to loan;
- Job introduction.

### **5.3.3. Measure to minimize gender issues**

One gender action plan will be prepared to ensure optimum participation of female during project implementation, providing employment opportunity to women, promoting role and position of the women. Awareness campaigns targeting women will be implemented during the implementation of the project, including awareness campaigns on environmental issues and social risks to improve accessibility to social service with equality between men and women. The gender action plan will be implemented by Ben Tre city People's Committee and ward/commune people's committee and women's union.

### **5.3.4. Measure to minimize risk of social ills**

Well controlling negative impacts and threats on public health during the construction of the sub-project is essential. Proactively preventing diseases arising in the course of construction of the project, while effectively responding to the epidemic cases through health awareness campaigns will be conducted. 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:

- Programs for preventing and raising public awareness on human trafficking and HIV/AIDS will also be developed and implemented by local authorities and contractors
- Measures to prevent and raise awareness of HIV/AIDS will be included in the contractor's contract
- The contractor's contract has been reviewed to ensure that the provisions relating to health and safety (OH & S) and include gender equality are all included.

### **5.3.5. Measure to minimize 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.

### **5.3.6. Consultation with stakeholders**

To minimize the risk related to the negative impacts that may arise and to establish communication channels, during project preparation, several public consultations have been organized. In addition, one community upgrade plan (CUP) has been prepared specifically for households living in the LIAs to represent their ideas on technical solutions in the design phase of the project. This will help to promote people's participation into the project and minimize complaints and conflict in the implementation phase. To avoid the overlapping in compensation work when there are many projects with different policies, the province authority has issued specific guidelines for the inventory, payment, replacement price for the project basing on resettlement policy of the project which has been approved by competent authorities.

### **5.3.7. Preparation of resettlement plan (RP)**

A RP was prepared for Ben Tre City based on the RPF prepared for the Project. The RP addresses the adverse impacts related to land acquisition and resettlement. The main principles of the RP are:

- Compensate HH on the basis of replacement cost.
- Implement assistance programs to reduce to the minimum, difficulties for households during and after relocation to ensure the life of PAPs after relocation to be "better than or at least equal "as before resettlement.



- The project implementation agencies will endeavor to create favorable conditions for PAPs in order to improve living conditions, income and production levels, and at the minimum to maintain the standard of living at the pre-project level.

Built a Resettlement Site in Phu Tan ward which has been constructed and invested by Ben Tre Construction Material JSC with full infrastructure to serve relocated households, ensuring the best living conditions for people. Specific information on the resettlement area in Phu Tan ward:

- Total area: 5.4 ha divided to 129 land plots; 100-150 m<sup>2</sup> residential land each.
- The average distance from the area to the former residence is about 1km-4km. As survey conducted, this will reduce social and economic disruption.

#### **5.3.8. Good preparation and implementation of communication and community consultation on health with participation of community**

Increasing accessibility to information for people in the project area. People will get information and update on project implementation to have proactive plan for production and daily activities. Information for the development: increasing accessibility to the information for people's lives, contributing into the improvement of life quality, enhancing involvement of community.

#### **5.3.9. Information publication, social accountability and monitoring responsibility**

To ensure the participation of affected communities, families, local governments and related organizations in sharing information on project, advice on the choice of technical solutions, expectation of impacts on land, income and on-land property... The disclosure of information is an important contribution in promoting the progress of the project during implementation, preparation, and operation under the agreement of the community, government and project management unit. This will minimize the possibility of arising conflicts and other risks, increase investment efficiency and social significance of the project.

#### **5.3.10. Hiring social experts**

Hiring social experienced experts by PMU to implement the resettlement plan, income restoration program and the Gender Action Plan and the Public Health Management Plan.

## **CHAPTER 6. ENVIRONMENTAL 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 Ben Tre Sub-project. The Environmental Management Program will identify the activities/actions to be implemented in the city of Ben Tre 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 2 basic parts: (1) ECOP, (2) Specific mitigation measures for the specific types of works.

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

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

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

### **6.2. KEY IMPACT MITIGATION MEASURES**

#### **6.2.1. Mitigation Measures for General Preparation Impacts (ECOPs)**

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

**Table 6.1: Mitigation measures in accordance with ECOPs**

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
<b>1. Generate dust, noise, vibration, exhaust gas</b>	<ul style="list-style-type: none"> <li>• Maintain the level of emission at construction sites within the permissible limit provided for in QCVN 05: 2013/BTNMT: National Technical Regulation on Ambient Air Quality.</li> <li>• Vehicles in Vietnam must undergo a regular emissions check and obtain certification: “Certificate of conformity from inspection of quality, technical safety and environmental protection” following Decision No. 35/2005/QD-BGTVT.</li> <li>• Carry out watering for dust control at least 2 times a day: in the morning and in the afternoon during dry weather with temperatures of over 25°C, or in windy weather. Avoid overwatering as this may make the surrounding muddy.</li> <li>• Exposed soil and material stockpiles shall be protected against wind erosion and the location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors.</li> <li>• Dust masks should be used by workers where dust levels are excessive</li> <li>• There should be no burning of waste or construction materials on site.</li> <li>• Cement processing plants should be far from residential areas.</li> <li>• Only use transportation vehicles with valid registry.</li> <li>• Neatly gather construction materials and wastes. Arrange for the workers to collect and gather construction materials and wastes to the designated places at the end of each day or shift.</li> <li>• Do not overload the materials/soils and stones to extreme heights onto trucks, as this may result in drops along transportation routes. Tightly cover the trucks carrying wastes and bulk materials before getting out of construction sites or quarries and borrow pits so as to restrict scattering along transportation routes.</li> </ul>	<ul style="list-style-type: none"> <li>• QCVN 05: 2013/BTNMT: National technical regulation on ambient air quality</li> <li>• QCVN 26:2010/BTNMT: National technical regulation on noise</li> <li>• QCVN 27:2010/BTNMT: National technical regulation on vibration</li> <li>• TCVN 6438-2005: Road vehicles. Maximum permitted emission limits of exhaust gas</li> <li>• Decision No. 35/2005/QD-BGTVT on inspection of quality, technical safety and environmental protection;</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>• Put temporarily gathered materials and waste heaps with a volume of about 20 m<sup>3</sup> within barriers or covered so as to avoid dust dispersion.</li> <li>• Transport wastes out of construction sites to the designated locations for reuse or to the disposal sites in the soonest possible time.</li> <li>• Do not put vehicles and machines to run idle in more than 5 minutes.</li> <li>• Avoid preparations of construction materials such as mixing concrete near local people's houses or other sensitive works like pagodas, school gates, or offices.</li> <li>• Locate vehicle washing stations at the exit/entrance of construction of component 1.</li> <li>• Periodically wash the trucks used for transporting materials and construction wastes.</li> <li>• Avoid construction operations generating great vibration and loud noise within the time between 6 pm and 7 am when construction takes place near residential areas. Night construction must be informed to the community at least 2 days in advance.</li> <li>• Perform the method of successive construction for each sewer section in construction sites of long sewer lines.</li> <li>• Observe and secure construction progress correctly.</li> <li>• Installing picket fence with height of 2.5 m at construction locations.</li> <li>• When needed, measures to reduce noise to acceptable levels must be implemented and could include silencers, mufflers, acoustically dampened panels or placement of noisy machines in acoustically protected areas</li> <li>• Avoiding or minimizing transportation through community areas and avoiding as well as material processing areas (such as cement mixing)</li> </ul>			
<b>2. Wastewater management</b>	<ul style="list-style-type: none"> <li>• The Contractor must be responsible for compliance with Vietnamese legislation relevant to wastewater discharges into watercourses.</li> </ul>	<ul style="list-style-type: none"> <li>• QCVN 14:2008/BTNMT:</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>• Employ local workers to limit the amount of generated domestic wastes and wastewater.</li> <li>• Provide septic tanks for toilets for treating wastewater before it can be discharged into the environment. On-site mobile toilets with 3-compartment septic tanks can be used in areas for major work items as traffic roads and canal. Wastewater from toilets as well as kitchens, showers, sinks, etc. shall be discharged into a conservancy tank for removal from the site or discharged into municipal sewerage systems; there should be no direct discharges to any waterbody</li> <li>• Wastewater containing pollutants over standards set by relevant Vietnamese technical standards/regulations must be collected in a conservancy tank and removed from site by licensed waste collectors.</li> <li>• Clear ditches around the workers' camps every week.</li> <li>• Creating ditches for rain water collection and diversion.</li> <li>• Make appropriate arrangements for collecting, diverting or intercepting wastewater from households to ensure minimal discharge or local clogging and flooding.</li> <li>• Before construction, all necessary wastewater disposal permits/licenses and/or wastewater disposal contracts have been obtained.</li> <li>• At completion of construction works, wastewater collection tanks and septic tanks shall be safely disposed or effectively sealed off.</li> </ul>	<p>National technical regulation on domestic wastewater;</p> <ul style="list-style-type: none"> <li>• QCVN 40:2011/ BTNMT: National technical regulation on industrial wastewater</li> </ul>		
<b>3. Solid waste management</b>	<ul style="list-style-type: none"> <li>• Before construction, a solid waste control procedure (storage, provision of bins, site clean-up schedule, bin clean-out schedule, etc.) must be prepared by the Contractors and it must be carefully followed during construction activities.</li> <li>• Before construction, all necessary waste disposal permits or licenses must be obtained.</li> </ul>	<ul style="list-style-type: none"> <li>• Decision No, 59/2007/NĐ-CP on garbage management;</li> <li>• Decision No,38/2015/NĐ-CP dated 24/04/2015 on waste and scrap</li> </ul>	Contractor	PMU, CSC, IEMC



Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>• Solid waste may be temporarily stored on site in a designated area approved by the CSC and relevant local authorities prior to collection and disposal through a licensed waste collector.</li> <li>• Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof.</li> <li>• No burning, on-site burying or dumping of solid waste shall occur.</li> <li>• If not removed off site, solid waste or construction debris shall be disposed of only at sites identified and approved by the CSC and included in the solid waste plan. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas, such as in areas of natural habitat or in watercourses.</li> <li>• Limit waste pollution from litter and drop of materials. Place dustbins at the workers' camps.</li> <li>• Temporarily collect and separate domestic wastes. Provide watertight dustbins for domestic waste and tightly cover them to avoid giving rise to bad odors and leachate leakage, attracting flies, mice and other pathogenic species.</li> <li>• Perform concrete mixing on impermeable ground. Collect waste and wastewater containing cement through drainage ditches with sedimentation pits in construction sites before being discharged into receiving waters.</li> <li>• Separate the components and parts which can be reused or recycled in the construction wastes before transporting the waste to treatment in accordance with design documents acceptable to the supervision engineer.</li> <li>• Weathered soil, wood and bricks can be reused for useful purposes such as ground leveling. Wood scraps may be used for cooking. Corrugated iron, iron, steel, packing materials and other materials which can be recycled can be delivered and sold to scrap traders.</li> <li>• Collect waste and tidy up construction sites at the end of a working</li> </ul>	management		

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>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.</p> <ul style="list-style-type: none"> <li>The Contractor will sign a contract with Ben Tre URENCO to collect solid waste, conforming to Decree No. 38/2015/ND-CP dated 24 April 2015 on management of waste and waste materials.</li> </ul>			
<b>4. Hazardous waste management</b>	<ul style="list-style-type: none"> <li>Temporarily collect, store, and transported for treatment all hazardous wastes (road asphalt, waste oil and grease, organic solvents, chemicals, oil paints, etc.) in accordance with Circular No. 36/2015/TT-BTNMT on management of hazardous waste.</li> <li>At each site or worker camp and maintenance area, the Contractor must arrange storage area or containers for hazardous waste (drum/plastic/composite containers can be used). These containers are only used to store hazardous waste and must be covered and labelled outside as “HAZARDOUS WASTE CONTAINER”.</li> <li>Sign contracts with for oil and grease to be delivered to suppliers/manufacturers</li> <li>Chemical waste of any kind shall be disposed of at an approved appropriate landfill site and in accordance with local legislative requirements. The Contractor shall obtain needed disposal certificates.</li> <li>The removal of asbestos-containing materials or other toxic substances shall be performed and disposed of by specially trained and certified workers.</li> <li>Used oil and grease shall be removed from site and sold to an approved used oil recycling company.</li> <li>Used oil, lubricants, cleaning materials, etc. from the maintenance of vehicles and machinery shall be collected in holding tanks and</li> </ul>	<ul style="list-style-type: none"> <li>Circular No. 36/2015/TT-BTNMT on hazardous waste management;</li> <li>Decision No.38/2015/NĐ-CP dated 24/04/2015 on waste and scrap management</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>removed from site by a specialized oil recycling company for disposal at an approved hazardous waste site.</p> <ul style="list-style-type: none"> <li>• Used oil or oil-contaminated materials that could potentially contain PCBs shall be securely stored to avoid any leakage or affecting workers.</li> <li>• Unused or rejected tar or bituminous products shall be returned to the supplier's production plant.</li> <li>• Relevant agencies shall be promptly informed of any accidental spill or incident</li> <li>• Store chemicals appropriately and with appropriate labeling</li> <li>• Appropriate communication and training programs should be put in place to prepare workers to recognize and respond to workplace chemical hazards</li> <li>• Prepare and initiate a remedial action following any spill or incident. In this case, the contractor shall provide a report explaining the reasons for the spill or incident, remedial action taken, consequences/damage from the spill, and proposed corrective actions</li> </ul>			
<b>5. Water pollution</b>	<ul style="list-style-type: none"> <li>• The Contractor is responsible for controlling the surface water quality when discharging it out of the construction site, in accordance with QCVN 08-MT:2015/BTNMT – <i>National Technical Regulation on surface water quality</i> and QCVN 14:2008/BTNMT – <i>National Technical Regulation on domestic wastewater quality</i>.</li> <li>• Provide preliminary sedimentation ponds and ditches of storm water runoff at the construction sites.</li> <li>• Provide construction workers on site with mobile toilets.</li> <li>• Avoid excavation and backfilling during rains.</li> <li>• Gather materials and wastes generated during excavation and backfilling, collect and transport them out of the construction site to</li> </ul>	<ul style="list-style-type: none"> <li>• QCVN 08-MT:2015/BTNMT – <i>National Technical Regulation on surface water quality</i></li> <li>• QCVN 09-MT:2015/BTNMT: <i>National Technical Regulation on Underground Water Quality</i></li> <li>• QCVN</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>the approved disposal sites within the soonest possible time.</p> <ul style="list-style-type: none"> <li>Do not allow temporary gathering of bulk materials and mixing of concrete within 50 m from ponds, lakes, rivers, streams, or other water sources.</li> <li>Store used and unused oil and petrol in closed containers on impermeable ground covered with roofs and contained within surrounding banks for easy control and collection in case of leakage. Do not locate oil and petrol storages within 25 m from rivers/canals.</li> <li>Collect and transport excavated soils from the construction of sewers and ditches out of the construction site within 24 hours.</li> <li>Only perform maintenance work of motored vehicles and equipment, including oil replacement or lubrication in designated areas, without allowing chemicals, petrol, oil, or grease to leak onto soil or into the drainage system or water sources. Trays are to be used to hold rags and materials used in maintenance. Collect and discard wastes in accordance with hazardous waste management regulation</li> </ul>	<p>14:2008/BTNMT: National technical regulation on domestic wastewater;</p> <ul style="list-style-type: none"> <li>QCVN 40: 2011/ BTNMT: National technical regulation on industrial wastewater;</li> <li>TCVN 7222: 2002: General requirements for concentrated wastewater treatment plants</li> </ul>		
<b>6. Impacts on plants and aquatic species</b>	<ul style="list-style-type: none"> <li>The Contractor shall prepare a Clearance, Revegetation and Restoration Management</li> <li>Plan for prior approval by the Construction Engineer, following relevant regulations. The Clearance Plan shall be approved by the Construction Supervision Consultant and followed strictly by the contractor. Areas to be cleared should be minimized as much as possible.</li> <li>Limit disturbances to areas with construction operations, especially in locations covered with green trees or vegetation. Do not use chemicals to clear vegetation.</li> <li>Do not gather materials and wastes at places covered with vegetation or with green trees, but on vacant land instead.</li> <li>Use sheet pile driving method using Larsen piles to limit impacts on the water quality.</li> </ul>	<ul style="list-style-type: none"> <li>Law on environmental protection No. 55/2014/QH13</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>• If possible, green trees should be moved and replanted in other places if the trees are in the way of the pipelines to be constructed.</li> <li>• The contractor shall remove topsoil from all areas where topsoil will be impacted by construction activities, including temporary activities such as storage and stockpiling, etc.; the stripped topsoil shall be stockpiled in areas agreed to by the Construction Supervision Consultant for later use in re-vegetation and shall be adequately protected.</li> <li>• Trees cannot be cut down unless explicitly authorized in the vegetation clearing plan.</li> <li>• When needed, temporary protective fencing will be erected to efficiently protect the preserved trees before commencement of any works within the site.</li> <li>• No area of potential importance as an ecological resource should be disturbed unless there is prior authorization from CSC, who should consult with PMU, IEMC and the relevant local authorities. This could include areas of breeding or feeding for birds or animals, fish spawning areas, or any area that is protected as a green space.</li> <li>• The Contractor shall ensure that no hunting, trapping, shooting, poisoning of fauna takes place.</li> </ul>			
<b>7. Impacts on urban landscape and beauty</b>	<ul style="list-style-type: none"> <li>• Carefully cover transport vehicles for materials and waste and periodically wash and clean the vehicles.</li> <li>• Dismantle the camps as well as other temporary works set up during construction and restore the site before the completed work could be handed over to the subproject owner. Back fill and tightly seal toilet pits, septic tanks, and temporary sewerage ditches.</li> <li>• Do not temporarily gather construction materials and wastes within 20m from the gate of schools, offices temples, pagodas, etc.</li> <li>• The Contractor will have to work out construction plans in such a way as to avoid the 1<sup>st</sup> and 15<sup>th</sup> days of each lunar month if</li> </ul>	<ul style="list-style-type: none"> <li>• Law on environmental protection No. 55/2014/QH13</li> <li>• TCVN 4447:1987: Construction regulation</li> <li>• Circular No. 22/2010/TT-BXD on requirements on safety</li> </ul>	Contractor	PMU, CSC, IEMC



Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>construction is to be carried out near historical and cultural works such as pagodas, temples, etc.</p> <ul style="list-style-type: none"> <li>Regularly collect materials and wastes and tidy up the construction site.</li> </ul>			
<b>8. Sedimentation, erosion, flooding, subsidence and slides</b>	<ul style="list-style-type: none"> <li>Avoid disturbances and damage to the existing vegetation and green trees.</li> <li>Periodically and thoroughly remove soils, stones and wastes from drainage sewers and ditches inside and around the construction site.</li> <li>Neatly gather materials and wastes so as to limit them being swept away by storm water.</li> <li>Carry out ground leveling and rolling after discarding materials at disposal sites.</li> </ul>	<ul style="list-style-type: none"> <li>TCVN 4447:1987: Construction regulation</li> <li>Circular No. 22/2010/TT-BXD: Regulation on construction safety</li> <li>QCVN 08-MT:2015/BTNMT – National technical regulation on surface water quality</li> </ul>	Contractor	PMU, CSC, IEMC
<b>9. Traffic management</b>	<ul style="list-style-type: none"> <li>Before construction, carry out consultations with local government and community and with traffic police.</li> <li>Set up traffic and maintain instruction signs and warnings to secure safety for people and means of transport during construction.</li> <li>Arrange and provide separate passageway with safe and easy access for pedestrian and for people with disability and mobility issues especially the areas in proximity of schools, including easy wheel chair access and hand rail. Make staff available any time for helping people with disability if needed</li> <li>Put speed limit signs at a distance of 200 m from the construction site.</li> <li>Carefully cover materials on trucks. Do not load to a height of 10cm higher than the truck body so as not to spill out and scatter materials onto roads, giving rise to dust and endangering road users. Collect spilt soils and materials at the construction site each day to avoid</li> </ul>	<ul style="list-style-type: none"> <li>Law on communication and transport No. 23/2008/QH12;</li> <li>Law on construction No. 50/2014/QH13;</li> <li>Law No. 38/2009/QH12 dated 19/6/2009 amending and supplementing some articles of the Law relating to capital construction investment</li> <li>Circular No. 22/2010/TT-BXD on regulation on</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>slippery incidents for vehicles.</p> <ul style="list-style-type: none"> <li>Do not park vehicles in the roads longer than necessary. Do not allow construction vehicles and materials to encroach upon the pavements.</li> <li>During construction near schools, deploy staff at the site to guide the traffic at the start of school time and when school is over. Water the roads to prevent dust, limit the speed of traveling trucks, do not allow flared horns, and do not dispose the waste and wastewater onto areas near schools.</li> <li>Install night lighting of all construction sites.</li> <li>Significant increases in number of vehicle trips must be covered in a construction plan previously approved. Routing, especially of heavy vehicles, needs to take into account sensitive sites such as schools, hospitals, and markets.</li> <li>Installation of lighting at night must be done, if necessary, to ensure safe traffic circulation.</li> <li>Employ safe traffic control measures, including road/rivers/canal signs and flag persons to warn of dangerous conditions.</li> <li>Avoid material transportation for construction during rush hours.</li> <li>Passageways for pedestrians and vehicles within and outside construction areas should be segregated and provide for easy, safe, and appropriate access. Signposts shall be installed appropriately in both water-ways and roads where necessary.</li> </ul>	construction safety		
<b>10. Influence to existing infrastructure and services</b>	<ul style="list-style-type: none"> <li>Provide information to affected households on working schedules as well as planned disruptions (at least 2 days in advance).</li> <li>The Contractor must only use vehicles of sizes and loads within permissible limits for the roads along such vehicles' route.</li> <li>During the construction under power lines, deploy qualified staff to observe and give instructions to the drivers of cranes and excavators</li> </ul>	<ul style="list-style-type: none"> <li>Decree No. 73/2010/ND-CP on administrative penalization of violations related to security and social affairs</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>so as to avoid causing damages to power lines, telecommunications lines, etc.</p> <ul style="list-style-type: none"> <li>• Stop construction when existing works are damaged. Identify causes of related incidents and work out solutions. In case the damages are due to the Contractors' faults, the Contractors have to repair, recover, and compensate for all damages at their own expenses. The results of handling such damages must be approved by the Supervisor Engineer.</li> <li>• Reinstall the road surface and sidewalks at construction sites after the construction of sewer lines has been completed.</li> <li>• The contractor should ensure alternative water supply to affected residents in the event of disruptions lasting more than one day.</li> <li>• Any damages to existing cable utility systems shall be reported to the authorities and repaired as soon as possible.</li> </ul>			
<b>11. Social impacts</b>	<ul style="list-style-type: none"> <li>• Inform the community at least 2 weeks before commencement of the construction. In case electricity and water supplies are to be disrupted, the PMU must inform PAHs of the same at least 2 days in advance.</li> <li>• Employ local laborers for simple tasks. Instruct workers on environmental issues, safety and health before construction tasks are assigned. It is advisable to communicate to migrant workers on local customs, practices and habits in order to avoid conflicts with local people.</li> <li>• The subproject owner and contractor are to cooperate closely with the local government in performing effective community sanitation in case of epidemic symptoms breaking out in the area.</li> <li>• The subproject owner and contractor are to cooperate with local authorities in preventing and fighting against social evils. Conduct sensitization campaigns with both workers and communities on these issues, liaison with local organizations to ensure monitoring,</li> </ul>	<ul style="list-style-type: none"> <li>• Decree No. 73/2010/ND-CP on administrative penalization of violations against security and social affairs</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>and a grievance redress system to which the community can refer to.</p> <ul style="list-style-type: none"> <li>• The subproject will cooperate with the local health agency in developing and implementing plans for control of diseases among workers.</li> <li>• Workers temporarily residing at the camps and rented houses must be registered with the local authorities for temporary residence.</li> <li>• Train workers on issues related to social security, social evils, diseases and epidemics, prostitution and drug use, environment, safety and health, HIV/AIDS and infectious diseases within 2 weeks prior to the commencement of packages with construction items lasting at least 6 months.</li> <li>• Prohibit workers from: <ul style="list-style-type: none"> <li>+ Consuming alcoholic drinks during working time</li> <li>+ Quarreling and fighting</li> <li>+ Gambling and indulging in social evils such as drug use and prostitution</li> <li>+ Disposing of garbage indiscriminately</li> </ul> </li> </ul>			
<b>12. Control of impacts on cultural works</b>	<ul style="list-style-type: none"> <li>• Do not gather materials and wastes within 20m from cultural, historical, and religious works such as temples, pagodas, churches, monuments, historic relics, etc. Spray water the construction sites next to such works.</li> <li>• Do not use machines generating loud noise and high vibration levels near cultural, historical, and religious works.</li> <li>• In case of archeological objects being unearthed during the implementation of earthwork, all parties will conform to the following procedures: <ul style="list-style-type: none"> <li>+ In case of archeological objects being unearthed during the implementation of earthwork, all parties will conform to the following procedures:</li> <li>+ Suspend construction operations at the place of discovery;</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Law on cultural heritage No. 28/2001/QH10;</li> <li>• Amended and supplemented Law on cultural heritage No. 32/2009/QH12;</li> <li>• Amended and supplemented Decree No. 98/2010/ND-CP</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>+ Preliminarily describe the area where the archaeological objects are to be unearthed;</li> <li>+ Strictly protect the area of the discovery so as not to damage or lose moveable objects. In case the unearthed objects are moveable or sensitive ruins, provide night protection until the local authorities, the Department of Culture, Sports and Tourism or the Institute of Archaeology takes over these unearthed objects;</li> <li>+ Inform the Supervision Engineer of the event and who in turn will immediately inform the subproject owner, the local authorities in charge of the case and the Institute of Archaeology (within 24 hours or less);</li> <li>+ Local relevant agencies and the Vietnam National Administration of Tourism will be responsible for protecting and preserving such archaeological relics before making decisions on the next suitable formalities. The Institute of Archaeology may be needed in the preliminarily assessment of the unearthed objects. The significance and importance of such discovered objects will be assessed by different criteria related to the nature of cultural heritages; such criteria would include aesthetic, historical, scientific, social or economic values;</li> <li>+ Decisions on handling such discovered objects will be made by competent levels. Such decisions can result in changes in site arrangements (e.g. when the discovered item is a cultural relic which cannot be displaced or is archaeologically important, it is necessary to preserve, recover and excavate it);</li> <li>+ The implementation of such decision by competent agencies related to the management of discovered objects will be communicated in writing by local competent agencies; and</li> <li>+ Only resume construction activities at the site after being permitted by the local competent agencies and the PMU in</li> </ul>			



Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	relation to safeguarding such relics			
<b>13. Community's safety and health</b>	<ul style="list-style-type: none"> <li>The Contractor will have to conform to regulations in Circular No. 22/2010/TT-BXD by the Ministry of Construction on safety in construction.</li> <li>The subproject owner and contractor are to cooperate closely with the local government in performing effective community sanitation in case of epidemic symptoms breaking out in the area.</li> <li>The subproject owner and contractor are to cooperate with local authorities in preventing and fighting against social evils.</li> <li>Fence of excavation pits and open channels and make off with luminous cordon and warning signs. Provide sufficient lighting when carry out construction at night.</li> <li>Limit the speed of transport means to 20 km/h within 200 m from the construction site so as to minimize dust and noise.</li> <li>Keep noise-generating machines and vehicles at such suitable distances that noise transmitted to residential areas will not be higher than 70 dBA.</li> <li>Use static compacting when the road base is constructed near areas with many households and weak temporary works to restrict vibration.</li> <li>The subproject will cooperate with the local health agency in developing and implementing plans for control of diseases among workers.</li> </ul>	<ul style="list-style-type: none"> <li>Circular No. 22/2010/TT-BXD regulation on construction safety</li> <li>Directive No. 02/2008/CT-BXD on safety and sanitation issues in construction units</li> <li>TCVN 5308-91: Technical regulation on construction safety</li> <li>Decision No. 96/2008/QĐ-TTg on clearance of UXOs</li> </ul>	Contractor	PMU, CSC, IEMC
<b>14. Workers' health safety</b>	<ul style="list-style-type: none"> <li>Train workers on issues related to environment, safety and health, thus enhancing their awareness of HIV/AIDS and infectious diseases within 2 weeks prior to the commencement of packages with construction items lasting at least 6 months.</li> <li>Provide workers with and request them to use adequate safety gear such as masks, helmets, shoes/boots, goggles, etc. depending on job</li> </ul>	<ul style="list-style-type: none"> <li>Decree No. 22/2010/TT-BXD on regulation of construction safety;</li> <li>Directive No. 02/2008/CT-BXD on safety and sanitation issues in</li> </ul>	Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>characteristics.</p> <ul style="list-style-type: none"> <li>• Safely install power lines at offices and in construction sites and do not lay connectors on the ground or water surface. Electric wires must be with plugs. Place outdoor electric panels in protection cabinets.</li> <li>• Limit the speeds of vehicles traveling inside construction sites to be 5 km/hour.</li> <li>• Provide fire-extinguishers, first-aid bags, and medical cabinets with sufficient medicines for treating general diseases in the locality must be provided at construction sites.</li> <li>• Safely store fuels and chemicals in areas with impermeable ground with roofs and surrounding banks, equipped with safety warning signs located at least 20 m from the camps and at the end of prevailing winds.</li> <li>• In case of chemical and fuel leakage, the following steps will have to be taken: <ul style="list-style-type: none"> <li>+ Immediate check must be carried out to detect any possible case of injury. In case of injury, first-aid must be given and the injured person must be rushed to the nearest medical station for healthcare, and at the same time the case must be informed to the Supervision Engineer and the PMU;</li> <li>+ Carry assessment to determine the kind of leaking/overflowing fuel/chemical;</li> <li>+ Do not flush overflowing chemicals into drainage systems. Send staff with suitable safety gear to the site to handle the leakage by scattering sawdust (in case of small volumes of leaks/overflow) or sand (for high volumes of leaks/overflow). Use shovels to remove the surface soil layer if the leakage/overflow takes place on vacant land; and</li> <li>+ Subsequent to the occurrence of such incident or accident, the</li> </ul> </li> </ul>	<p>construction units;</p> <ul style="list-style-type: none"> <li>• TCVN 5308-91: Technical regulation on safety in construction;</li> <li>• Decision No. 96/2008/QD-TTg on clearance of UXOs.</li> </ul>		

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<p>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.</p> <ul style="list-style-type: none"> <li>• Set up the camps with sufficient supplies of clean water, power, and sanitation facilities. There must be at least one toilet compartment for every 25 workers, with separate toilets for males and females. Workers' beds must be provided with mosquito nets so as to prevent dengue fever. Temporary tents will be unacceptable.</li> <li>• Clean camps, kitchens, baths, and toilets and sanitize regularly, and keep in good sanitation conditions. Provide dustbins and collect wastes daily from the camps. Clear drainage ditches around the camps periodically.</li> <li>• Stop all construction activities during rains and storms, or upon accidents or serious incidents</li> </ul>			
<b>15. Management of warehouses and borrow pits</b>	<ul style="list-style-type: none"> <li>• All borrow pit locations to be used must be previously identified in conformity with approved construction technical specifications. Sensitive sites such as scenic spots, areas of natural habitat, areas near sensitive receiving waters, or areas near water sources should be avoided. An open ditch shall be built around the stockpile site to intercept wastewater.</li> <li>• Retaining walls are to set up around disposal areas if necessary.</li> <li>• The use of new sites for stockpiling, gathering or exploiting materials necessary for construction operations must obtain prior approval from the Construction Engineer.</li> <li>• In case landowners are affected by the use of their areas for stockpiling, gathering or exploiting materials, such landowners must be included in the project resettlement plan.</li> </ul>		Contractor	PMU, CSC, IEMC

Environmental – social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	<ul style="list-style-type: none"> <li>If access roads are needed for these new sites, they must be considered in the environmental assessment report.</li> </ul>			
<b>16.</b> <b>Communication to local community</b>	<ul style="list-style-type: none"> <li>Open communications channels are to be maintained with the local government and concerned communities; the contractor shall coordinate with local authorities (leaders of local wards or communes, leaders of hamlets) for agreed schedules of construction operations in areas nearby sensitive places or during sensitive times (e.g. religious festival days).</li> <li>Copies of Vietnamese versions of these ECOPs and of other relevant environmental protection documents shall be made available to local communities and to workers at the site.</li> <li>Project information will be disseminated to affected parties (e.g. local authorities, enterprises and affected households, etc.) through community meetings before construction commencement.</li> <li>A contact address will be provided to the community.</li> <li>The community will be provided with all information, especially technical findings, in a language that is understandable to the general public and in a form convenient to interested citizens and elected officials through the preparation of fact sheets and news releases, when major findings become available during project phase.</li> <li>Community concerns and requested information are to be monitored as the project progresses.</li> <li>Inquiries must be responded by telephone and written correspondence in a timely and accurate manner.</li> <li>Local residents must be informed about construction and work schedules, interruption of services, traffic detour routes and provisional bus routes, blasting and demolition operations, as appropriate.</li> <li>Technical documents and drawings will be provided to local People's Committees, especially the sketch of construction areas and the EMP</li> </ul>	<ul style="list-style-type: none"> <li>Decree No. 73/2010/ND-CP on administrative penalization of violations related to security and social affairs</li> </ul>	Contractor	PMU, CSC, IEMC

<b>Environmental – social issues</b>	<b>Mitigation measures</b>	<b>Vietnamese regulation</b>	<b>Responsibility</b>	<b>To be supervised by</b>
	<p>of the construction site.</p> <ul style="list-style-type: none"><li>• Notification boards shall be erected at all construction sites providing information about the project, as well as contact information about the site managers, environmental staff, health and safety staff, telephone numbers and other contact information so that affected people could have a channel to voice their concerns and suggestions.</li></ul>			



### 6.2.2. Site-specific ESMP

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

**Table 6.2: Site Specific Impacts and Mitigation Measures**

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
<b>1.</b>	<b>COMPONENT 1: TERTIARY INFRASTRUCTURE UPGRADING IN LIAs (LIA 1, LIA 2, LIA 6, LIA 7)</b>				
	<b>Preparation phase</b>				
	UXO clearance	- The subproject owner (the subproject PMU) will sign a contract with the military civil engineering agency or Ben Tre Provincial Military Base for UXO detection and clearance at the construction sites. No construction activity will be allowed until the UXO clearance is completed.	Competent Military Unit	PMU	- Counterpart fund - IM: Contract
	Land acquisition and resettlement, grave relocation	- Implementation of approved RP in accordance with its provision.	PMU, City People's Committee	ISMC	- Counterpart fund - IM: approved RP
	<b>Construction phase</b>				
	Localized flooding - Residents within LIAs 1,2,6,7.	- 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.	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions
		- 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			

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<p>flood prevention and control alternatives during construction period or the flow diversion alternatives to ensure the drainage in the location.</p> <ul style="list-style-type: none"> <li>- The contractors must set up temporary drainage at the construction site and ensure that they are cleared of mud and other obstructions, such as: <ul style="list-style-type: none"> <li>• Building drainage works along/across the site during backfilling and ground leveling.</li> <li>• Digging drainage ditches/drains suiting practical conditions of the streets.</li> </ul> </li> <li>- Building drainage works along/across the site during backfilling and ground leveling.</li> <li>- Provide drainage ditches/drains suiting practical conditions of the streets.</li> <li>- Deploying standby pumps and other equipment items in case of needed drainage.</li> <li>- Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations.</li> <li>- Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area.</li> </ul>			
	Odor and management of 7.794 m <sup>3</sup> sediments generated from small canal dredging in LIAs.	- 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
	<ul style="list-style-type: none"> <li>- Residents along canal.</li> <li>- People commuting along transportation route.</li> </ul>	<p><u>At the sites</u></p> <ul style="list-style-type: none"> <li>- On-site location for temporary gathering of sludge must be to the tail end of the wind, far from residential areas and sensitive works.</li> <li>- Sediment dredged from channels would give off stinking odors of</li> </ul>	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<p>such gases as CH<sub>4</sub>, H<sub>2</sub>S, 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.</p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- 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.</li> <li>- EM (Effective Microorganisms) deodorants are to be sprayed every day. These deodorants are able to remove offensive odors from H<sub>2</sub>S and mercaptans.</li> </ul> <p><i>Management of dredged sediments from the canals:</i></p> <ul style="list-style-type: none"> <li>- The Dredged Materials Management Plan (DMMPs) for have for the dredged works has been prepared. The DMMP is described in detailes in Annex 2.</li> <li>- According to the analyses, the sediments from the canal dredging work are not hazardous, with heavy metals lower than the acceptable limits. However, the dredging soils and sediments have high amount of organic compounds and pathogenic microorganisms (e.g. Ecoli) thus should not be used directly for agricultural purpose. It is recommended that the sediments could be dewatered and kept at least 03 months to allow partial biodegradation of organic substances and removal of microbial organisms. The sediments could then be used for perennial crops or planting tree for urban landscape purpose, based on the actual needs of local people. Otherwise, it will be transported and disposed at Ben Tre WTP.</li> <li>- Ensure that detailed design scope for the chanel dredging will include the update of DMMP with additional analysis of sediment</li> </ul>			

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<p>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</p> <ul style="list-style-type: none"> <li>- Prior to construction, the contractors shall a specific DMMP based on the updated DMMP. The contractor's DMMPs shall be submit by Construction Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary gathering of dredged materials, and control of polluting material during temporary gathering and transportation, pollution control, and risks at disposal sites.</li> </ul> <p><u>For the transportation</u></p> <ul style="list-style-type: none"> <li>- Clean up the transport vehicles before leaving construction site. Do not load to a height of 10cm higher than the truck body so as not to spill out and scatter the sediment onto roads, giving rise to offensive odor, dust and endangering road users.</li> <li>- Do not park vehicles in the roads longer than necessary. Do not allow construction vehicles and materials to encroach upon the pavements.</li> <li>- Maintain the required speed limit and do not overuse horn.</li> <li>- Periodically registry and supervise the quality of transport vehicles as required by the government regulations.</li> <li>- Comply with the traffic safety regulations while participating traffic.</li> <li>- Clean up wastes dropped off on road.</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading.</li> </ul>			
	Social disturbance and increased traffic risks	<ul style="list-style-type: none"> <li>- PMU will ensure that detailed design will consider the plan and the time of construction for travel and circulation advantage.</li> </ul>	Detailed design consultant	PMU	<ul style="list-style-type: none"> <li>- Fund: City</li> <li>- IM: detailed design</li> </ul>

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	<ul style="list-style-type: none"> <li>- Impacts on traffic within LIAs by narrow alleys</li> <li>- Impacts on traffic along connecting streets</li> <li>- Social disturbance in Ward 5 (LIA 1), Ward 6 (LIA 2), Ward 8 (LIA 6), Ward Phu Khuong (LIA 7)</li> </ul>	<p><i>For impacts on traffic within LIAs</i></p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- Construction operations are to be successively performed by alley segment. Extensive construction operations on the entire route should be avoided.</li> <li>- For major alleys with a width of over 4m, construction should be carried out on one half of the road surface, leaving the other half for traffic traveling.</li> <li>- Construction operations are to be limited during rush hours.</li> <li>- Construction warning signs and traffic instruction signs are to be set up to ward off road users from entering or passing by the construction site.</li> <li>- Temporary vehicle-keeping spots must be established to serve road users within LIAs during construction days.</li> <li>- Clean up the transport vehicles before leaving construction site. Do not load to a height of 10cm higher than the truck body so as not to spill out and scatter materials onto roads, giving rise to dust and endangering road users.</li> <li>- Do not park vehicles in the roads longer than necessary. Maintain the required speed limit and do not overuse horn.</li> <li>- Periodically registry and supervise the quality of transport vehicles as required by the government regulations.</li> <li>- Comply with the traffic safety regulations while participating traffic.</li> <li>- Clean up wastes dropped off on road.</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading of construction materials, equipment, and wastes.</li> </ul>	Contractor	PMU, CSC, IEMC	<p>contract</p> <ul style="list-style-type: none"> <li>- Fund: IDA/IBRD</li> <li>- IM: Construction contract conditions</li> </ul>



No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<ul style="list-style-type: none"> <li>- Reinstall the road surface if occurring the damages during construction.</li> </ul> <p><u>For impacts on traffic along connecting streets</u></p> <p>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 bypass 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.</p> <p><u>For impacts on social disturbance</u></p> <ul style="list-style-type: none"> <li>- Prioritized recruitment and employment of the workforce available in the locality;</li> <li>- Carrying out procedures on declaring the personnel present at construction sites;</li> <li>- Setting up workshops on construction site rules &amp; regulations for officers and workers;</li> <li>- Contractors' sanction measures against violations of construction site rules &amp; regulations.</li> </ul>			
	Damage to water supply and communication systems (along alleys in LIAs (10.74 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
		<ul style="list-style-type: none"> <li>- Inform the water supply management and communication companies of the construction activities and their potential impacts such the risks of breakage other damages to the water supply pipeline at least 01 month before start of the construction;</li> <li>- Set up barriers around the construction area of water supply pipeline;</li> <li>- Use smaller excavation machine and Larsen pile driving method of</li> </ul>	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		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 sensitives receptor: Kim Quang Pagoda (from 2 m to alley) and Outdoor Shrine (from 3 m to alley) in LIA 1.	- 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 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 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 goes 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 honking in areas close to the pagoda area. - Immediately address any issue/problem caused by the construction	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		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/shrine, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage. - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken structures as agreed with the pagodas/shrine's owner.			
<b>Operation phase</b>					
	The impact on the environment while maintaining drainage systems	- 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.	People's Committee of Ben Tre City	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.	People's Committee of Ben Tre City	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 1m <sup>3</sup> ; ii) the trash can must be covered; iii) 1 trash can every 100m;	People's Committee of Ben Tre City	City	- City Budget - IM: City Operation and Maintenance Plan

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		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.			
<b>2</b>	<b>COMPONENT 2: PRIORITY PRIMARY AND SECONDARY INFRASTRUCTURE</b> <b>(i) Rehabilitating Chin Te canal; (ii) Upgrading and expanding the existing Ngo Quyen street (iii) Construction of Dong Tay Avenue (iv) Connecting roads (N6, N18) (v) Rehabilitating 30/4 canal.</b>				
	<b>Preparation phase</b>				
	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
	<b>Construction phase</b>				
<b>2.1</b>	<b>Subcomponent 2.1, 2.5: Rehabilitating Chin Te va 30/4 canal</b>				
	Odors from 4.905 m <sup>3</sup> the dredged sediment - People living in the densely populated area from Km1+450 to Km1+920 (Chin Te canal) and intersecting N6 Street-30/4 canal at Km0 +355.	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
		<i>To control impacts by dredged sludge:</i> - The Dredged Materials Management Plan (DMMPs) for have for the dredged works has been prepared. The DMMP is described in details in Annex 2. - 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	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<p>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 Ben Tre WTP.</p> <ul style="list-style-type: none"> <li>- Ensure that detailed design scope for the chanel dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor's dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts.</li> <li>- Prior to construction, the contractors shall a specific DMMP based on the updated DMMP. The contractor's DMMPs shall be submit by Construction Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary gathering of dredged materials, and control of polluting material during temporary gathering and transportation, pollution control, and risks at disposal sites.</li> </ul> <p><i>To control impacts by odors from dredging process:</i></p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- Malodor in the dredged sediment is odors of the various gases as CH<sub>4</sub>, H<sub>2</sub>S, 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</li> </ul>			



No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<p>sources.</p> <ul style="list-style-type: none"> <li>- The dredged sediment to be collected along the work sites and need to be covered by HDPE fabric to limit sediment water leaking into the soil and surrounding, and transported for disposal within 48 hours. The management plan on dredged materials (see Annex DMMP) will be prepared to instruct the contractors to manage the waste source.</li> <li>- Uncontrolled disposal of the dredged sediment is prohibited. The waste source must be managed properly under the supervision of PMU and construction supervision consultant.</li> <li>- Spraying EM (Effective Microorganisms) every day. The deodorant can eliminate malodors from H<sub>2</sub>S and Mercaptan.</li> </ul>			
	Impacts due to transportation of the dredged sediments: Residences along the transportation route	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
		<ul style="list-style-type: none"> <li>- Clean up the transport vehicles before leaving construction site. Do not load to a height of 10cm higher than the truck body so as not to spill out and scatter the dredged sediment onto roads, giving rise to offensive odor, dust, and endangering road users.</li> <li>- Do not park vehicles on the roads longer than necessary. Do not allow construction vehicles and materials to encroach upon the pavements.</li> <li>- Maintain the required speed limit and do not overuse horn.</li> <li>- Periodically registry and supervise the quality of transport vehicles as required by the government regulations.</li> <li>- Comply with the traffic safety regulations while participating traffic.</li> <li>- Clean up wastes dropped off on road.</li> <li>- Assign staff to guide the traffic during transportation, unloading, and loading.</li> </ul>	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	Risk of subsidence during construction (from Km1+450 to Km1+920 (Chin Te canal) and intersecting N6 Street at Km0 +355 (for 30/4 canal)	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
		<ul style="list-style-type: none"> <li>- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure sustainability and stability of the embankment;</li> <li>- 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.</li> <li>- Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work.</li> <li>- Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to CSC and the authorities concerned for approval by the construction contractors.</li> <li>- Heavy-duty machinery and equipment must not be gathered near canal banks.</li> <li>- Regularly check and monitor the risk of landslides to plan for possible reinforcement.</li> <li>- Avoid or limit dredging in the rainy season.</li> <li>- Construction of side slope is made in accordance with the design</li> <li>- 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.</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the affected households or the local communities.</li> </ul>	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	Affecting residential access and traffic - 25 temporary bridges from Km2+070 to Km2+500 (for Chin Te canal). - 4 temporary bridges from Km0+00 to Km0+355.	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
		<ul style="list-style-type: none"> <li>- 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.</li> <li>- Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work.</li> <li>- 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.</li> <li>- 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.</li> <li>- Temporary bridges are to be dismantled with the successive method; simultaneous dismantling or demolition must be avoided.</li> <li>- Cover the incomplete trenches under construction at end of the working day.</li> <li>- Provide night lighting system with luminously painted fence and night lamp.</li> <li>- Machinery and equipment can be gathered only on one canal side.</li> <li>- Traffic instruction signs are to be erected to direct road-users into replacement traffic roads.</li> <li>- Deploy staff to guide the traffic during rush hours.</li> <li>- Immediately address any issue/problem related to the temporary bridges and roads caused by the construction activities and raised by</li> </ul>	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		the affected households or the local communities.			
	Damaged infrastructure facilities at intersections On Chin Te canal at Km1+566.78 to Km1+664.50.	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
		<ul style="list-style-type: none"> <li>- Dredging inside the box culverts must not be performed with heavy-duty motorized equipment such as excavators, scoops, etc.</li> <li>- 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.</li> <li>- It will be strictly prohibited to place equipment, machines or materials inside the existing box culverts.</li> <li>- 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.</li> <li>- Workers need to quickly clear dropped debris inside the culvert.</li> </ul>	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions
	Local flooding during the dredging process (from Km1+450 to Km1+920 on Chin Te canal and Km0+00 to Km0+355 on 30/4 canal)	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
		<ul style="list-style-type: none"> <li>- The Contractors must apply the specific construction methods, and flood prevention and control alternatives during construction period or the flow diversion alternatives to ensure the drainage in the location.</li> <li>- The contractors must set up temporary drainage at the construction site and ensure that they are cleared of mud and other obstructions, such as: (i) building drainage works along/across the site prior to dredging operations; (ii) Digging drainage ditches/drains suiting practical conditions.</li> </ul>	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<ul style="list-style-type: none"> <li>- Construction operations are to be carried out in a successive manner to avoid taking up too much drainage surface area.</li> <li>- Deploying standby pumps and other equipment items in case of extreme weather events</li> <li>- Upon receiving information or feedback from local communities on localized flooding at the construction site, contractors are to take immediate measures to facilitate water flow and speed up drainage with pumping operations.</li> </ul>			
	Impacts on PCRs and sensitives receptors: Relocated 01 graves (30/4 canal)	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
		<p><u>Relocation of graves:</u></p> <ul style="list-style-type: none"> <li>- Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation, reburial and other related costs which are necessary to satisfy customary religious requirements. Compensation in cash will be paid to each affected family or to the affected group as a whole as is determined through a process of consultation with the affected community. The level of compensation will be decided in consultation with the affected families/communities. All costs of excavation, relocation and reburial (5,765,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways.</li> <li>- During implementation the Subproject Owner will make early announce to the households whose graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to the affected household as required in the subproject RP and ESMP.</li> </ul>	Contractor	PMU, CSC, IEMC	- Fund: IDA/IBRD - IM: Construction contract conditions



No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
<b>2.2</b>	<b>Subcomponent 2.2: Upgrading and expanding the existing Ngo Quyen street</b>				
	Impacts on PCRs Relocated 25 graves	- PMU will ensure that detailed design will consider arrange temporary walkways to ensure safety for those working or living on construction sites.	Detailed design	PMU	- Detailed design contract - City fund
		- 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 reburial, 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 (5,765,000 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.	Contractor	PMU, CSC, IEMC	- Include in construction contract conditions - IDA/IBRD buget
<b>2.3</b>	<b>Subcomponent 2.3, 2.4: Construction of connecting roads (N6, N18) and Dong Tay Avenue</b>				
	Impact on water flow - Intersections with hydraulic canals (3 bridges on Dong-Tay Avenue at the 3 intersections with Ca Loc Channel and 02 culverts	- PMU will ensure that detailed design will consider construction operations in line with the planned progress schedule.	Detailed design	PMU	- Detailed design contract - City fund
		- 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	Contractor	PMU, CSC, IEMC	- Include in construction contract conditions - IDA/IBRD buget

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	on N18, 01 culvert on N6).	<p>materials into the canals.</p> <ul style="list-style-type: none"> <li>- In case of materials and waste falling into the canals during construction, contractors are to promptly have workers tidy them up.</li> <li>- Contractor will enter into contracts with URENCO for collecting waste every day.</li> <li>- 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.</li> </ul>			
	Impact on water quality and water flow of Ca Loc canal due to construction of the bridge	<ul style="list-style-type: none"> <li>- 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</li> </ul>	Detailed design	PMU	<ul style="list-style-type: none"> <li>- Detailed design contract</li> <li>- City fund</li> </ul>
	<ul style="list-style-type: none"> <li>- Intersections with hydraulic canals (03 small bridges on Dong Tay Avenue).</li> </ul>	<ul style="list-style-type: none"> <li>- A construction plan of detailed measures and schedule is to be worked out for the building/laying of sewers and bridges at the intersections with the canal. This plan must be informed 30 days in advance to local government authorities and residents in the affected areas of Dong Tay Avenue and connecting roads (N6, N18)</li> <li>- In the final segment of the drainage ditch temporarily connected to the canal, there will be a settlement pit for suspended matter to retain sludge, pollutants and waste in the water before it is discharged into the canal. This settlement pit will be emptied and tidied up every day by workers.</li> <li>- Before operation, all construction means and machines will be carefully checked in terms of technical parameters as well as operational performance to limit possible spills of oil, grease or fuel.</li> <li>- Construction operations during high tides should be limited.</li> <li>- Construction supervision staff at site must carry out strict management of workers during construction processes in order to</li> </ul>	Contractor	PMU, CSC, IEMC	<ul style="list-style-type: none"> <li>- Include in construction contract conditions</li> <li>- IDA/IBRD buget</li> </ul>

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		limit materials and waste from spilling into the canal. - No machine & equipment maintenance is to be carried out in areas close to the canal. - The construction unit should speed up the progress to cut down the radius of pollution transmission.			
	Impacts on PCRs and sensitives receptors: Relocated 42 graves of Dong Tay Avenue, 24 graves of N18 street; Ba Chua Xu temple (30 m to Dong Tay Avenue) and Ngoc Truoc Pagodas (35 m to Dong Tay Avenue).	- PMU will ensure that detailed design will consider arrange temporary walkways to ensure safety for those working or living on construction sites	Detailed design	PMU	- Detailed design contract - City fund
		<u>Relocation of graves:</u> - Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for reburial, 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 (5,765,000 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 Ba Chua Xu temple (from 30 m) and Ngoc Truoc Pagodas (35 m):</u> - Inform the temple of the construction activities and their potential	Contractor	PMU, CSC, IEMC	- Include in construction contract conditions - IDA/IBRD buget

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		<p>impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction.</p> <ul style="list-style-type: none"> <li>- The contractor shall coordinate with local authorities (leaders of local wards or communes) for agreed schedules of construction activities at sensitive times (e.g., religious festival days). Avoid construction activities during religious events every first and 15th days of the lunar month and during festival days if possible.</li> <li>- Prohibit gathering of construction materials within 100m in front of the pagoda/church and monastic.</li> <li>- Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagoda.</li> <li>- The contractor shall provide safety measures as installation of fences, barriers warning signs, lighting system against traffic accidents as well as other risk to local people and goes to pagoda.</li> <li>- Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas.</li> <li>- Truck drivers shall restrict honking in areas close to the pagoda area.</li> <li>- Immediately address any issue/problem caused by the construction activities and raised by the pagoda.</li> <li>- The construction method shall include the measures to protect the foundation of the fence/gate, main building of the pagoda/temple, such as using supporting pillars or steel frame to prevent the risk on infrastructure collapse/damage.</li> <li>- In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken structures as agreed with the pagodas/temple's owner.</li> </ul>			
	<p>Damaged infrastructure facilities at intersections</p> <p>On Chin Te canal at</p>	<ul style="list-style-type: none"> <li>- Dredging inside the box culverts must not be performed with heavy-duty motorized equipment such as excavators, scoops, etc.</li> <li>- In case of high water level inside the culverts, they must be cleared by specialized sewage trucks. And if the water level inside the</li> </ul>	Contractor	PMU, CSC, IEMC	<ul style="list-style-type: none"> <li>- Include in construction contract conditions</li> <li>- IDA/IBRD budget</li> </ul>

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	Km1+566.78 to Km1+664.50.	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.			
<b>Operation phase</b>					
<b>2.1</b>	<b>Subcomponent 2.1, 2.5: Rehabilitating Chin Te va 30/4 canal</b>				
	The impact on the environment while maintaining drainage systems	The same component 1	People's Committee of Ben Tre City	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.	People's Committee of Ben Tre City	City	- City Budget - IM: City Operation and Maintenance Plan
<b>2.2</b>	<b>Subcomponent 2.2; 2.3; 2.4: Upgrading and expanding the existing Ngo Quyen street, Construction of connecting roads (N6, N18) and Dong Tay Avenue</b>				
	The impact on the environment while maintaining drainage systems	The same component 1	People's Committee of Ben Tre City	City	- City Budget - IM: City Operation and Maintenance Plan
	Traffic safety	The same subcomponent 2.1	People's Committee of	City	- City Budget - IM: City Operation



No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
			Ben Tre City		and Maintenance Plan
<b>COMPONENT 3: RESETTLEMENT</b>					
<b>Operation phase</b>					
	Impact from air emission	<ul style="list-style-type: none"> <li>- Regular clearing soil and sand on the road and bridge surface to reduce the dust;</li> <li>- Watering and washing the roads at least once a day during the dry season to mitigate the dust from surface of bridges/roads.</li> <li>- Inspecting/requiring the vehicles carrying the materials to be covered in order to avoid spilling materials on roads.</li> <li>- Checking the registry of the running vehicles which meet the emission standards as per the State regulations.</li> <li>- Planting trees along both road sides to prevent the dust dispersion into people's houses along the both sides.</li> </ul>	People's Committee of Ben Tre City	City	<ul style="list-style-type: none"> <li>- City Budget</li> <li>- IM: City Operation and Maintenance Plan</li> </ul>
	Impact from waste water The generated wastewater from resettlement site is about 225 m <sup>3</sup> /day.	<ul style="list-style-type: none"> <li>- Households in the resettlement sites have to build the toilets with septic tank in accordance with regulations of the Government, the wastes from the toilets must be primarily treated in the septic tanks of each household before discharging into the public drainage system. In this case, the pollutant load has to be reduced by additional 30-40% BOD<sub>5</sub>/COD after treatment in the septic tank. The wastewater will be then connected to the wastewater collection and treatment system of Ben Tre City (funded by ADB ODA).</li> <li>- Sewer systems should be designed as closed sewer system.</li> <li>- Daily cleaning and scrapping are required at the drainage manhole to avoid clog.</li> <li>- Regularly carry out the dredging to limit the accumulation and deposition of organic compounds.</li> </ul>	People's Committee of Ben Tre City	City	<ul style="list-style-type: none"> <li>- City Budget</li> <li>- IM: City Operation and Maintenance Plan</li> </ul>
	Impact from solid waste The volume of the solid waste (2,852 kg/day)	<ul style="list-style-type: none"> <li>- Management Board of the resettlement areas must sign a contract for collection and transportation of municipal waste with URENCO or private waste collectors to transfer garbage emissions from</li> </ul>	People's Committee of Ben Tre City	City	<ul style="list-style-type: none"> <li>- City Budget</li> <li>- IM: City Operation and Maintenance</li> </ul>

No	Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
		resettlement areas; - Disposition of garbage cans along the internal transport line in resettlement areas. - Specification of trash can must meet the provisions of the construction according to the QCVN 07: 2010/BXD particular: i) the capacity of the trash can will be 100 liters and not exceeding 1 m <sup>3</sup> ; ii) the trash can must be covered; iii) 1 trash can every 100 m; iv) rubbish in bins will not be left for than 24 hours; v) require daily emptying. - Management Board of the resettlement areas must coordinate with local government to encourage residents to do garbage categorization program..			Plan

*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 30/4 canal, Chin Te canal and small canals in LIAs:**

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 2.

### **6.2.3. Emergency Procedures**

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

#### **6.2.3.1. Vehicle Accidents**

Vehicle accidents may include, but are not limited to:

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

#### **Procedure:**

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

#### **6.2.3.2. Electrical faults/accidents**

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

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

#### **Procedure:**

When an electrical accidents occurs:

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

#### **6.2.3.3. Fire**

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

All the bulldozers, excavators, HW and hazardous materials storage areas, and the site office must be equipped with portable 2 kg fire extinguisher in each location (the type depends on the immediate fire risk). The fire extinguishers must be in good working condition. The

Contractors' Supervisor – Vehicles and Devices shall perform monthly checks and replace as needed – tags shall be kept on the extinguishers which indicate their validity.

**Procedure:**

- Upon identification of a fire incident, try to suppress the fire if it is deemed possible and safe to do so using the available suppression equipment);
- If it is not possible to do so, move to a safe location (up wind and sufficient distance) and report the fire to the fire brigade stating your name, location, the status of the fire;
- Report the fire to the Contractors' General Manager; and
- The Contractors' General Manager will inform all workers and on-site visitors and ensure that they are all accounted for and in safe locations. They shall also inform the PMU HSE Manager, who shall inform the applicable government department and any households on or off site who may be in danger and advice them to evacuate.

**6.2.3.4. Chemical/Fuel Spill**

A spill of chemical/fuel has the potential to cause soil and underground water contamination, if not controlled and cleaned up timely and properly. Chemical/fuel spills include, but are not limited to, the following:

- Fuel spill during refueling;
- Fuel/oil/grease leaks during vehicle parking or operating; and
- Breaking of fuel tanks on vehicles.

Spill response facilities: A spill kit shall be provided on each heavy equipment (bulldozers and excavators), in the HW and hazardous materials storage areas, and in any designated fueling locations. A spill kit includes a drip tray, absorbent materials, and impermeable bags to collect contaminated soil and used absorbent materials, and a small spade used for collecting contaminated soil.

**Procedure:**

- When there is a spill, immediately use the absorbent materials to absorb the spilled materials and locate the drip tray to collect the spilled flow (if the spill continues);
- Collect used absorbent materials into an impermeable bag;
- Use the spade to collect the contaminated soil into the impermeable bag; note that there should be no contaminated soil left (stained soil must be collected to the full horizontal and vertical depth of the impact);
- Transfer the filled impermeable bag to the HW Storage Area for storage;
- If the spill is larger than one spill kit or person can handle, request another worker to support (e.g. to bring more spill kits);
- Use work gloves, safety glasses, long sleeved tops and trousers during the above response process and minimize direct contact with the spilled fuel/oil; and
- At and around the location of release, samples shall be taken to confirm whether any contaminated soil/underground water remains. The number of samples will depend on the scale of the release and the estimated impacted area. The parameters to be analyzed will depend on the substance released. Depths where samples are taken should be at the ground surface and immediately above the underground water table. These should be identified in a sampling plan prepared by the HSE Management and Monitoring Office in consultation with appropriately qualified technical staff. Response to any remaining contamination should be defined accordingly.



### **6.2.3.5. Medical Emergency**

A medical emergency is a situation in which, due to an acute illness or injury, there is an immediate risk to a person's life or long-term health. Medical emergencies include, but are not limited to, the following:

- Injuries from vehicle accidents;
- Wildlife attacks, e.g. snake bites or bees attack;
- Heat stress;
- Electrocution; and
- Unexploded-ordnance incidents.

**Procedure:**

- Report the injury to the First Aider, stating your name, location, nature of emergency and assistance required;
- Where safe to do so, stay in the location until assistance arrives;

The First Aider will co-ordinate first aid response; the First Aider can give first aid as far as they are capable. If further medical attention is required, then the injured shall be transferred to the nearest medical clinic for further treatment.

Within two working days of receiving an occupational accident investigation record and the minutes of the meeting about disclosure of the occupational accident investigation record, the First Aider must prepare statistics of the occurred occupational accidents and records in a Statistic Book with following principles:

- Every occupational accident that has happened to workers must be recorded;
- When a worker suffers from multiple occupational accidents, each accident must be separately recorded;
- Every occupational accident that has happened to workers that cause them to take one day off or more must be recorded.

### **6.2.3.6. Adverse Weather**

Potential adverse weather events include, but are not limited to: Heavy rain; Strong wind; or Typhoon. The potential for an earthquake, tsunami and heavy flood happening at the site is considered unlikely.

**Procedure:**

The Contractor General Manager will check the national and local weather forecast each morning prior to work commencing. Should adverse weather be predicted, depending on the severity and timing of the weather expected. If adverse weather is expected to be serious, lengthy and soon (e.g. in the case of a typhoon), the Contractor General Manager shall contact all workers not to come to work. If the weather is less serious and is not expected to last long, the Contractor Supervisor - Workers will cover this situation during the daily toolbox talk, continue to monitor the weather situation throughout the day and issue instructions as necessary to stop work, do their work sites safe, and find a safe sheltering location (either back at the site office, if sufficient time to return, or locally to the active works (in the case of the latter, the worker shall call the Contractor Supervisor – Workers to inform them where and when they are in the sheltering location). If the Contractor Supervisor – Workers do not hear from a worker(s) within 15 minutes of instruction to shelter, the Contractor Supervisor – Workers shall mobilize to the location by car to ensure the safety of the worker(s).

#### **6.2.3.7. Broken water pipes**

The existing water supply pipes on the routes may be broken due to the following reasons:

- During earthwork process for constructing foundation holes, inappropriate identification of the location or the wrong operating actions by the workers, non-compliance with the technical design drawings may cause the collision between the construction equipment and the water supply pipes;
- The affecting force of the construction equipment focuses on one place, while the foundation of the construction area is weak, which creates the break of the water supply pipes;
- Such incidents if occur will create a loss of the huge water volume and an impact on the domestic water demand of the residents who access to this water supply source.

#### **Procedure:**

- Immediately turn off the valve/use the available facilities, materials in the site to seal the cracks, breaks temporarily;
- Inform immediately the functional agency in charge of the particular water supply pipes for timely repair; Excavate a ditch to lead the water flow to the drainage sewer/canals to limit the water spill out on the surface;
- Advise the residents in vicinity the water reserve alternative during repair, incident recovery time.

#### **6.2.3.8. Sanitary Effluent Spill**

- A spill of sanitary effluent has the potential to cause surface water, soil and underground water contamination and nuisance/health hazard to nearby households, if not controlled and cleaned up timely and properly. Sanitary effluent spills can occur during emptying and transportation of effluent from septic tanks being demolished on site.
- Spill response facilities: A spill kit shall be provided on each septic tank collection truck. A spill kit includes impermeable bags to collect contaminated soil and a small spade used for collecting contaminated soil.

#### **Procedure:**

- When there is a spill, immediately stop the flow;
- Use the spade to collect the contaminated soil into the impermeable bag; note that there should be no contaminated soil left (contaminated soil must be collected to the full horizontal and vertical depth of the impact);
- Transfer the filled impermeable bag to the Waste Storage Area for storage;
- If the spill is larger than one spill kit or person can handle, request another worker to support (e.g. to bring more spill kits);
- Use work gloves, safety glasses, long sleeved tops and trousers during the above response process and minimize direct contact with the spilled effluent.

### **6.3. SOCIAL ACTION PLAN**

#### **6.3.1. Occupational training foundation**

Establishment of the occupational training foundations for the households, the members of which are unemployed is the critical demand in order to ensure that the people stay in the project areas and able to find out the appropriate job. Curriculums on skills need to be designed relevant to the households consultation on the priorities, demand and educational background. The

curricula need to be focused to ensure to find out the jobs. It is necessary to coordinate with the potential employers in this matter.

The occupational training schools under MOET management in the project areas, the occupational training centers may organize the training courses on IT, textile and sewing skills, mechanics, electrical techniques, mushroom planting, animal husbandry, other agricultural technical supporting services...; organize training courses, expanding programs for the high schools pupils and even for the members of the rural households. It is necessary to train both men and women in the project areas. Moreover, it requires setting up the training courses on occupational re-training for men and women just in case they lose the jobs after completing the project. It also includes the training for the households having people with disability.

### **6.3.2. Supporting internal and external forces for the people**

Around 1/3 of the interviewed people advised that they have received the supports. However, many people told that many supporting programs have taken place in the past, now only a few programs are ongoing. The main supporting sources are from the government agencies and locality, mainly from the communes' People's Committees and villages, Women's Union, Farmers Union of the communes, villages, and hamlets. Some people said that the supporting sources are from NGO, Red Cross and Vietnamese overseas.

During project implementation, it is necessary to conduct the consultation with the affected households on the programs of the government, the local unions such as Women's Union, Farmers' Union, and Youth Union. The seriously affected households should be able to access to the ongoing national programs such as National Target Program on Water Supply and Sanitation, especially for the poor.

### **6.3.3. HIV/AIDS and other sexually transmitted diseases, human trafficking**

During project implementation, there will be a large amount of the labor force focusing in the construction sites. According to the experience from the previous similar construction projects, the STI rate in the labor groups will increase if there are no applied prevention measures in order to ensure that the workers are protected against the STD, which include HIV/AIDS. The public health action plan will be set up based on the previous experience of the earlier projects and the public consultation in order to ensure that the works are protected against STI.

In order to mitigate and address the HIV/AIDS related risks and human trafficking, it requires paying a special attention to women. The Project needs to conduct a good communication and dissemination on HIV/AIDS and other risks such as drug abuse and human trafficking. HIV/AIDS programs should include the awareness enhancement campaigns in the construction sites and in the community, peer education development and public monitoring in combination with understanding about safe migration which are implemented and monitored by the communities, PMU and Women's Unions of the project's communes.

### **6.3.4. 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. ENVIRONMENTAL MONITORING PROGRAM

### 6.4.1. Objective and Approach

Main objective of the Environment Monitoring program is to ensure that (a) the potential negative impacts of the project are minimized; (b) the ESMP is effectively implemented; and (c) the ESMP is adequate to mitigate the potential negative impacts. Given that monitoring the implementation of the RP will be conducted separately, the environmental monitoring program will comprise (a) monitoring the safeguard performance of the contractor during site clearance and construction, (b) environmental quality monitoring, (c) monitoring effectiveness of the ESMP.

### 6.4.2. Monitoring of Contractor's Safeguard Performance

Three levels of safeguard monitoring will be implemented: routine monitoring, periodic monitoring, and community monitoring as follows:

**Routine monitoring:** The routine monitoring will be made by the Construction Supervision Consultant (CSC) as assigned by PMU. The CSC will include the monitoring results in the project progress reports.

**Periodical monitoring (every six months):** As part of the overall monitoring of the ESMP, the ESU assisted by the Independent Environmental Monitoring Consultant (IEMC) will also monitor the contractors' performance every 6 months and the results will be reported to the PMU and the WB.

**Community monitoring:** Monitoring by local communities will be conducted following the Government practices with the technical and management support from the PMU.

### 6.4.3. Environmental Quality Monitoring

To ensure an acceptable level of environmental quality, monitoring of dust, noise, vibration, air quality, and water quality will be made at project specific locations that are likely to be significantly affected by the construction activities, or requested by local authorities and communities for specific purposes. ESU/IEMC will be responsible for the monitoring of the program.

Below is a list of the key issues and scope of monitoring that will be considered in the implementation of the monitoring program:

**Implementation of the Dredge Material Management Plan (DMMP)** for all sludge and similar material excavated from the project work sites: Amount, level of heavy metals, locations and performance at disposal sites, and impacts on local residents will be monitored. Outline DMMPs will be prepared during detailed design, and will be used as the basis for contractors' dredged materials management plans.

**General Construction Impacts:** To include local flooding; traffic management especially in residential areas; air, noise, and dust levels in residential areas; and water quality upstream and downstream of construction sites, with specific attention paid and impact on local residents;

**Others:** As agreed with local agencies and communities during the preparation of the monitoring program.

Table 6.4 provide general guidance on the monitoring program considering that the activities will be carried out before construction (project baseline environment), during construction (assumed 4 years), and during the first year of operation. Detailed monitoring programs will be



prepared during the detailed design stage. An estimated cost for monitoring is incorporated into the ESMP cost (Section 6.8.2). Many of these measurements are required by Vietnamese regulations and would need to be done even if not directly related to expected project impacts.

Sampling locations are described in Annex 3 and the number of samples are made in accordance with progress of each work.

**Table 6.4: Location, parameters and frequency of monitoring**

No	Monitored items	Preparation and construction phase
<b>I</b>	<b>Monitoring of air quality</b>	
	1. Monitoring parameters	Noise, TSP, CO, NO <sub>2</sub> , SO <sub>2</sub> , L <sub>eq</sub> , vibration
	2. Monitoring frequency	Preparation phase: 01 time before construction Construction phase: measurements taken every six-months
	3. Applied Regulation	QCVN 05:2013/BTNMT, QCVN 06:2009/BTNMT; QCVN 26:2010/BTNMT; QCVN 27:2010/BTNMT
	4. Monitoring positions	55 samples (Sampling locations are presented in Appendix)
<b>II</b>	<b>Surface Water Quality Monitoring</b>	
	1. Monitoring parameters	pH, DO, COD, BOD, N-NH <sub>4</sub> <sup>+</sup> , N-NO <sub>2</sub> <sup>-</sup> , N-NO <sub>3</sub> <sup>-</sup> , P-PO <sub>4</sub> <sup>3-</sup> , oil & grease, Coliform, Cl, 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	10 samples (Sampling locations are presented in Appendix)
<b>III</b>	<b>Wastewater quality monitoring</b>	
	1. Monitoring parameters	pH, BOD <sub>5</sub> , COD, H <sub>2</sub> S, N-NH <sub>4</sub> , N-NO <sub>3</sub> , P-PO <sub>4</sub> , oil & grease, Coliforms, TSS
	2. Monitoring frequency	Preparation phase: 01 time before construction Construction phase: Do not monitor
	3. Applied Regulation	QCVN 14:2008/BTNMT
	4. Position monitoring	02 samples (Sampling locations are presented in Appendix)
<b>IV</b>	<b>Soil</b>	
	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	22 (Sampling locations are presented in Appendix)
<b>V</b>	<b>Sediment</b>	
	1. Monitoring parameters	As, Cd, Cu, Pb, Zn
	2. Monitoring frequency	Preparation phase: 01 time before construction Construction phase: do not monitor
	3. Applied Regulation	QCVN 43:2012/BTNMT
	4. Monitoring positions	22 (Sampling locations are presented in Appendix)

No	Monitored items	Preparation and construction phase
VI	Monitoring of erosion	During embankment construction
VII	Monitoring of solid waste	Monitoring volume of waste generated and sediment dredged
VIII	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	55	134	854.000	114.436.000	4.905.101
2	Soil	Every 6 months	22	55	870.000	47.850.000	2.051.007
3	Surface water	Every 6 months	10	26	1.962.000	51.012.000	2.186.541
<b>Total</b>						<b>239,298,000</b>	<b>102,570.94</b>

#### 6.5. SOCIAL MONITORING PROGRAM

The objectives of social monitoring program is to ensure the implementation of impact mitigation measures in order to minimize the negative effects on the living condition of the residents, social and cultural life in the project areas and maintain the sustainable community concurrence on the Project. The program contents are stated as below:

- Monitoring land acquisition and resettlement works
- Monitoring livelihood and income recovery: primary financial supports as per policies; expediting Occupational training programs
- Supervising the implementation of impacts mitigation program on community health and safety
- Supervising mitigation of conflicts of benefits and local economic effects
- Supervising mitigation of gender impacts
- Supervising information release and accountability

The detail contents are presented in Table 6.6:

**Table 6.6: Proposed social monitoring program for Ben Tre city subproject**

No.	Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
	Land acquisition and resettlement works	<ul style="list-style-type: none"> <li>- The affected households are able to receive compensation according to WB policy and their income will be recovered;</li> <li>- HHs which have no land will receive one slot in resettlement area.</li> </ul>	<ul style="list-style-type: none"> <li>- Setting up Resettlement policy framework in accordance with the GoV regulations harmonized with WB's policy</li> <li>- Establishing Resettlement Action Plan for land acquisition, compensation, support and implementation of resettlement works</li> <li>- Implementing land acquisition and resettlement works</li> </ul>	<ul style="list-style-type: none"> <li>- Resettlement policy frameworks and plans are established.</li> <li>- Number of the affected HHs, quantity/level of grassroots affection</li> <li>- Number of affected HHs on illegal land assets is clearly identified.</li> <li>- Number of HHs participating in livelihood recovery, occupational training, occupational change.</li> </ul>	<ul style="list-style-type: none"> <li>- PMU</li> <li>- Center of Municipal Land Fund Management and Development</li> <li>- Local authorities</li> <li>- Consultants</li> </ul>
	Monitoring livelihood and income recovery: primary financial supports as per policies; expediting Occupational training programs	HHs participating in livelihood/income are well assisted.	<ul style="list-style-type: none"> <li>- Assistances are made following Resettlement Plan Framework</li> <li>- Loan programs</li> <li>- Occupational training</li> </ul>	<ul style="list-style-type: none"> <li>- Number of HHs are assisted as per Resettlement policy framework</li> <li>- Number of HHs has access to loan programs</li> <li>- Number of people/HHs have the occupational trainings</li> </ul>	
	Supervising the implementation of impacts mitigation program on community health and safety	Minimizing risks during construction period, social evils and traffic disturbance.	<ul style="list-style-type: none"> <li>- Developing action plans on risks and emergency response during construction</li> <li>- Developing social evils mitigation plans during construction</li> <li>- Developing action plans on reducing traffic disturbance during construction</li> </ul>	<ul style="list-style-type: none"> <li>- Number of site shelters/camps fully equipped by first aid services</li> <li>- Number of training courses on occupational safety regulations delivered to the workers</li> <li>- Number of provided labor protective equipment/ total number of laborers</li> <li>- Number of entry restriction sign boards installed in the fences, barriers, warning boards.</li> </ul>	As the above

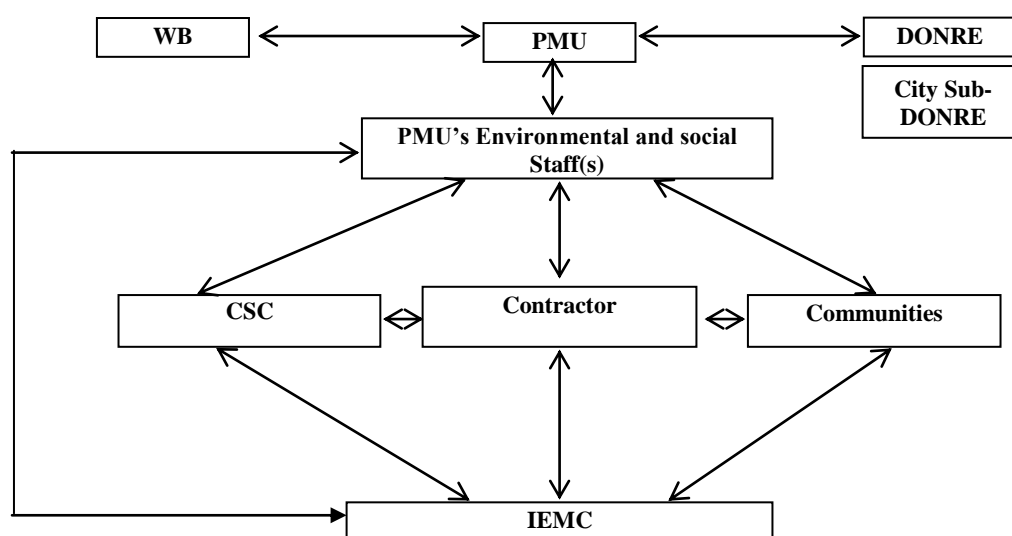
No.	Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
				<ul style="list-style-type: none"> <li>- Number of local workers (living &lt;5km far from the sites)</li> <li>- Number of site visits by the grassroots health staff</li> <li>- Activities on traffic lane control and divergence</li> </ul>	
	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.	<ul style="list-style-type: none"> <li>- Number of recruited local laborers / total workers of the construction structures</li> </ul>	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	<ul style="list-style-type: none"> <li>- Mobilizing women to join in community activities of the Project</li> <li>- Supporting to maintain the previous occupation or change to the new ones.</li> <li>- Training on new occupations for women if needed</li> </ul>	<ul style="list-style-type: none"> <li>- Ratios of women participating in Project's community activities</li> <li>- Number of women is assisted to maintain the previous occupations.</li> <li>- Number of women attends in the new occupational training courses.</li> </ul>	As the above
	Supervising information release and community consultation.	<ul style="list-style-type: none"> <li>- Project information is fully, timely disclosed and easy to be accessed by the local citizens.</li> <li>- Improve community participation in the project activities.</li> </ul>	<ul style="list-style-type: none"> <li>- Information disclose is made on wards' radio broadcast, residence information boards, cultural houses, ward People's Committee office areas...</li> <li>- Distribution of leaflets if necessary</li> <li>- Community consultation about technical study in LIAs, demand of people in project areas.</li> </ul>	<ul style="list-style-type: none"> <li>- Number of communication sessions on the radio</li> <li>- Number of information stations/wards/work items</li> <li>- Number of distributed leaflets</li> <li>- Number of consultation meetings;</li> <li>- Number of people take part in consultation meetings.</li> </ul>	As the above

## 6.6. ROLE AND RESPONSIBILITIES FOR ESMP IMPLEMENTATION

### 6.6.1. Implementation Arrangement

The tables and figures below summarize the roles and responsibilities of the key parties and their relationships regarding the implementation of the ESMP.

- Contractors will be responsible for implementing mitigation measures. These measures will be included in bidding documents and their costs are to be included in construction bid packages;
- CSC will be responsible for monitoring the day-to-day implementation of mitigation measures. Related costs are included in the CSC service contract;
- IEMC will be responsible for overall environmental monitoring which includes support to the PMU in implementing environmental supervision and monitoring, and responsible for reporting on the implementation through monitoring reports.



**Figure 6.1: Organization chart for ESMP Implementation**

**Table 6.7: Roles and responsibilities of key parties**

Community/Agencies	Responsibilities
PMU	<ul style="list-style-type: none"> <li>- PMU will be responsible for monitoring the overall subproject implementation, including environmental compliance of the subproject. PMU will have the final responsibility for ESMP implementation and environmental performance of the subproject during the construction and operational phases.</li> <li>- Specifically the PMU will: (i) closely coordinate with local authorities in the participation of the community during subproject preparation and implementation; (ii) monitor and supervise ESMP implementation including incorporation of ESMP into the detailed technical designs and bidding and contractual documents; (iii) ensure that an environmental management system is set up and functions properly; (iv) be in charge of reporting on ESMP implementation to the DONRE and the World Bank.</li> <li>- In order to be effective in the implementation process, PMU will assign Environmental Staff(s) (ES) to help with the environmental aspects of the subproject.</li> </ul>
PMU Environmental and Social Staff(s)	<ul style="list-style-type: none"> <li>- The ES is responsible for monitoring the implementation of the World Bank's environmental and social safeguard policies in all phases and</li> </ul>



(ES)	<p>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.</p>
Construction Supervision Consultant (CSC)	<ul style="list-style-type: none"> <li>- The CSC will assign Environmental and Social Staff(s) and will be responsible for routine supervising and monitoring all construction activities and for ensuring that Contractors comply with the requirements of the contracts and the ECOP. The CSC will engage sufficient number of qualified staff (e.g. Environmental Engineers) with adequate knowledge on environmental protection and construction subproject management to perform the required duties and to supervise the Contractor's performance.</li> <li>- The CSC will also assist the PMU in reporting and maintaining close coordination with the local community.</li> </ul>
Contractor	<ul style="list-style-type: none"> <li>- The contractor will assign Environmental and Social Staff(s) to carry out Environmental and Social mitigation measures proposed in ESIA/ESMP.</li> <li>- Based on the approved environmental specifications (ECOP) in the bidding and contractual documents, the Contractor is responsible for establishing a Contractor ESMP (CESMP) for each construction site area, submit the plan to PMU and CSC for review and approval before commencement of construction. In addition, it is required that the Contractor get all permissions for construction (traffic control and diversion, excavation, labor safety, etc. before civil works) following current regulations.</li> <li>- The Contractor is required to appoint a competent individual as the contractor's on-site <i>Safety and Environment Officer (SEO)</i> who will be responsible for monitoring the contractor's compliance with health and safety requirements, the CESMP requirements, and the environmental specifications (ECOP).</li> <li>- Take actions to mitigate all potential negative impacts in line with the objective described in the CESMP.</li> <li>- Actively communicate with local residents and take actions to prevent disturbance during construction.</li> <li>- Ensure that all staff and workers understand the procedure and their tasks in the environmental management program.</li> <li>- Report to the PMU and CSC on any difficulties and their solutions.</li> <li>- Report to local authority and PMU and CSC if environmental accidents occur and coordinate with agencies and key stakeholders to resolve these issues.</li> </ul>
Independent Environmental Monitoring Consultants (IEMC)	<ul style="list-style-type: none"> <li>- IEMC will, under the contract scope, provide support to PMU to establish and operate an environmental management system, offers suggestions for adjusting and building capacity for relevant agencies during subproject implementation and monitor the CESMP implementation in both construction and operation phases. IEMC will also be responsible to support PMU to prepare monitoring reports on ESMP implementation.</li> <li>- The IEMC will have extensive knowledge and experience in environmental monitoring and auditing to provide independent, objective and professional</li> </ul>

	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, 55 projects financed by WB, ADB or IFC have been implemented in Ben Tre province. However, These project have been carried out by Ben Tre Provincial Management Unit / Department of Agriculture and Rural Development on behalf of Ben Tre People's Committee.

#### ***Capability of staff:***

An assessment of safeguards implementation capacity of existing PMU staff indicates that PMU staffs have limited knowledge on WB safeguard requirements as well as limited knowledge of environment and social issues. Such lack of capacity represents a risk to project implementation of safeguards requirements contained in the ESMP and, as required by the WB policy, is to be addressed through capacity building. Therefore it is proposed to provide capacity building through technical assistance that will support the PMU during the implementation of the safeguards requirements. The technical assistance will provide the necessary technical support the PMU in its work with contractors as well as other entities involved in the implementation of the ESMP.

#### ***Equipment***

The PMU will also need to be provided, equipped and updated with new computer software to be used in financial and accounting management as well as data analyses and consolidation, suiting the accounting standards of both the Vietnamese system and the Donor's system, so that a most suitable and optimal accounting system could be set up to handle finance-accounting management tasks.

### **6.6.2. Environmental Compliance Framework**

#### ***(i) Environmental Duties of the Contractor***

The contractor firstly shall adhere to minimize the impact that may be result of the subproject construction activities and secondly, apply the mitigation measures under ESMP to prevent harm and nuisances on local communities and environment caused by the impacts in construction and operation phases.

Prior to construction, the contractor will be required to prepare and submit a contractor's site-specific Environmental Management Plan (Contractor's SEMP) to the CSC and PMU based on the ESMP of the project and requirement in the Specification of Bidding Document. The contractor's site-specific SEMP shall demonstrate compliance with Vietnamese environmental technical regulations/ standards, the mitigation measures set down in the specifications and the World Bank Safeguard Policies. The content of the site-specific SEMP shall be in line with the

subproject specific ESMP and shall be enhanced by the Contractor's works practices, implementation procedures and program. The site-specific SEMP shall be certified by the CSC with subsequent submission to the PMU for approval. No construction activity should be implemented before approval of the contractor's site-specific SEMP.

Remedial actions that cannot be effectively carried out during construction should be carried out on completion of the works (and before issuance of the acceptance of completion of works)

The duties of the Contractor include but not limiting to:

- Compliance with relevant legislative requirements governing the environment, public health and safety;
- Work within the scope of contractual requirements and other tender conditions;
- Organize representatives of the construction team to participate in the joint site inspections undertaken by the Environmental Staff of the CSC;
- Carry out any corrective actions instructed by the Environmental Staff of the PMU and CSC;
- In case of non-compliances/discrepancies, carry out investigation and submit proposals on mitigation measures, and implement remedial measures to reduce environmental impact;
- Stop construction activities, which generate adverse impacts upon receiving instructions from the Environmental Staff of PMU and CSC. Propose and carry out corrective actions and implement alternative construction method, if required, in order to minimize the environmental impacts; Non-compliance by the Contractor will be cause for suspension of works and other penalties until the non-compliance has been resolved to the satisfaction of the ES of PMU and CSC.

***(ii) Contractor's Safety, Social and Environmental Officer (SEO)***

The contractor shall be required to appoint competent staff(s) as the Contractor's on-site safety, Social and environmental officer (SEO). The SEO must be appropriately trained in environmental management and must possess the skills necessary to transfer environmental management knowledge to all personnel involved in the contract. The SEO will be responsible for monitoring the contractor's compliance with the ESMP requirements and the environmental specifications. The duties of the SEO shall include but not be limited to the following:

- Carry out environmental site inspections to assess and audit the contractors' site practice, equipment and work methodologies with respect to pollution control and adequacy of environmental mitigation measures implemented;
- Monitor compliance with environmental protection measures, pollution prevention and control measures and contractual requirements;
- Monitor the implementation of environmental mitigation measures;
- Prepare audit reports for the site environmental conditions;
- Investigate complaints and recommend any required corrective measures;
- Advise the contractor on environment improvement, awareness and proactive pollution prevention measures;
- Recommend suitable mitigation measures to the contractor in the case of non-compliance. Carry out additional monitoring of noncompliance instructed by the ES of PMU and CSC

- Inform the contractor and ES (of PMU and CSC) of environmental issues, submit contractor's ESMP Implementation Plan to the ES of PMU and CSC, and relevant authorities, if required;
- Keep detailed records of all site activities that may relate to the environment.

***(iii) Independent Environmental Monitoring Consultant (IEMC)***

In order to minimize the environmental impacts during construction phase of the Subproject, the Subproject owner shall ensure that environmental quality monitoring requirements are established for the subproject. An IEMC appointed by PMU shall carry out the monitoring.

- IEMC will be responsible for carrying out environmental sampling, monitoring and marking report during subproject implementation. Environmental monitoring will be report periodically to PMU and World Bank (respectively every 03 months for PMU and every 6 months for WB in construction phase).
- EMC will also supply specialized assistance to PMU and ES in environmental matters.

***(iv) Environmental Supervision during Construction (CSC)***

During construction phase, a qualified CSC reporting to the PMU shall carry out the environmental supervision. The CSC will assign environmental and social staff(s), will be responsible for inspecting, and supervising all construction activities to ensure that mitigation measures adopted in the ESMP are properly implemented, and that the negative environmental impacts of the subproject are minimized. The CSC shall engage sufficient number of Environmental Supervision Engineers with adequate knowledge on environmental protection and construction 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	IEMC	PMU	Every three-month
6	PMU	DONRE	Every three-month
7	PMU	WB	Every six-month

**6.7. TRAINING AND CAPACITY BUILDING**

The Table 6.6 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: <ul style="list-style-type: none"> <li>- Requirements of environmental monitoring;</li> <li>- Monitoring and implementation of mitigation measures;</li> <li>- Community involvement in environmental assessment;</li> <li>- Guiding and monitoring contractors, CSC and community representatives in the implementation of environmental monitoring;</li> <li>- Forms used in environmental monitoring processes;</li> <li>- Reaction and risk control;</li> <li>- Manner of receiving and submit forms;</li> <li>- Other issues to be determined.</li> </ul>
Responsibility	With the help of the Technical Assistance Team, the Independent environmental Monitoring Consultant (IEMC) and PMU implement safety policies.
II. Subjects	<b>CSC, CONTRACTORS, REPRESENTATIVES OF LOCAL AUTHORITIES (WARDS/COMMUNES), COMMUNITIES</b>
Training course	Implementation of mitigation measures
Participants	CSC; construction engineers, site construction field manager. staff in charge of environment issues, the contractor; representatives of local authorities; representatives of urban groups
Training frequency	Shortly after awarding contracts to the contractors with updates on demand
Duration	Three-day training for CSC and contractors, and two-day training for others
Content	<ul style="list-style-type: none"> <li>- Overview of the overall environmental monitoring;</li> <li>- Requirements of environmental monitoring;</li> <li>- The roles and responsibility of the contractors and CSC;</li> <li>- The content and method of environmental monitoring;</li> <li>- Reaction and risk control;</li> <li>- Introducing monitoring forms and instructing on filling out forms and reporting incidents;</li> <li>- Other issues to be determined</li> <li>- Preparing and submitting reports</li> </ul>
Responsibility	With the help of technical assistance teams, PMU, the independent environmental monitoring consultant (IEMC) implement safety policies.
III. Subjects	<b>COMMUNITIES / WORKERS</b>
Training course	Safety and environmental sanitation



Participants	Representatives of workers (team leaders) working directly for the project components
Training frequency	As appropriate
Duration	One day of presentation and one day of on-site presentation
Content	<ul style="list-style-type: none"> <li>- Brief presentation on safety issues and overview on the environment;</li> <li>- Key issues requiring the attention of the community and construction workers to mitigating safety risks (land roads, waterways, equipment, machinery, etc.) as well as reducing pollution (dust, exhaust gases, oil spills, waste management, etc.);</li> <li>- Management of safety and environmental sanitation on site and at workers' camps;</li> <li>- Mitigation measures applied on site and camps;</li> <li>- Safety measures for electricity, mechanical engineering, transportation, air pollution;</li> <li>- Methods of dealing with emergency situations;</li> <li>- The rights and responsibilities of environmental monitoring</li> <li>- Environmental monitoring, environmental monitoring form</li> <li>- Measures to mitigate the social impact and monitoring implementation</li> </ul> <p>Other issues to be determined</p>
Responsibility	Contractors, PMU with the assistance of IEMC

## 6.8. TOTAL ESTIMATES

The following table provides a cost estimate for the implementation of environmental management plan (ESMP). The cost of ESMP<sup>7</sup> implementation will include (i) the costs of implementing mitigation measures by the contractor, (ii) expenses supervised by CSC, (iii) cost of the independent environmental monitoring consultant (IEMC), (iv) the costs of environmental quality monitoring, (v) the cost of safety management for the PMU, including both technical assistance in implementing safety policies and training programs. The costs of implementing mitigation measures during construction will be a part of the value of construction contracts, while the costs for a site-specific environmental monitoring plan (SEMP) by the construction supervision consultant (CSC) will be provided in construction supervision contracts. The costs of the PMU operations relating to EMP are allocated from the project management budget of the PMU, including safety training programs, and basic allowances to participants in the monitoring programs. After the project has been completed, the costs of environmental monitoring of constructed works will be taken from the operation and maintenance budget of the city.

It should be noted that the involvement of the community in the process of ESMP implementation is completely voluntary participation for the benefit of own community and households. Therefore, communities partaking in monitoring the ESMP will not get paid. However, in order to encourage community participation, it is necessary to allocate costs of materials and instruments for monitoring activities and some remuneration for a small number of members chosen by the public to participate in monitoring activities. As stipulated in the Prime Minister's Decision No. 80/2005 / QD-TTg dated 18 April 2005 promulgating the regulations on investment supervision by the community and Joint Circular guiding the implementation of Decision 80/2005/QD-TTg, "expenses for the community's investment monitoring in the commune/ward in are reflected in the cost estimates of the Communal Fatherland Front Committee's budget and allocated from the communal/municipal budget; support funds for the dissemination, organization of training courses,

<sup>7</sup>Excluding costs for RP implementation and independent monitoring the performance of RP/EMP

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 Ben Tre Sub-project (million USD)	Funded by
(a) Mitigation during construction	As a part of the contract	WB
(b) Monitoring safety policies during construction	As a part of the cost for Construction Supervision Consulting (CSC)	WB
(c) PMU's units in charge of environmental safety policies	As part of the costs for the PMU	Counterpart funds
(d) Environmental quality monitoring	0.23	WB
(e) Independent environmental monitoring consulting (IEMC)	0.76	WB
(f) Capacity building programs on safeguard policies	0.01	WB

**Table 6.11: Estimated cost for IEMC (1 USD = 23.330 VND)**

No.	Content	Unit	Quantity	Price (VND)	Total (VND)	Total (USD)
1	Specialist salary (I)	person-month	60	40,000,000	2.400.000.000	102.128
2	Specialist salary (II)	person-month	60	30,000,000	1.800.000.000	76.596
3	Specialist salary (III)	person-month	60	15,000,000	900.000.000	38.298
4	Local stays and allowance	person-day	1.800	520,000	936.000.000	39.830
5	Traveling expenses	Trip/ person	270	3,000,000	810.000.000	34.468
6	Training course	class	20	10,000,000	200.000.000	8.511
7	Office supply	monitoring session			300.000.000	12.766
8	Office and communication	month	60	5,000,000	300.000.000	12.766
	<b>Total</b>				<b>7,646,000,000</b>	<b>325,363</b>

## 6.9. GRIEVANCE REDRESS MECHANISM (GRM)

Complaints relating to any subproject's problems will be solved through negotiations to achieve the consensus. A complaint will go through three stages before it can be transferred to the court. The enforcement unit will pay all administrative and legal fees relating to the acceptance of complaints. This cost is included in the project budget.

Complaint procedures and resolution will be performed as follows:

**The first level *People's Committee of ward/commune*.** An affected household is to take his/her complaint to any member of the People's Committee of the ward / commune, through the village head or directly to People's Committee of the commune / ward, in written or oral form. The said member(s) of the People's Committee or the village head will inform the People's Committee of the ward/commune on the complaint. The People's Committee of Ward/Commune will work directly in person with the said affected household and will decide on the settlement of the complaint 5 days after receiving such complaint (this may take 15 days in mountainous or remote areas). The Secretariat of the People's Committee of the relevant commune/ward is responsible for documenting and recording all the complaints that it is handling.

After the Ward/Commune People's Committee issues its decision, the relevant household can make an appeal within 30 days. In case a second decision has been issued but the said household is still not satisfied with such decision, such household can appeal to the municipal (city) People's Committee (CPC).

**The second level *The CPC*.** Upon receiving a complaint from a household, the CPC will have 15 days (or 30 days in case of remote and mountainous areas) after receiving the complaint to resolve the case. The CPC is responsible for filing and storing documents on all complaints that it handles.

When the CPC has issued a decision, the household can make an appeal within 30 days. In case a second decision has been issued and the household is still not satisfied with such a decision, they can appeal to the Provincial People's Committee (PPC).

**The third level *The PPC*.** Upon receiving a complaint from the household, the PPC will have 30 days (or 45 days in case of remote and mountainous areas) after receiving the complaint to resolve the case. The PPC is responsible for filing and storing documents for all complaints to be submitted.

After the PPC has issued a decision, the household can appeal within 45 days. In case a second decision has been issued and the household is still not satisfied with such decision, they can appeal to the court within 45 days. The PPC will then have to pay the compensation into an account.

**The Forth level *Provincial Court*.** In case a complainant brings his/her case to a provincial court and the court rules in favor of the complainant, the provincial authorities will have to increase the compensation up to such a rate as may be ruled by the court. In case the court's ruling is in favor of the PPC, the complainant will be refunded the amount of money that has been paid to the court.

The decision ruling the settlement of complaints will have to be sent to complainants and concerned parties, and shall be publicly posted at the headquarters of the People's Committee of the relevant level. The complainant will receive such ruling three days after the result of complaint resolution at the ward / commune / town level has been decided upon and 7 days at the district or provincial level.

**Personnel:** The environment and resettlement staff chosen by the PMU will design and maintain a database of the project-related complaints from affected households, including information such as: the nature of the complaint, the source and date of receipt of the complaint, the name and address of the complainant, action plan, and current status.

For oral complaints, the receiving/mediator board will record these requests in a complaint form at the first meeting with the affected person.

***Contractor and Construction Supervision Consultant:***

During construction, the GRM will also be managed by the contractors under supervision of the CSC. The contractors will inform the affected communities and communes about the GRM availability to handle complaints and concerns about the project. This will be done via the community consultation and information disclosure process under which the contractors will communicate with the affected communities and interested authorities on a regular basis. Meetings will be held at least quarterly, monthly information brochures will be published, announcements will be placed in local media, and notices of upcoming planned activities will be posted, etc.

All complaints and corresponding actions undertaken by the contractors will be recorded in project safeguard monitoring reports. Complaints and claims for damages could be lodged as follows:

- Verbally: direct to the CSC and/ or the contractors' safeguard staff or representatives at the site offices.
- In writing: by hand-delivering or posting a written complaint to specified addresses.
- By telephone, fax, e-mails: to the CSC, the contractors' safeguard staff or representatives.

Upon receipt of a complaint, the CSC, the contractors' safeguard staff or representatives will register the complaint in a complaint file and maintain a log of events pertaining to it thereafter, until it is resolved. Immediately after receipt, four copies of the complaint will be prepared. The original will be kept in the file, one copy will be used by the contractor's safeguard staff, one copy will be forwarded to the CSC, and the fourth copy to the PPMU within 24 hours since receipt of the complaint.

Information to be recorded in the complaint log will consist of:

- The date and time of the complaint.
- The name, address and contact details of the complainant.
- A short description of the complaint.
- Actions taken to address the complaint, including contact persons and findings at each step in the complaint redress process.
- The dates and times when the complainant is contacted during the redress process.
- The final resolution of the complaint.
- The date, time and manner in which the complainant was informed thereof.
- The complainant's signature when resolution has been obtained.

Minor complaints will be dealt with within one week. Within two weeks (and weekly thereafter), a written reply will be delivered to the complainant (by hand, post, fax, e-mails) indicating the procedures taken and progress to date.

The main objective will be to resolve an issue as quickly as possible by the simplest means, involving as few people as possible, and at the lowest possible level. Only when an issue cannot be resolved at the simplest level and/ or within 15 days, will other authorities be involved. Such a situation may arise, for example, when damages are claimed, the to-be-paid amount cannot be resolved, or damage causes are determined.

***Independent monitoring consultants (environmental, social and resettlement)***, who have enough the specialized capacity, would be selected by PMU through bidding. Independent monitoring consultants are responsible for checking the procedures and decisions on settling complaints. Independent monitoring consultants may propose additional measures to address any outstanding complaints. While checking the procedure for complaint resolution and reviewing the decision on complaint resolution, the independent monitoring agencies are required to closely coordinate with the Vietnam Fatherland Front, whose members are responsible for monitoring law enforcement of local complaints.

***World Bank Grievance Redress Mechanism:*** Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanism or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaints to the WB's independent Inspection Panel which determines whether harms occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the WB's attention, and Bank Management has been given an opportunity to respond. For information on

how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit [www.worldbank.org/grs](http://www.worldbank.org/grs). For information on how to submit complaints to the World Bank Inspection Panel, please visit [www.inspectionpanel.org](http://www.inspectionpanel.org).

## **CHAPTER 7. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE**

This Chapter describes the process and results of public consultations as required in the national and Bank environmental safeguard policies. It describes feedback and options received from each ward or commune-based consultation and evidence of broad community support for the subproject investments. It provides sample pictures of public consultation meetings. The Chapter also summarizes responses and commitments of the subproject owner in complying with the environmental and social mitigation measures and information disclosure.

### **7.1. PUBLIC CONSULTATION PROCESS**

Public consultation is used to help identify opportunities and risks, improved subproject design and implementation, and increase subproject ownership and sustainability. Public consultation is specifically required by the World Bank's environmental and social safeguard policies. A meaningful public consultation was used for the subproject. This is a two-way process in which beneficiaries provide advice and input on the design of the proposed subproject that affect their lives and environment, promotes dialogue between governments, communities, NGOs and implementing agencies to discuss all aspects of the proposed subproject. The feedback from consultation will be incorporated into the subproject ESIA and design.

People 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 must also 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 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 in the public meetings and consultations. Representatives of mass organizations in the subproject that 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 follows:

- i. Disseminate key information related to policies of the World Bank, the Government and the subproject.
- ii. Provide locals with subproject information 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. Respond to questions from local communities concerning the subproject and safeguard policies;
- v. CPCs and PMU provided answers to questions to local residents related to subproject and local policies;
- vi. 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 in the project area including 8 wards/communes: 3, 4, 5, 6, 8, Phu Tan, Phu Khuong and Phu Hung. The first consultation was conducted from 25 to 26 July 2016 to provide information on the subproject investments, potential impacts, and scope of ESIA process. The second consultation was conducted from 26 to 30 October 2016 as a follow up to the first consultation and to seek public feedback to the ESIA draft. Public consultations were conducted through questionnaires and two-way public consultation meetings 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. 67 participants attended the first consultation and 557 participants attended the second consultations. Tables 7.1 and 7.2 summarize the details of public consultation at each ward or commune covered in the subproject area.

## 7.2. PUBLIC CONSULTATION RESULTS

**Table 7.1: Summary of result of the 1<sup>st</sup> public consultation**

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
1	Ward 3 25/07/2016	Representatives People's Committee, Youth Union administration officials, the Vietnam Fatherland Front, Women's Union: 4 Affected households: 6	In the course of project implementation, environmental hygiene must be ensured. - It is necessary to take measures to mitigate the negative impacts affecting the existing structures of the locals. - Quarter 3 are mostly poor household. We must ensure the resettlement of people in case of clearance. - Ensure habitat, urban aesthetic of the road are included in the works undertaken by the project. - After resettlement, avoid poor house design, which does not guarantee suitable living area.	Project noted all comments and will integrate all these ideas in the activities of environmental impact assessment, resettlement programs and provide appropriate mitigation measures.
2	Ward 4 25/07/2016	Representatives People's Committee, Red Cross: 2 Affected households: 3	- Giving the specifications, design plans as well as the exact location of the route as soon as possible - The policy of compensation and resettlement for people must be satisfactory - Accelerate working rate for the people to stabilize their lives.	Project noted the comments, which will be assessed and integrated into the project implementation process to ensure people stabilization of lives
3	Ward 5 26/07/2016	Representatives People's Committee: 1 Affected households: 9	- People living in group 2 and group 6 were inundated during heavy rain. However, the alley is no longer scalable to 4 m. Therefore, the proposal is to upgrade many alleys in the local area. - The upper alley in the area does not provide environmental sanitation and social security (narrow alley, flooding). Localities are expected to consult citizens for clearance compensation and resettlement to expand and upgrade the alley on the ward line. - Propose specific plans (drawings, design drainage systems ...) to convince people to get involved in the project. - Proposal to expand Luong Thuc alley (starting from Hung Vuong road to Nguyen Van Tu road) connect Quarter 3: 4.3 and 2.	Project noted the comments and will have specific assessment of the actual situation to prepare the design plans, construction; policies and appropriate measures with efficacy

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
4	Ward 6 26/07/2016	Representatives People's Committee, the Vietnam Fatherland Front, The Erly group: 4 Affected households: 10	<ul style="list-style-type: none"> <li>- The system of ward lines alley severely degraded, making walking difficulties, and flooding during rains. Besides, environmental sanitation can not be guaranteed in the process of collecting and transporting solid waste. Measures should be proposed for power system construction, pre-construction water alley routes to ensure they are put into use</li> <li>- The exchange of water of the canals in the area limited by the canal route sediment, degradation, local authorities are not capable to fully resolve</li> <li>- Recommended resettlement measures for households eligible for compensation and site clearance.</li> </ul>	Project noted the comments, which will be assessed and integrated into the construction plan, design and implement of projects.
5	Ward 8 25/07/2016	Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 6 Affected households: 1	<ul style="list-style-type: none"> <li>- Project Dong Tay Avenue construction was announced since 2008 - 2015 without progress, affecting people in the area: making the sale and string construction, repair not licensed ... causing difficulties for people's lives.</li> <li>- Recommend investors to complete the project in accordance with the construction schedule to avoid delays which cause many problems for people.</li> <li>- Please note that all projects at Group 3 and Group 4 of Ward 8 have low ground which are easily flooded during rainy days; construction should take note of appropriate measures to minimize inundation affecting area residents.</li> </ul>	Project noted the comments and will have specific assessment of the actual situation locally to come up with good design plans, construction policies and reasonable solution, to ensure people's schedule to settlement.
6	Phu Tan Ward 25/07/2016	Representatives People's Committee, the Veterans Association, Youth Union administration	<ul style="list-style-type: none"> <li>- Suggest 30/4 channel management at road-side residential area (away from the Nguyen Dinh Chieu Street on) and the stadium.</li> <li>- Proposed construction with appropriate direction to avoid flooding in residential areas.</li> <li>- Recommend for road-side construction at the vacant area of Chín Tế canal</li> </ul>	Project noted all comments, which will be noted and integrated into the activities of environmental impact assessment and provide optimal mitigation measures. At the same time there will be further research to solutions for appropriate safety

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
		officials, Senior citizen, the Vietnam Fatherland Front, Farmer Association, Women's Union: 3 Affectec households: 4	<ul style="list-style-type: none"> <li>- Recommend orientation on dredging sludge treatment, avoiding mosquito sanitation and disease treatment .</li> <li>- Take measures to reduce accidents in construction, making separators from residential areas to ensure safety for the people in the region.</li> </ul>	during project execution.
7	Phu Khuong Ward 25/07/2016	Representatives People's Committee, the Veterans Association, Youth Union administration officials, The Erly Group, Red Cross: 4 Affectec households: 5	<ul style="list-style-type: none"> <li>- Recommend making road management to the left in the direction of Nguyen Thi Dinh to restrict re-encroachment, waste disposal, sewage which will pollute the environment.</li> <li>- Currently the Ngo Quyen Street is filled with garden land and scattered buildings, no drainage system. Recommend measures to prevent waterlogging drainage.</li> <li>- Zone 5 and the Dong-Tay Highway of Quarter 1 are flooded in the rainy season. Suggest solutions to drainage and flooding to limit damage to the urban aesthetic.</li> <li>- During the dredging, there will be a rise in mosquitoes and disease, spraying should be planned and there must be methods on how to kill mosquito larva and proviing nets while sleeping to prevent disease.</li> <li>- Dredging sludge to be transported in the day to not affect the community.</li> </ul>	Project noted the comments and will have specific assessment of the actual situation locally to have the design plans, construction fair, effective; solutions to minimize environmental impact and safety accordingly.
8	Phu Hung commune 25/07/2016	Representatives People's Committee, Senior citizen, the Vietnam Fatherland Front, Women's Union: 4 Affectec	<ul style="list-style-type: none"> <li>- Recommend that the power and water cut schedule is to be informed in details so that it won't affect residents ' lives</li> <li>- Take measures to ensure traffic in the region and limit environmental pollution (dust, noise, waste water ...) in the construction process.</li> <li>- Recommend that the Dong-Tay Highway construction units should invest in sewer system in order to not have bad influence one incision Ba Bau (about 200 -300m) which affects residents of Phu</li> </ul>	Project noted the comments, which will be assessed and integrated into the construction plans, design. Measures will also be taken to build project implementation plan and resettlement policy which will not

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
		households: 1	<p>Thanh village and Phu Chien village directly</p> <ul style="list-style-type: none"> <li>- Proposed construction of resettlement areas first and foremost, to stabilize and facilitate people's lives which are affected by the project before the compensation and ground clearance process</li> <li>- A number of pressing issues in the commune: the odor from landfill and recycled plastic burning operations (landfill site). Inundation of roads when heavy rain. Suggest to use technology to effectively handle the investment environment and to build incinerator and waste treatment plant in the commune.</li> </ul>	disturb the lives of people in the region.

**Table 7.2. Summarizing the comments gathered from the second public consultation**

Location, Time	Participants	Community's opinions	PMU and Consultant's responses
Ward 27/10/2016	<ul style="list-style-type: none"> <li>- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 11</li> <li>- Affected households: 27</li> </ul>	<ul style="list-style-type: none"> <li>- Publicly disclose the detailed implementation schedule for the community to know.</li> <li>- The vehicles must be checked and not driving beyond the speed limit.</li> <li>- Avoid material gathering along the route affecting regional traffic.</li> <li>- Spray water to avoid dust generation during construction</li> <li>- Disclosure of information about the project, provide the appropriate policy</li> <li>- Mitigate flooding and waterlogging</li> <li>- Construction of embankments on both sides to reduce landslide</li> <li>- Do not undertake piling during rest periods</li> </ul>	<ul style="list-style-type: none"> <li>- Comply with the committed contents</li> <li>- Organize meetings and notify the details about the project to the people when the project is approved</li> </ul>
Ward 4 28/10/2016	<ul style="list-style-type: none"> <li>- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior</li> </ul>	<ul style="list-style-type: none"> <li>- Construction by concentration method to avoid prolonging the construction</li> <li>- Consider collecting wastewater from households</li> <li>- Inform people about compensation plans as soon as possible</li> <li>- Collect the waste from the construction and construction workers to avoid</li> </ul>	<ul style="list-style-type: none"> <li>- Comply with the committed contents</li> <li>- Consider the contributed ideas of the residents</li> </ul>

Location, Time	Participants	Community's opinions	PMU and Consultant's responses
	citizen, the Vietnam Fatherland Front, Women's Union: 9 - Affectec households: 67	environmental pollution - Take mitigation measures for flood at the beginning of the lane during construction. One side must be completed before continuing with the another. - Spray water to avoid dust generation during construction - Allocate reasonable traffic flow and make temporary construction of local roads	
Ward 5 26/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 14 - Affectec households: 129	- Study the altitude to avoid flooded roads - Properly arrange the sewers and materials collection, avoid long set up at residents' houses, hindering their transportation - Perform electrical work safety and fire protection to avoid affecting the residential - Implement the project quickly - The compensation must be clear and timely implemented to stabilize the lives of residents. - During construction, make sure of clean water; restrict production of waste at the source of the people	The commitments of residents are focused, the mitigation measures must be fully implemented as committed
Ward 6 30/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 111 - Affectec households: 68	- Those affected must be supported and provided information. - 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. - Avoid delaying the project implementation - Upgrade the water supply canals for production	Issues of generated dust and emissions are included in the ESIA and mitigation measures will be applied.
Ward 8 29/10/2016	- Representatives People's Committee,	- There should be policies to support and publicize information to households affected if the project is about to last	- Publication of detailed implementation schedule of



Location, Time	Participants	Community's opinions	PMU and Consultant's responses
	the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 5 - Affectec households: 71	<ul style="list-style-type: none"> <li>- Pay attention to the construction piling, avoid affecting the lives of residents</li> <li>- Check and record the condition before the construction works as a basis for compensation.</li> <li>- Implement the construction as prescribed to avoid affecting the daily lives of the people</li> <li>- Materials transport trucks must be fully covered to prevent material spillage, affecting sanitation</li> <li>- Use underground works to avoid affecting the road surface</li> <li>- When there is necessary relocation, arrange the resettlement sites with adequate infrastructure to ensure the lives of the people.</li> </ul>	the project in each location before the construction - The commitments are in the ESIA report
Phu Tan Ward 28/10/2016	- Representatives People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 9 - Affectec households: 67	<ul style="list-style-type: none"> <li>- The mosquitoes will grow while dredging, there needs to be sanitation teams to prevent disease and to spray sanitizer for disease reduction</li> <li>- Make sure that domestic wastewater of workers is not discharged into the environment, affecting people in the region</li> <li>- When dredging, pay attention to environmental sanitation.</li> <li>- Paying attention to social security in the locality.</li> <li>- There should be measures to reduce odor emission and disinfection measures.</li> <li>- During construction, the project owner must disseminate information to the communication along with the investor to implement the project.</li> </ul>	The commitments are in the ESIA report and construction package
Phu Khuong ward 27/10/2016	- Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 5 - Affectec households: 18	<ul style="list-style-type: none"> <li>- Provide specific and clear schedules and plans</li> <li>- Seriously implement the commitments</li> <li>- Take measures to mitigate the impact on business activities of the locals.</li> <li>- Check and verify the status of the project before construction to avoid being influenced</li> <li>- Taking measures to mitigate odors from dredging</li> </ul>	The mitigation measures must be fully implemented as committed
Phu Hung	- Representatives	- Arrange hygiene team to prevent the disease and spray sanitizer to prevent	People can contact the People's

Location, Time	Participants	Community's opinions	PMU and Consultant's responses
Comune 29/10/2016	People's Committee, the Veterans Association, Youth Union administration officials, Senior citizen, the Vietnam Fatherland Front, Women's Union: 8 - Affectec households: 38	<p>the spread of disease when dredging When dredging, pay attention to environmental sanitation. There should be measures to reduce odor emission and disinfection measures.</p> <ul style="list-style-type: none"> <li>- Disseminate information for self-management teams to promote and coordinate with the investor to implement the project</li> <li>- Implement the project soon to reduce pollution in localities</li> <li>- Domestic waste is required to be collected within the day to avoid waste generation.</li> </ul>	Committee wards for guidance on prescribed procedures for construction and repairing of buildings.

### **7.3. RESPONSES AND COMMITMENTS OF SUBPROJECT OWNER**

The Subproject Owner agrees on and acknowledges opinions/comments from the People's Committees of Wards/Communes and their local residents. The Subproject Owner and the Consultant have reviewed and incorporated those opinions/comments in the report and finalized the ESIA report on the basis of fully acquiring opinions/comments of the People's Committees of Wards/Communes and local communities in the subproject area.

The Subproject Owner will continue to pay attention to the implementation and supervise the Contractor's performance of mitigation measures for environmental impacts adequately and in accordance with the contents in the ESIA report.

The Subproject Owner commits to reasonably handle all issues related to compensation and assistance for local people, according to regulations prescribed by the Vietnamese Government.

### **7.4. INFORMATION DISCLOSURE**

The draft ESIA had been published at the offices of Ben Tre City People's Committee and the People's Committees of subproject wards and communes on January 07, 2017. Basing themselves on the contents of the ESIA, the local people could get the Subproject information and contribute their opinions/comments on environmental issues of the Subproject.

The draft ESIA was also sent to the World Bank office in Vietnam for its disclosure in the World Bank's Operations Portal on January 10, 2017.

## CHAPTER 8. CONCLUSIONS, RECOMMENDATIONS AND COMMITMENTS

### 8.1. CONCLUSIONS

The “*Scalingup Urban Upgrading Project (SUUP) Ben Tre City Sub-Project, Ben Tre Province*” is an urban upgrading project of which the main work includes rehabilitation of existing infrastructures, especially those of the city’s low income areas and new development of secondary and primary infrastructures. Ben Tre project will help to improve the city’s drainage conditions, local flooding and environmental conditions, contributing to the sustainable growth of the city.

The ESIA report complies with the current environmental impact assessment requirements stipulated by the Vietnamese Government and WB’s safeguard policies. The report will be one of the key documents to be submitted to State management agencies in charge of the environment to determine the location and scope of the work as a basis for applying for an investment license. In addition, this is also an important document for the project appraisal and in the negotiation and signing of the loan agreement between the Government of Vietnam and the World Bank.

#### **Environmental impacts:**

The environmental impacts were assessed with support from the baseline and statistical data as well as experiences from similar projects-assisted by the World Bank. The impacts are relatively quantified as best as they can be for three stages of project’s preparation, construction and operation. It will be further assessed and adjusted during the project implementation 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 Chin Te and 30/4 canals will help to address the drainage, environmental pollution and local encroachment and will create more green spaces for the city.

Most of the impacts during the 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 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 disturbing 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 are 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 Ben Tre City and in particularly helping Ben Tre 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 legal regulations on environmental protection when subproject operation has been completed.



## **APPENDIX 1: DUE DILIGENCE FOR BEN TRE SUBPROJECT**

### **1.1. Due Diligence for Phu Tan Ward Resettlement Sites**

The project of Phu Tan Resettlement Site was approved for adjusting the detailed construction plan of 1/500 scale in Decision No. 12/2016/QĐ-UBND dated September 08, 2016 by the People's Committee of Ben Tre City.

The planned land plot for the construction of Phu Tan Resettlement Site is located on Nguyen Thi Dinh Street, Phu Tan Ward, Ben Tre City, about 800m from the interchange of Tu Dien Crossroad and about 670m from the interchange of Phu Khuong Crossroad.

The project is composed of two stages:

- Stage 1: investing in the infrastructure of the Resettlement Site on an area of 5.4 ha divided into 129 residential land plots by 100-150 m<sup>2</sup> each (Figure 3 below).
- Stage 2: investing in the infrastructure on an area of 9.5 ha

Those households whose entire house is affected and have no place to live will be allocated plots in the project resettlement site in Phu Tan Ward as follows:

- Resettlement site investor in Phu Tan Ward: Ben Tre Construction Material Joint Stock Company (The company as a joint stock company). Total resettlement site area: 5.4 ha divided into 129 residential land plots by 100-150 m<sup>2</sup> each (Figure 3 below).
- Currently, the land acquisition has not been carried out. Ben Tre City People's Committee will direct Compensation and Site Clearance Boards to collaborate with Ben Tre LFDC and Construction Material Joint Stock Company to conduct the compensation, support and resettlement. Money for compensation and site clearance will be drawn from the investor's fund.
- The expected start date for beginning the construction of the resettlement site is in Q4/2017. The resettlement plot will be provided to the relocated HHs at beginning of Q2/2018.
- Infrastructure facilities will be provided including: roads, planted trees, water supply, drainage, lighting, electric supply and social facilities such as garden, playground, supermarket etc. This is also the wish of the affected people who would like to receive land plots in the resettlement site with the necessary social infrastructures.
- The resettlement site is built in the area where there are available infrastructure and public utility services. When designing the resettlement site, the design units took into account the access to social services such as health centers, schools, markets and commercial centers. Surrounding infrastructures: primary school and secondary school located 1-2 km away from the resettlement area, market located 1 km away from the RS.
- The average distance from the area to the AP's former residences is about 1-4km. This will reduce social and economic disruption for relocated HHs.
- Currently, the Design Consultants are in the process of design preparation for the resettlement site. It is expected that the preparation of necessary procedures for the construction of the resettlement site will be completed in QII/2017. Construction will start in QIV/2017 and will be completed in QII/2018.
- So far, the environmental impact assessment report (EIA) of the project has not been developed and approved. However, the EIA of the project will be approved by Ben Tre

Provincial People's Committee prior to construction. The project owner has to implement environmental impact mitigation measures as suggested in the EIA.

## **1.2. Due Diligence for Ben Tre Waste Treatment Plant**

- The waste treatment plant (WTP) in Ben Tre is built in Hamlet 2, Huu Dinh Commune, Chau Thanh District, Ben Tre Province, xxxkm from Subproject. Of a total area of 40,328.4 m<sup>2</sup>, the area of construction permitted is 39,922 m<sup>2</sup> for garbage disposal with a capacity of 200 tons/day. With a total investment of 175 billion VND, Ben Tre WTC is invested by Ben Tre Solid Waste Treatment JSC.
- The project applies waste treatment technologies under high-speed fermentation aerobic process at the same time with producing and recycling organic waste into fertilizer.
- The project is in the construction phase, expected to be completed and put into operation in 2017.
- Report on environmental impact assessment of the project has been approved by the People's Committee of Ben Tre Province by Decision No. 1535/QĐ-UBND dated 8/7/2015.

The project has been implemented in compliance with the environmental management plan approved by Ben Tre Provincial Department of Natural Resources and Environmental as follows:

### *In land clearance phase:*

Compensation for affected objects under the project has been carried out in accordance with compensation and land acquisition policies of Ben Tre Province. So far, there has been no claim related to this.

### *In construction phase:*

- Waste will be collected and treated by URENCO through the contract signed by both units.
- Pray water for construction area and material gathering area in dry season.
- The periodic environmental monitoring report in this phase was developed by the project owner and submitted to Ben Tre Provincial Department of Natural Resources and Environment.

### *In operation phase: The project owner will comply with the following measures:*

- Odor mitigation:
  - Periodically twice per day, bio-products will be sprayed on waste surface for minimization of odor, especially after raining.
  - Creating buffer zone for isolation of waste containing places from surrounding environment. Planting green trees, grass for landscape of the buffer zone.
  - The vehicles collecting, transporting waste to the plant must be fully covered and equipped with a leachate collecting system during transportation.
- Wastewater treatment:
  - Waste collection and transportation vehicles must be cleaned before leaving the plant. This pollution source is conveyed to the wastewater treatment station of the plant.
  - All wastewater must be conveyed to the wastewater treatment system for treatment in line with applicable standards before being discharged into receiving sources. The

wastewater treatment system (WTS) must be finished and operated in accordance with the approved design before the project officially receives waste.

- Wastewater treatment technology: Wastewater → sewage screen → anaerobic tank → stabilization tank → Aroten tank → Oxidation tower → flocculation tank → aerobic tank → Lagoon → Recipient source.
- Other measures
  - In dry season, roads within the plant scope must be sprayed with water for minimization of dust caused by transportation activities.
  - Solid domestic waste, sludge from WTS, other waste substances caused by the plant operation will be treated in line with characteristics, functions of each receiving works.
  - Bottom liner will be provided in waste containing, composting places for preventing leachate from penetrating outside, ensuring completion before the project temporarily containing waste.
  - Fully covering waste receiving places with impermeable material to reduce the amount of rain water infiltrating into waste, causing leachate, leachate spill outside the waste dumps, negatively impacting surrounding environment.
  - Periodically every 3 months, environmental quality monitoring reports are developed and submitted to Ben Tre Provincial Department of Natural Resources and Environment.

In general, environmental protection measures to be implemented by the project owner are similar to safeguard policies of the WB, so waste caused by the subproject is ensured to be treated in compliance with regulations.

### **1.3. Due Diligence for the Project of Sewage Drainage System Construction of Ben Tre City**

- The project of sewage drainage system construction of Ben Tre City as an item in CSS sanitation strategy of Ben Tre City, established in 2015 by ADB experts, has proposed measures to collect and treat wastewater for sanitation of Ben Tre City.
  - Capital source: ADB ODA (\$US 35.6 million); government budget (\$US 7.1 million)
  - Project progress: Under the establishment of FS, estimated to be started in 2018 and operated by 2020.
  - Capacity: 8,500 m<sup>3</sup>/day, 72 km long wastewater collection pipelines and 13 pumping stations.
  - The purpose of this project is to collect and treat wastewater from 10 wards of Ben Tre City (Wards 1 – 5, part of Wards 6 – 8, wards of Phu Khuong and Phu Tan).

Status report on environmental impact assessment: uncompleted. However, the impact assessment and social environment reports of the project would be developed and evaluated in accordance with ADB's safeguard policies and the Government of Vietnam. The reports will be approved by the ADB experts and Ben Tre People's Committees.

## APPENDIX 2: BEN TRE DREDGED MATERIALS MANAGEMENT PLAN

### 2.1. Location of Dredging, Volume and Characteristics of Dredged Materials

Dredging of small canals in LIA 1, LIA 2, LIA 6, LIA 7: The volume of dredging sediment estimated about 7,794 m<sup>3</sup>.

Upgrading and dredging of Chin Te and 30/4 canals: The volume of dredging sediment estimated about 3,750 m<sup>3</sup> and 1,155 m<sup>3</sup>, respectively.

### 2.2. Final Disposal Site

According to the analyses, the sediments from the canals dredged work are not hazardous, with the levels of heavy metals. However, it has high amount of organic compounds and pathogenic microbial (e.g. *Ecoli*) thus should not be used directly for used for agricultural purpose. This could rather be drained out and kept at least 03 months so as to remove the microbial and partial decomposition of organic compounds. The sediments could then be used for perennial crops or planting tree for urban landscape purpose, based on the actual needs of local people. Otherwise, it will be transported and disposed at Ben Tre Waste Treatment Plant.

Ben Tre Waste Treatment Plant (WTP) is built in Hamlet 2, Huu Dinh commune, Chau Thanh district, Ben Tre province is away approximately 10.5 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.

### 2.3. Contractor's Dredging Management Plan

The Contractor is required to prepare a Contractor's Dredging Management Plan (CDMP) and submitted to the Environmental Consultant of the Construction Supervision team and the PMU Environmental Officer for review and approval. The CDMP will include, but not limited to the followings:

- 1) The Scope of Works in the Contract package, construction method and schedule
- 2) Volume and quality of water quality and sediment quality in the dredging area covered by the contract
- 3) Water users that may be affected by the dredging and embankment lining
- 4) Materials uploading and transportation method: indicate proposed route of the transport from the dredged site to the disposal area, time of operation, type of vehicles/trucks and proposed measures to reduce the leakage of the dredged materials from the transport trucks,
- 5) Schedule to inform the nearby communities about the project, disclosure of name and contact number for possible complaints.
- 6) Potential social and environmental impacts, including the site-specific impacts and risks
- 7) Mitigation measures to address the potential impacts and risks. The mitigation measures should be proposed based on ESIA/ECOP, ESMP, SEMP, the potential impacts and mitigation measures presented in Section 4 and 5 of this Plan and the following requirements:

- 8) Environmental Quality Monitoring plan carried out by the contractor (particularly pH, DO, TSS, BOD, salinity etc. for water and heavy metals including pH, Hg, As, Cd, Cu, Pb, Zn and Cr, Organic Materials and Mineral Oils for sediments and soil.
- 9) For soil and sediment: The number of samples taken will follow the following guidelines

#### The number of Sediment samples

Volume of dredged (m <sup>3</sup> )	No of Sediment Samples
Up to 25,000	3
25,000 to 100,000	4-6
100,000 to 500,000	6-10
500,000 to 2,000,000	10-20
For each 1,000,000 above 2,000,000	Additional 10

At least one water, soil and sediment sample must be taken for each contract package:

- Consultation with affected community about the draft CDMF.
- Excavated soil are separated from dredged materials from source. Excavated soils will be reused on-site and off-site as much as possible and transported to the nearest disposal site appraised under ESIA, or identified and approved during detail engineering design or construction phase.
- The mitigation measures are adequate to address the potential social and environmental impacts associated with various steps and activities, areas of influence and receptors of dredging, temporary storage, transportation and final disposal of the dredged materials.
- Field survey are carried out by the Contractor during the preparation of the CDMF in order to identify if there are additional sensitive receptors not identified previously under CCSEP and proposed additional site-specific mitigation measures accordingly.
- Contractor's environmental monitoring plan are included.
- Commitments to carry out corrective actions when excessive pollution is determined, or when there are complaints about environmental pollution, social impacts from any stake holders.

## 2.4. Potential Impacts and Mitigation Measures for Dredging and Embankment lining

### Potential Impacts and Mitigation Measures

Impacts and Description	Mitigation Measures
<b>AT DREDGING AND TEMPORARY LOADING AREAS</b>	
<b><i>Odour and air pollution, nuisance</i></b> Decomposition of organic matters under anaerobic conditions generates strong odour-generated gases such as SO <sub>2</sub> , H <sub>2</sub> S, VOC etc. When the muds are disturbed and excavated, these gases are released much faster into the air. Exposure to odour pollution affect the health of workers, local residents and cause public nuisance.	<ul style="list-style-type: none"> <li>- Inform the community at least one week before dredging is started;</li> <li>- Minimise the duration of temporary loading of dredged materials on-site;</li> <li>- Temporary loading materials must be transported to the disposal site within 48 hours;</li> <li>- Load the materials on-site tidily;</li> <li>- Do not load the materials temporarily outside the construction corridor determined for each</li> </ul>

Impacts and Description	Mitigation Measures
	canal section; <ul style="list-style-type: none"> <li>- Avoid loading the sediment in populated residential areas or near public buildings such as kindergarten. Load the sludge as far from the houses and buildings as far as possible;</li> <li>- Cover the temporary sediment loads when loading near sensitive receptors or longer than 48 hours unavoidable.</li> </ul>
<b><i>Dust and nuisance</i></b> <ul style="list-style-type: none"> <li>- Temporary loading of sediment at the construction site cause nuisance to the public;</li> <li>- Dry and wet mud may be dropped along the dredging area and on transportation route causing nuisance to the public and traffic safety risks.</li> </ul>	<ul style="list-style-type: none"> <li>- Avoid temporary loading of dredged materials on-site;</li> <li>- Dredged materials must be transported to the final disposal sites earliest possible and no later than 48 hours from dredging;</li> <li>- Use truck with water-tight tank to transport wet/damp dredged materials;</li> <li>- All trucks must be covered tightly before leaving construction site to minimise dust and mud dispersion along the road.</li> </ul>
<b><i>Traffic Disturbance</i></b> 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.	<ul style="list-style-type: none"> <li>- Arrange worker to observe and direct excavators driver when traffic is busy.</li> </ul>
<b><i>Social Disturbance</i></b> <ul style="list-style-type: none"> <li>- Concentration of workers and equipment, construction plants, temporary loading of materials and wastes, traffic disturbance, dusts and odour pollution etc. will disturb daily activities and the lives of local residents;</li> <li>- Conflicts may also be arisen if workers, waste, materials, equipment etc. are present outside the construction corridor.</li> </ul>	<ul style="list-style-type: none"> <li>- Inform the community at least one week before construction is started;</li> <li>- Monitor to ensure that physical disturbances are within the construction corridors only;</li> <li>- Contractor recruit local labours for simple works, brief them about project environmental and safety requirements before started working;</li> <li>- Contractor register the list of workers who come from other localities to the commune at the construction site;</li> <li>- Led the water leaked from wet/damp dredged materials going back to the river, not to affect garden or agricultural land;</li> <li>- Keep the areas to be disturb minimal;</li> <li>- Enforce workers to comply with codes of conducts.</li> </ul>
<b><i>Landslide and soil subsiding risks at dredging area</i></b> <ul style="list-style-type: none"> <li>- Relative deep excavation or cut and fills on the embankments that create slopes may lead to landslide and soil subsiding at the slops or excavated areas, particularly in rainy weather;</li> <li>- Deep excavation also cause risks to the</li> </ul>	<ul style="list-style-type: none"> <li>- During field survey for the preparation of CDMP, the contractor in coordination with the Environmental Officer of PMU and the Environmental Consultant of the CES identify weak structures that may be at risk and determine appropriate mitigation measures accordingly;</li> <li>- Consider and select appropriate dredging</li> </ul>



Impacts and Description	Mitigation Measures
existing buildings nearby, particularly the weak structures or located too close to the deep excavation area.	<p>method that allow minimising soil subsiding risks, for example carry out stepped excavation, stabilise slopes in parallel to dredging;</p> <ul style="list-style-type: none"> <li>- Apply protective measures such as sheet piles at risky locations.</li> </ul>
<p><b>Water Quality Degradation</b></p> <p>Turbidity in water will be increased when the mud is disturbed; Water leaked from dredged material and surface runoff through disturbed ground also contain high solid contents. Muddy water entering irrigation ditch will cause sedimentation. Aquatic life in the canal would also be affected by turbid water.</p>	<ul style="list-style-type: none"> <li>- Build coffer dams surrounding the dredging area and pump the water out before starting dredging;</li> <li>- If dredging is carried out directly onto the water, dredge at intervals to allow suspended materials to resettle before continuing. Observe water colour at 20 m upstream and stop dredging when water colour there started to change.</li> </ul>
<p><b>Increased Safety risk for the Public</b></p>	<ul style="list-style-type: none"> <li>- Place stable barriers along the construction corridor boundary to separate the site with nearby structures;</li> <li>- Place warning signs and reflective barriers along the construction area, at dangerous locations and within sensitive receptors;</li> <li>- Ensure adequate lighting at.</li> </ul>
<p><b>Health and Safety risk to the workers</b></p> <ul style="list-style-type: none"> <li>- The health of workers may be affected due to exposure to odour and other contaminants from sediment</li> <li>- Risk of being drown</li> </ul>	<ul style="list-style-type: none"> <li>- Within two weeks before dredging is started, the contractor will coordinate with local authority to identify good swimmers or those who can dive in the locality, and hire at least one of them at each canal construction site deeper than 3 m and there are workers working on or near water surface;</li> <li>- Provide and enforce the workers to use masks. If and when working in the water, protective cloths, rubber boots, gloves and hats must be worn.</li> </ul>
<p><b>Others</b></p>	<ul style="list-style-type: none"> <li>- Other relevant measures specified in ECOP or proposed by the contractors as necessary.</li> </ul>
<b>MATERIAL LOADING AND TRANSPORTATION</b>	
<p><b>Dust and nuisance, traffic safety risks</b></p> <p>Dust or wet materials may be dropped along the transportation route</p>	<ul style="list-style-type: none"> <li>- Use water-tight tank trucks for transporting wet/dam materials;</li> <li>- Cover the materials tightly before leaving the construction site;</li> <li>- Do not overload material on the trucks.</li> </ul>
<b>AT FINAL DISPOSAL SITE</b>	
<p><b>Landslide and soil subsiding risks at final Disposal site</b></p> <p>Landslide and subsiding risk may happen on slopes created at the final disposal site of dredged materials if the slopes created are too high, steep or unstable</p>	<ul style="list-style-type: none"> <li>- Level the materials after being disposed off;</li> <li>- Slopes of the dumps will not be steeper than 45°;</li> <li>- Build/create the walls to protect slopes;</li> <li>- Create and maintain drainage at the foot of each dump higher than 2 m.</li> </ul>
<p><b>Soil and Water Quality Pollution</b></p> <ul style="list-style-type: none"> <li>- The disposal of salty soil would not affect</li> </ul>	<ul style="list-style-type: none"> <li>- Apply measures that ensure rainwater onto the materials is not mix with the surface runoff</li> </ul>

Impacts and Description	Mitigation Measures
<p>the existing soil quality;</p> <ul style="list-style-type: none"> <li>- No risks of subsidence and landslide for residential areas around this area;</li> <li>- No impacts on river water quality.</li> </ul>	<p>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:</p> <ul style="list-style-type: none"> <li>+ Build drainage ditches surrounding the designated disposal area;</li> <li>+ Use impermeable materials to cover the walls surrounding the materials to isolate it with the surrounding;</li> <li>+ Other measures proposed by the contractors to meet pollution control targets.</li> </ul>

## 2.5. Specific Guidance for Dredging at Chin Te and 30/4 canals

- Identifying the available land for disposing the dredged materials. The plan should also identify the possible lands to be appropriated for the disposal of dredged materials. Public land, land for construction of rural roads, public works, private land, etc. may be used, with an agreement with the project affected households. It should also meet local plans for land use.
- Preparing for a transportation plan. In case, the dredge disposal area is far away from the dredged sites, the DMP shall set out a transportation plan including: (a) methods of transportation (pipeline, barges, hopper barges) and uploading to the disposal area. If trucks are used, indicate proposed route of the transport from the dredged site to the disposal area, (b) time of operation, (c) type of vehicles/trucks and proposed measures to reduce the leakage of the dredged materials from the transport trucks, (d) contractors' responsibilities for cleaning the roads and carry out remedial works if necessary, and (e) a communication plan for the nearby communities including contact number for possible complaints.
- Plan for managing the disposal areas including: (a) plan for reducing the drainage, (b) construction of the perimeter dykes, (c) construction of sub-containment area, if applicable, (d) planned thickness of the dredged materials (typically less than 1.5 meters), (e) any measures to protect ground water and soils (e.g., installation of PVC membrane).
- Designing the Draining for Disposal lands. As the dredged materials are in the state of mud at first and soil particles are suspended for 24 to 48 hours. All drainage water from disposal land shall be driven to the drains and discharged back to the river. In order to limit the negative impacts of mud (produced by dredging) on the environment as well as the water quality of the canals, the dredged sediment will be transported to a containing area which is appropriately located and properly design with an adequate size. The dredged spoil will be pumped to the disposal land and then overflow to a settlement pond, where turbidity and total suspended solids are settled. After some time, effluent is returned to the river. A typical design of the dike around each disposal may be as follows: Height: 2m, Footing width: 5 m, and Surface width: 1m. The plan should set out a basic layout.
- Monitoring the Disposed Dredged Materials. A plan for monitoring the dredged materials as well as water quality of effluent would be required. As stated before, an intensive monitoring would be required if the dredged materials contains higher content of the heavy metals and other harmful materials than the national thresholds.
- In order to mitigate the issue of turbidity during dredging operation, the DMP shall set out dredging equipment and/or techniques suitable to the particular site. On laying

dredging machines on a barge, contractors can use a proper mud –stopping net for enclosing the dredging site and keeping back mud on land, not to let it goes back to the canal. If the disposal site for dredge materials is located far away from the dredger, a suction dredger should be used to transfer all the mud and soil in water to the disposal sites. The length of dredging sections should be limited less than 1 km and the dredging should be done one by one.

At the completion of the contract, carry out an assessment on dredged materials, and determine the use of the dredged materials for activities such as: (a) construction (roads and dykes), (b) basis for individual houses, and (c) gardening.