LONG AN PROVINCIAL PEOPLE'S COMMITTEE

TAN AN CITY PEOPLE'S COMMITTEE

REPORT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

PROJECT

Vietnam Scaling Up Urban Upgrading

Tan An City subproject–Long An Province

TAN AN, FEBRUARY 2017

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PROJECT OWNER

TAN AN CITY PEOPLE'S COMMITTEE, LONG AN PROVINCE

CONSULTANT

VIETNAM CONSTRUCTION AND ENVIRONMENT JOINT STOCK COMPANY

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ABBREVIATION

Ahs	Affected Households
CC	Climate change
AC	Asphalt concrete
CeC	Cement concrete
CMC	Construction monitoring consultant
DED	Scale-up of urban upgrading project
DOC	Department of Construction
DOF	Department of Finance
DONRE	Department of Natural Resources and Environment
DOT	Department of Transport
DPI	Department of Planning and Investment
MKD	Mekong River Detal
EIA	Environmental impact assessment
ESIA	Environment and Social Impact Assessment
ECOP	Environmental Code of Practice
EMC	External Monitoring Consultant
EMP	Environmental Management Plan
EMS	Environmental monitoring system
LIA	Low-income area
MOC	Ministry of Construction
MUDP	Management of Urban Development under Urban Development Agency
NUUP	National urban upgrading program
ODA	Official Development Assistance
PPMU	Provincial Project Management Unit
PPU	Project Preparation Unit
PSC	Project Steering Committee
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
RP	Resettlement Plan
P/CPC	Provincial/City People's Committee
UDA	Urban Development Agency
URENCO	Urban Environment Company
WB	World Bank

CHAPTER 1. PROJECT INTRODUCTION AND DESCRIPTION

1.1. BACKGROUND AND OBJECTIVES OF PROJECT

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

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

Like other municipal regions in the country, the Mekong Delta region has undergone rapid urbanization at the rate of about 25%. In addition, this region is projected to be amongst the most affected by climate change impacts. Annually, 50% area of the region is flooded from 3-4 months, 40% areas experience salt water intrusion. With the consequences from global climate change, (high temperatures, rising of sea level, and changes in rainfall), the major livelihoods of agriculture and aquaculture, as well as coastal communities and assets in the Mekong Delta region will be seriously affected by saline intrusion and flooding.

In order to overcome the above-mentioned challenges, Vietnam set comprehensive goals, including: (i) developing urban areas to be synchronous and with 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. Specifically, to ensure the achievement of these goals for Vietnam's Mekong Delta, the Decision No. 939/QĐ-TTg dated 19 July 2014 reflected the Prime Minister's approval of the master plan of socio-economic development of the Mekong Delta region towards 2020.

The Government of Vietnam (GoV), with the assistance of the World Bank, has undertaken two urban upgrading projects in the period from 2004 to 2017. This included the Urban Upgrading Project in Vietnam (VUUP 1-4 covered Nam Dinh, Hai Phong, Ho Chi Minh City, Can Tho), Urban Upgrading Project in the Mekong Delta Region (MDR-UUP, covered 6 cities Can Tho, Cao Lanh, My Tho, Tra Vinh, Rach Gia and Ca Mau). The project has significantly transformed these urban areas, changing perceptions of urban management and project management for the cities involved. In view of the Government, the upgrading of cities in the Mekong Delta are special priorities as this will increase the city's resilience and help reduce the city's vulnerabilities to water related risks.

The proposed Vietnam Scaling-Up Urban Upgrading project (SUUP) is aligned with the Government's priorities, and derives from a stock taking the ongoing investments and previous experience in these areas. Investments under the project will promote a risk-informed approach to infrastructure design and construction (including screening for disaster and climate risks, promoting green/permeable infrastructure, storm-water storage etc.). The selection of infrastructure sub-projects has been prioritized to ensure: (i) benefits to the urban poor; (ii) alignment to long-term sustainable urban development goals and attention to urban resilience; (iii) adherence to key principles of compact urban design and universal accessibility; and (iv) technical and economic soundness. These activities will be complemented by technical assistance to local governments to enhance the cities' capacities in urban planning, land management and city resilience.

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

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

1.1.2. **Project objectives**

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

1.1.3. **Project Components**

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

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

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

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

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

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

Component 3 – Resettlement Sites

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

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

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

1.2. LEGAL AND TECHNICAL BASIS FOR ESIA PREPARATION

1.2.1. National Regulations and Technical Basis

a) Legislations

- Law on Environmental protection No. 55/2014/QH13 passed by the 13th National Assembly on 23 June 2014 and took effect since 01 January 2015;
- Construction Law No. 50/2014/QH13 adopted by the 13th National Assembly of the Socialist Republic of Vietnam dated 18 June 2014 and took effect since 01 January 2015;
- Land Law No. 45/2013/QH13 passed by the 13th National Assembly of the Socialist Republic of Vietnam dated 29 November 2013 and took effect since 01 July 2014

- Law on Water Resources No. 17/2012/QH13 passed by the 13th National Assembly of the Socialist Republic of Vietnam, session 3 on 21 June 2012;
- Labour Law No. 10/2012/QH13 passed by the 13th National Assembly of the Socialist Republic of Vietnam on 18/06/2012
- Urban Planning Law No. 30/2009/QH12 passed by the 12th National Assembly of the Socialist Republic of Vietnam on 17/06/2009
- Biodiversity Law No. 20/2008/QH12 passed by the 12th National Assembly of the Socialist Republic of Vietnam on 13/11/2008;
- Law on amendment and supplementation of some articles of Law on Fire Prevention and Fighting No. 40/2013/QH13 adopted by the 13th National Assembly of the Socialist Republic of Vietnam on 22/11/2013
- Law on People's health No. 21/LCT/HĐNN8 adopted by the 13th National Assembly of the Socialist Republic of Vietnam on 30/06/1989.
- Decree No. 18/2015/NĐ-CP dated 14 February 2015 of the Government on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plans
- Decree No. 19/2015/NĐ-CP dated 14 February 2015 of the Government detailing the implementation of a number of articles of the law on environmental protection;
- Decree No. 59/2015/NĐ-CP dated 18/06/2015 of the Government on management of construction investment project;
- Decree No. 16/2016/NĐ-CP dated 16/03/2016 of the Government on management and use of official development assistance (ODA) and concessional loans provided by foreign donors;
- Decree No. 201/2013/NĐ-CP dated 27/11/2013 of the Government detailing some articles of Law on Water Resources;
- Decree No. 140/2006/NĐ-CP dated 22/11/2006 of the Government providing for the environmental protection at stages of elaboration, evaluation, approval and implementation of development strategies, planning, plans, programs and projects;
- Decree No. 59/2007/NĐ-CP dated 09/4/2007 of the Government on the management of solid waste;
- Decree No. 38/2015/NĐ-CP dated 24/4/2015 of the government on management of waste and discarded materials.
- Decree No. 80/2014/NĐ-CP dated 06/8/2014 of the Government on drainage and wastewater treatment;
- Decree No.179/2013/NĐ-CP dated 14 November 2013 of the Government on the sanction of administrative violations in the domain of environmental protection;
- Circular 27/2015/TT-BTNMT dated 29 May 2015 of Ministry of Natural Resources and Environment on strategic environmental impact assessment, environmental impact assessment and environmental protection plan;
- Circular No. 36/2015/TT-BTNMT dated 30/6/2015 of Ministry of Natural Resources and Environment on hazardous waste management;
- Circular No. 28/2011/TT-BTNMT dated 01/8/2011 of Ministry of Natural Resources and Environment on regulating technical process on environmental monitoring of ambient air and noise;

- Circular No. 29/2011/TT-BTNMT dated 01/8/2011 of Ministry of Natural Resources and Environment regulating the technical process on inland surface water monitoring;
- Circular No. 30/2011/TT-BTNMT dated 01/8/2011 of Ministry of Natural Resources and Environment regulating the technical process on underground monitoring.
- Circular No. 19/2011/TT - BYT dated 06 June 2011 of Ministry of Health guiding the management of labor hygiene, laborers' health and occupational diseases;
- Circular No. 22/2010/TT-BXD dated 03/12/2010 of Ministry of construction providing labor safety in construction.

b) Vietnam's Applicable Standards and Regulations

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

Water quality:

- QCVN 01:2009/BYT– National technical regulation on drinking water quality;
- QCVN 02:2009/BYT– National technical regulation on domestic water quality;
- QCVN 08-MT:2015/BTNMT– National technical regulation on surface water quality;
- QCVN 09-MT 2015/BTNMT– National technical regulation on ground water quality.;
- QCVN 14:2008/BTNMT – National technical regulation on domestic wastewater;
- QCVN 40:2011/BTNMT – National technical regulation on industrial wastewater;

Air quality:

- QCVN 05:2013/BTNMT– National Technical Regulation on Ambient Air Quality;
- QCVN 06:2009/BTNMT– National technical regulation on hazardous substances in ambient air;
- TCVN 6438:2005 - Road vehicles –Maximum allowable limits of gas emission.

Soil and sediment quality:

- QCVN 03-MT:2015/BTNTM - 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/BTNTM- National technical regulation on sediment quality;

Noise and vibration:

- QCVN 26:2010/BTNMT - National Technical Regulation on Noise;
- QCVN 27:2010/BTNMT – National Technical Regulation on Vibration.;

Solid waste:

- TCVN 6705:2009 – Normal solid waste. classification;
- TCVN 6706:2009 – Hazardous waste. Classification;

Drainage and construction works:

- TCVN 7957:2008 - Drainage and sewerage - External Networks and Facilities - Design Standard.
- TCXDVN 33:2006 – Water supply – Pipeline distribution System and Facilities.
- QCVN 07:2016/BXD: National technical regulation "infrastructure works".

- QCXD VN 01:2008/BXD – National construction regulation – construction planning;
- QCVN 04-05:2012/BNNPTNT – National technical regulation – Irrigation works – Main Regulations on design.

Labor safety and health

- Decision No. 3733/2002/QĐ-BYT dated 10/10/2002 promulgating 21 labor hygiene standards, 05 principles and 07 labor hygiene measurements.
- QCVN 18:2014/BXD – National Technical regulation on safety in construction

c) Legal documents related to the project:

- 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 Mkeong 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 WB team on identification of the Vietnam Scaling Up Urban Upgrading Project from 21 to 29 March 2016;
- Aide Memoire of WB team on preparation of the Vietnam Scaling Up Urban Upgrading Project from 6 to 14 October 2016;

d) Documents and Data prepared by the Subproject owner

- Pre-FS of the Vietnam Scaling Up Urban Upgrading Project –Tan An city subproject, Long An province which was prepared by the City PC of Tan An and competent consultant.

- Basic design for the Vietnam Scaling Up Urban Upgrading Project– Tan An city subproject, Long An province.

- Related legal documents provided by Tan An City and its line departments.- Related legal documents provided by Tan An City and its line departments.

1.2.2. **World Bank's Safeguards 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 Tan An subproject:

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

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

- World Bank-financed projects should also take into account the World Bank Group Environmental, Health, and Safety Guidelines (known as the "EHS Guidelines"). The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice.
- The EHS Guidelines contain the performance levels and measures that are normally acceptable to the World Bank Group and are generally considered to be achievable in new

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

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

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

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

[5] 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

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

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

1.3. DESCRIPTION OF TAN AN SUB-PROJECT

1.3.1. **Sub-project location**

Tan An City is one of the key socio-economic development areas in Long An province, with geographic coordinates from 106°21' to 106°27' of East longitude and from 10°20' to 10°00 of North latitude. It is located on National Highway 1A and in intersection with Vam Co Tay River, and 47 km far away from Ho Chi Minh City towards the Southwest. Administrative boundaries are defined as follows:

- In the North: border with Thu Thua district.
- In the South: border with Chau Thanh district.
- In the East: border with Tan Tru district.
- In the West: border with Chau Thanh district, Tien Giang province.

The natural area of the whole city is 81.9 km^2 (8,194 ha), in which the area of urban and suburban land is 3,916 ha and 4,278 ha, respectively. In terms of administrative units, there are 9 wards: Ward No.1, 2, 3, 4, 5, 6, 7, Khanh Hau and Tan Khanh ward and 05 communes including Huong Tho Phu, An Vinh Ngai, Loi Binh Nhon, Binh Tam, Nhon Thanh Trung.

Given with above-mentioned geographical settings, the attraction of investment to Tan An city is a favorable condition, facilitating to promote socio-economic development of the city in particular and of Long An province in general.

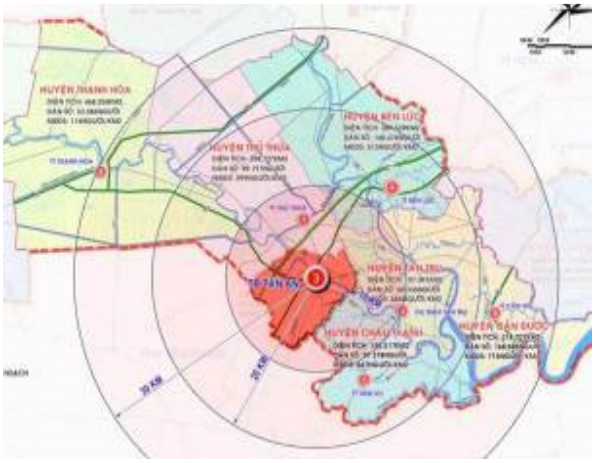


Figure 1.1. Location of Long An Provincial

Figure 1.2. Location of Tan An City

The subproject of Tan An City, funded by the World Bank, will cover 07 wards and 01 commune in Tan An city, including Wards No.1, 2, 3, 4, 6, 7, Khanh Hau and Loi Binh Nhon communes.

1.3.2. **Detailed Description of Tan An's sub-project Investment Items**

The Tan An subproject includes four (04) main components as follows:

Component 1: Tertiary Infrastructure Upgrading in Low Income Areas

This component will finance the upgrading of infrastructure in 04 low-income areas (LIAs) covering a total area of 52ha and 1,418 households, aiming at the rehabilitation and new construction of alleys, drainage systems, improvement of sanitation for residents. These four LIAs

comprise of LIA 1 (Ao Quan area - ward 1, 3) with total 266 households, and poverty rate accounting for 2.6% of the area; LIA 2 (Mui Tau area - Ward 2), with 78 households, with the area of 7.8ha, and poverty rate accounting for 10.2%; LIA 3 (Cau Tre canal - Ward 4) with total 486 households, an area of 2.7ha and poverty rate of which accounts for 2.6%; LIA 4 (Rot canal - Ward 6) with 588 households, an area of 20.1ha, and poverty rate accounting for 2.5%. With an overall area of 21.4ha, with 4,312m of alleys (2 - 4m wide) will be newly-made; 2,140m of sewers will be renewed; 2,251m of canals in LIA will be rehabilitated; and lighting systems also renewed.

Component 2: Priority Primary and Secondary Infrastructures

The goal of improving the main connection infrastructure network, aligned with urban development upto Type II by 2020, requires urgent infrastructural upgrade, including traffic roads, drainage systems and sewers, embankments for river bank protection and canals. This is supported by component 2, which will include the following investments:

- Embankment of Bao Dinh River in ward 3 and 4 with total length of 1,300m
- Construction of Ring road with total length of 5,950m (in Khanh Hau ward and Loi Binh Nhon commune).
- Upgrading of Luu Van Te street with total length of 1,850m (in ward 4)
- Rehabilitation of Cau Tre canal (at the section from Bao Dinh river to National Highway No.1) (in ward 4)
- Construction of connecting road between Tran Phong Sac and Nguyen Minh street (in ward 4)

Component 3: Resettlement Site

This component will support the construction of 2ha resettlement areas in a former jail – in ward 1 and 3 –for those who are affected and relocated by the sub-project. This will include the construction of technical infrastructure such as roads, electricity, lighting, water supply and drainage system, etc and associated social infrastructure such as cultural house, health station and kindergarten.

Component 4: Implementation Support and Technical Assistance

Activities under this component will focus on supporting (i) improvement of performance capacity and project management (capacity of social security, finance, bidding procurement, monitoring and evaluation, including audit and learning domestic/international experience); (ii) consolidation of integrated urban planning capacity to respond to climate change, and (iii) strengthening of planning capacity for anti-change urban areas.

Locations of investment items under the project are shown on the map (see Figure 1.3)

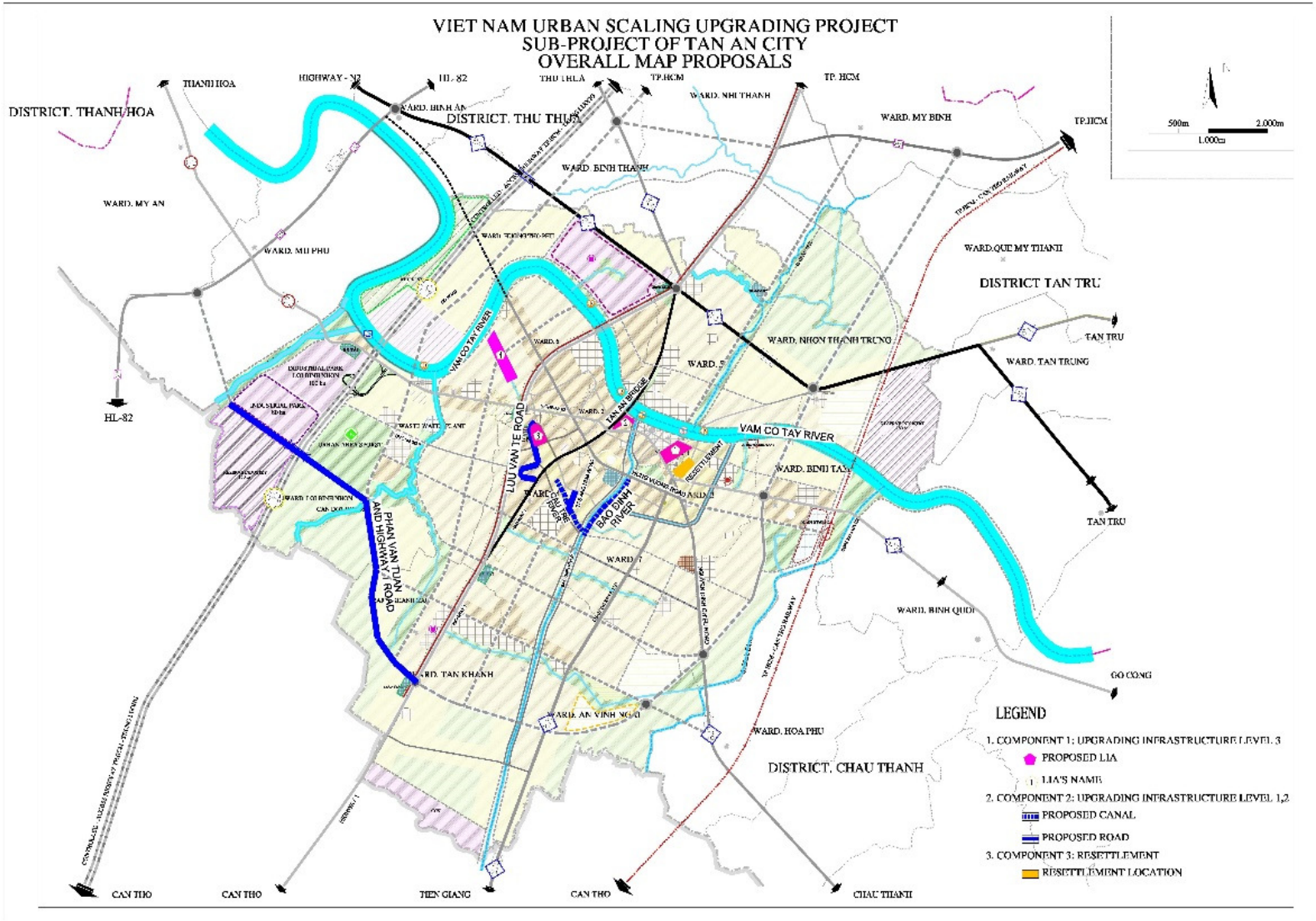


Figure 1.3. The map of investment items under the Subproject of Tan An City

Table 1.1. The main investment items of the Tan An city subproject

No.	Investment Items	Description of Proposed investment items
I	**Component 1**	**Tertiary Infrastructure Upgrading in 04 LIAs (1, 2, 3, 4) covering 52 ha and involving 5,672 people**
1.1	Upgrading of alleys; installation of drainage and lighting system in LIAs	- Upgrading and widening of 11 main alleys from existing 3 - 4 m wide to cement concrete of 4.0 m wide and total length of 2.1 km. - Upgrading, rehabilitation of 02 small alleys from existing 1.5 m wide to t concrete alleys of 2 m wide, and total length of 0.1 km. - Installation of a drainage concrete pipe D600 - D800 along main alleys with total length of 2.1 km; and a brick-type drainage ditch B400 in small alleys with total length of 100 m. - Provision of lighting system, waste bins and garbage trolleys
1.2	Rehabilitation of polluted canals ponds in LIAs	**- Embankment of Ao Quan**: Dredging the canal, widening up to 5-7m wide, total length of 0.103 km; Construction of revetment with concrete slope on pile foundation. Construction of operational roads with cement concrete structure of 2m wide and 0.103 km long; installation of drainage system alongthe road side by UPVC pipe D200 with a length of 0.103 km. - **Rehabilitation of canals in LIAs:** (i) Mui Tau canal; (ii) Cau Tre canal in LIA; (iii) Rot canal. ▪ Mui Tau canal: Dredging of the canal of 0.168 km long and 2-4 m wide from existing depth at +0.2m to the designed depth at 0.5 m; Construction of concrete drainage box 2.0m x 2.0m dimensions underground in combination with cement concrete road of 4m wide and 0.168 km on the top of the box pipe. ▪ Cau Tre canal (segment 1): Dredging of the canal of 0.550 km long and 3-8 m wide, from existing depth at +0.2 m to the designed depth at -0.5 m. Construction of concrete drainage box 3.0 m x 3.0 m dimensions underground in combination with cement concrete road of 4m wide and 0.550 km long on the top of the box pipe. ▪ Rot Canal: Dredging of the existing canal of 1.2km long, 2-8m wide, from current depth at + 0.2 m to the designed depth at 0.5 m; Ecological soft embankment with tree landscaping (slope 1:1, height of 2.2 m). Cosntruction of drainage ditch B400 along the embankment sides with total length of 2.4 km.
1.3	Construction of a green lineary park in LIA 2 – Mui Tau	Construction of Terrazzo-brick-type paths in the park with the width of 4m and length of 0.2 km; Construction of drainage ditch of 20 cm width, 20 cm height and 0.2 km length. Provision of lighting system and trees planted in the park.
II	**Component 2**	**Priority primary and secondary infrastructures**
2.1	Embankment and construction of Bao Dinh river park in ward 3 and 4; construction of an extension of the	**Segment 1: Construction of Bao Dinh river embankment and green park along side of the embankment** - Dredging work from the existing depth at 0.9 m to the designed depth at 2 m with total length of 1.3 km. - Revetment with concrete retaining wall (2.3 m high) - Construction of operational roads and Terrazzo-brick-type paths in the park behind the embankment (width of 4m, length of 0.65 km)

	embankment in ward 7	- Construction of a drainage system on sides of operational roads and paths in the park by concrete pipe D600, total length of 0.65 km; - Tree planting and installation of lighting system along operational roads. **Segment 2: Construction of an extension of Bao Dinh river embankment** - The road base will be elevated from 0.89 m to the designed depth at 1.85 m with a length of 1 km. Currently, it is an earth road. - Then, construction of concrete asphalt road with pavement of 7 m wide and sidewalk of 2.5 m wide on each side, total length of 1 km . - Construction of a drainage system and manholes with concrete pipe D600 along a road side, total length of 1km. -Supply of lighting system and tree planting along sidewalks with the length of 1km.
2.2	Rehabilitation of Cau Tre canal (segment 2)	- Dredging of the canal of 1.24 km long, 3-8 m wide. - Construction of a ecological soft embankment (slope 1:1), height of 2.2 m, a width of 6 m and a length of 1.24 km, and grass and landscaping trees will be planted on sandbags. - Construction of concrete operational roads along sides of the embankments with a width of 2 m, total length of 2.48 km. - Construction of drainage ditches B400 along embankment sides with total length of 2.48 km.
2.3	Construction of ring road (from Chanh canal to National Highway 1)	- Segment 1 (existing road of 6m wide, 4.2km long and stone pavement): widening of the existing road to concrete asphalt of 14 m wide, sidewalk of 5 m wide along each side, total length of 4.2 km; - Segment 2 (the rest): construction of concrete asphalt road segment with a width of 14 m, sidewalk (5 m wide each side), length 1.8 km. - Construction of drainage system and manholes by RC pipe D600 along road sides, total length of 12 km. - Installation of lighting system, tree planting along sidewalk on both sides of the road with total length of 12 km.
2.4	Rehabilitation and upgrading of Luu Van Te road	- Upgrading of the existing road of 4 m wide to the concrete asphalt with a width of B = 7 m, sidewalk of 3.5m wide on both sides, total length of 1.85 km. - Construction of a drainage system and manholes by RC pipe D600 along road sides, total length of 3.7km - Installation of lighting system, tree growing along sidewalk on both sides of the road with total length of 3.7 km.
2.5	Construction of link between Tran Phong Sac and Nguyen Minh Duong roads	- Construction of a new concrete asphalt road with a width of 7m, sidewalk of 2.5m wide on both sides, total length of 0.5 km; construction 01 reinforced-concrete residential bridge across Cau Tre canal with 1 span, 7m wide and 10m long. - Construction of drainage system and manholes by RC pipe D600 along road sides, total length of 1km; - Installation of lighting system, tree planting along sidewalk on both sides of the road with total length of 1 km.
III	**Component 3**	**Resettlement sites**
3.1	Resettlement areas in ward 1 and ward 3	- Ground leveling from the existing depth of 0.6 m to the designed elevation of 2.2m with total area of 2 ha. - Construction of concrete asphalt road of 6-8m wide, sidewalk of 3-4 m wide on each side, with total length is 0.574 km.

		- Construction of drainage system by RC pipe D600, with a length of 0.995 km; wastewater drainage pipe UPVC D300, 0.562 km long; - Construction of water supply system for domestic activities by UPVC pipe D100, total length of 0.618 km. - Construction of a lighting system and tree planting along sidewalks with total length of 1.148 km.

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, embankment and other works behind the dyke (operation roads on both sides, drainage, lighting, trees). The construction measures for these works are presented as follows:

+ Site preparations

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

+ 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;
- Dredged material will be direct transported by truck to landfill;
- Construction of embankment as designed.

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

+ Construction of embankment and auxiliary works

Construction of embankment

- The pilling test

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

- The mass pilling

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

- Construction of embankment

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

Construction of the on-bank works

- Constructing drainage system and other underground structures
- Installating the embankment fence

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

1.3.4. List of Proposed Machineries and Equipment

The specific characteristics of construction activities depend on actual conditions (actual construction progress of each construction item, the budget, the capacity of contractors, weather conditions, etc.). Therefore, it is not possible to accurately determine the quantity of machines and equipment at this stage of sub-project preparation. The list of equipment and machineries can only be proposed with common basic vehicles, facilities and equipment to be mobilized as presented in Table 1.2.

Table 1.2. List of Machinery to be used in the Subproject

No	Equipment and machines	Component 1				Component 2						Component 3
		LIA 1	LIA 2	LIA 3	LIA 4	Ring road	Connecting road between Tran Phong Sac and Nguyen Minh Duong road	Luu Van Te road	Cau Tre canal	Embankment of Bao Dinh River	Connecting road of the embankment of Bao Dinh River	Resettlement area
1.	Single-bucket excavator, bucket capacity of 0.8m^3	1	1	1	1	3	2	5	3	5	2	3
2.	Dozer 108 CV	1	1	1	1	3	2	5	3	5	2	3
3.	Scraper 1.2m^3	-	-	-	-	3	-	-	-	-	-	-
4.	Auto-operated grader 108CV	1	1	1	1	2	1	4	2	4	1	2
5.	Excavator 2m^3	1	1	1	1	2	1	4	2	4	1	2
6.	Vibrating roller 10T	1	1	1	1	3	2	6	3	7	2	2
7.	Pneumatic-tyre tanpling roller 16T	-	-	-	-	2	2	3	3	3	2	2
8.	Water truck 5m^3	1	1	1	1	2	2	4	3	4	2	2
9.	Crane 130T	1	1	1	1	2	2	3	2	4	2	2
10.	Mortar mixing machine	4	4	4	4	4	3	6	6	6	3	7
11.	Water pump	1	1	1	1	3	2	3	3	3	2	2
12.	Asphalt concrete machine	-	-	-	-	2	1	3	3	3	1	2
13.	Pile compressor	-	-	-	-	-	-	1	1	1	-	2
14.	Generator	1	1	1	1	1	1	1	1	1	1	1
15.	Dump truck	2	2	2	2	5	3	6	6	8	3	6
16.	Steel cutting and bending machine	3	3	3	3	10	4	8	8	8	4	6
17.	Electric welder	3	3	3	3	10	2	6	6	6	2	5
18.	Welding transformer	1	1	1	1	4	2	2	2	2	2	4
19.	Rammer	5	5	5	5	5	4	6	5	6	4	5
20.	Concrete breaker	3	3	3	3	4	1	2	2	2	1	2

1.3.5. Demands for Raw Materials, Fuel and Disposal Sites

1.3.5.1. *Demand for raw materials*

❖ ***Quantity***

According to the feasibility study of the Tan An Subproject, the demands for materials, fuel during construction are shown as belows:

Table 1.3. Type and quantity of main raw materials

No	Work Items	Quantity					
		Cement (kg)	**Sand (m^3)**	**Stone1×2 (m^3)**	**Asphalt (kg)**	**Macadam type 1 (m^3)**	**Macadam type 2 (m^3)**
1	LIA 1	215041.392	294.895944	552.065328		552.096	
2	LIA 2	294931.737	404.4531715	757.163933		433.2096	
3	LIA 3	256322.16	351.50612	658.04344		658.08	
4	LIA 4	896426.46	1229.30997	2301.35214		2301.48	
5	Ring road		2540077.056	2089059.984	395217795.5	42768	59400
6	Tran Phong Sac road		76972.032	63304.848	11976296.83	1296	1800
7	Luu Van Te road		332262.6048	273265.9272	51697681.32	5594.4	7770
8	Cau Tre canal		95445.31968	78498.01152	14850608.07	1607.04	2232
9	Embankment of Bao Dinh River	2690541.36	3689.66052	6907.29624			
10	Connecting road of the embankment of Bao Dinh River		898.00704	73855.656	13972346.3	1512	2100
11	Resettlement area		96215.04	79131.06	14970371.04		
Total		**4353263.1**	**3147839.9**	**2668291.4**	**502685099**	**56722.3**	**73302**

❖ ***Supply sources***

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. Detail information on material sources is described as follows:

- Ballast, macadam, ashlars can be provided by mines in Dong Nai and An Giang provinces;
- Hollow, solid and pavement bricks and glazed tiles can be bought in Ho Chi Minh City and Tan An City;
- Asphalt concrete can be used from batching plants in Long An;
- Geo-textile, asphalt can be imported or bought in Ho Chi Minh City;
- Cement for construction is produced by domestic certified factories, and can be bought in Tan An city;
- Steels are domestic or imported types and can be bought in Tan An City.

Table 1.4. Location and Distance of Material Supply Sources

No	Indicators	Type of mines		
		Quarry	**Sand pit**	**Soil bank**
1	Distance to the Subproject area	Dong Nai, An Giang province	Tan Chau town (An Giang province)	Near construction line
2	Quality of material sources	Usable	Usable	Usable
3	Availability	2,000m^3 – 5,000m^3	2,000m^3 – 5,000m^3	2,000m^3– 5,000m^3
4	Transport line	Waterway	Waterway	Road
5	Environmental licenses	Licensed	Licensed	Licensed

1.3.5.2. ***Fuels demand***

❖ ***Power supply***

- The construction unit will work with electricity management authorities in the city to make agreement on power supply used for daily activities on site and during construction. This power supply will be taken from the city general source through its own connection points to the site and construction areas. In case of any difficulty, generators can be equipped on site.

❖ ***Water supply***

- Water used for construction and daily life must be examined and tested on criteria according to current standards. Construction unit will negotiate with functional agencies to agree on water supply for construction and daily activities. In addition, domestic water can also be purchased with tanks for daily activities on site.

For daily activities of construction workers: The volume of domestic water used daily is based on water norms applicable to construction workers on site in compliance with specification 20TCN 4474 TC - 87 "water norm for meal preparation" is 25 liters/person/day and specification 20TCN33 TC – 85 "water norm for bathing and washing" is 45 liters/person/ day.

1.3.5.3. ***Waste disposal sites***

Tan An has a disposal site located 17 km up north of the city, covering 336,051 m^2 and being located at Tan Dong commune, Thanh Hoa district. Waste collected daily of about 50 tons from wards of Tan An and the surrounding areas, including ward 1, ward 2, ward 3, ward 4, ward 5, ward 6, Tan Khanh ward, Khanh Hau ward, Loi Binh Nhon, Binh Tam commune, Huong Phu Tho commune, An Vinh Ngai commune, My An commune and My Phu commune of Thu Thua district. The actual amount of waste collection and treatment currently is much smaller than the design capacity of the facility of 400 tons of waste a day. Waste generated from the construction work of the sub-project will be transported to and treaed in this facility. Detailed due dilligence of the disposal site is provided in Annex 2

1.3.6. **Area of Influence**

In the course of ESIA preparation, the identification of the affected area plays an important role. With construction of technical infrastructure, roads, development of traffic systems in the city, improvement of canal and channel systems, urban embellishment, improvement of drainage conditions and environmental hygiene, resettlement relocation of LIAs will bring direct benefits to residents in project area. There are about 35,000 direct beneficiaries from the project, who benefit from the sub-project activities viz. upgrading infrastructure in low-income areas, improving environmental hygiene conditions, transportation, drainage capability of the system in Bao Dinh River, Rot canal, Cau Tre canal in wards 1, 2, 3, 4, 6, 7, Khanh Hau and Loi Binh Nhon commune.

The project not only brings benefits to residents in the project area, but also contributes to promote socio-economic development in Tan An City in particular and Long An province in general. As estimated, there are about 186,612 indirect beneficiaries from project effectiveness in Tan An

City. Besides positive project impacts, project affected areas also have other negative ones on sensitive areas such as residential areas, schools, hospitals and traffic systems defined in 500m radius from implementation scope of components 1, 2 and 3.

In addition, other affected areas such as waste treatment area in Tan Dong commune, Thanh Hoa district, about 17 km far away from Tan An city towards the North. Waste will be transported along National Highway No.62: Materials will be loaded and transported from the suppliers through provincial road No.827B to the site.

Figure 1.4. Project affected areas of material transportation and waste discharge as expected

1.4. Organization of the Subproject

The project owner, with support from the Steering Committee, will be the focal contact between the donors and Central Ministries and Departments, local authorities and contractors to provide coordination during project implementation.

For the project implementation, the assigned roles among the executive agencies, project owner, PMU, contractors, donor and shareholders are as follows:

- The Government of Vietnam, related central Ministries and Departments;
- Executive agency: Long An Provincial People's Committee
- Project Owner: Tan An City People's Committee
- Donor: World Bank (WB)

1.4.1. Human resource and implementation management

❖ *Government of Vietnam and World Bank*

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

People's Committee of Long An 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 Tan An Province.

Sub-project owner - People's Committee of Tan An City

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

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

1.4.2. **Investment and Subproject Implementation Schedule**

Investment fund

Total investment is 47,177,554 USD, in which:

- WB fund: 35,205,393 USD, accounting for 75%.
- Counterpart fund: 11,972,162 USD, accounting for 25%.

(1 USD = 22.320 VND).

Implementation Schedule

Project execution schedule is shown in the following table.

Table 1.5. Subproject Implementation Schedule

No.	Items	Completion date
1	Preparation of project proposal	4/2016
2	Prime Minister's approval for the project proposal	10/2016
3	Prime Minister's approval of investment policy (approval of project portfolio)	12/2016
4	Completion of draft of FS, detailed design and component reports	01/2017
5	Pre-appraisal of the World Bank	01/2017
6	Completion of FS, detailed design, component reports following results of pre-appraisal	01/2017
7	Final appraisal of the World Bank	2/2017
8	Approval of FS and component reports	2/2017
9	Agreement negotiation and sign of agreement	3-4/2017
10	Approval detailed design, total estimate of bidding document for 30% working volume (phase 1)	6 – 9/2017
11	Construction of 30% working volume (phase 1)	10/2017 – 4/2019
12	Completion and put the work into use (phase 1)	5/2019
13	Approval detailed design, total estimate of bidding document for 70% working volume (phase 2)	10/2018 – 4/2019
14	Construction of 70% working volume (phase 2)	5/2019 - 12/2021
15	Completion and put the work into use (phase 2)	01/2022

1.5. METHODS FOR ESIA PREPARATION

1.5.1. Methods for environmental impact assessment

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 Tan An 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.
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.

1.5.2. **Objectives and methods of Socio-econimc survey (SES)**

The objective of the SES is to establish the baseline data on the socio- economic status of project area, to analysis and establish the project policies of compensation, assistance and resettlement. It will also be used to design the IRP for the severely AHs in order to restore their income. The baseline data will also be used as reference for the monitoring and evaluating the project objectives and RP implementation.

The Socio – Economic data includes information on population size, religion, education, employment, income and expenditure of PAPs. The data also cover means of production and recreation of AHs, capacity of access to social and physical infrastructure services, environmental conditions, status of flooding and waterborne diseases.

The SES used a structured household questionnaire method to gather the data (Appendix 1). The SES was conducted at the same time with IOL survey from July to August of 2016. The sample proportion for SES and IOL consists of (i) 100% of the PAHs for IOL; (ii) 100% of the severely AHs and relocated households and 10 % of the other PAHs for SES.

According to the initial design, the scope of the project affected land including 8 wards/communes of Tan An City. The number of PAHs selected for SES is summarized in Table 1.6.

Table 1.6. Number of Surveyed in the project area

No	Ward	No of AHs	SES		
			Samples size	Populations	Average populations
1	Ward 1	85	30	114	3.80
2	Ward 2	30	17	74	4.35
3	Ward 3	89	32	109	3.41
4	Ward 4	241	102	400	3.92
5	Ward 6	169	62	213	3.44
6	Ward 7	33	16	56	3.50
7	Khanh Hau	113	43	137	3.19
8	Loi Binh Nhon	139	64	249	3.89
Total		**899**	**366**	**1,352**	**3.69**

Source: *Survey data SA of Tan An city. 2016*

CHAPTER 2. NATURAL ENVIRONMENT AND SOCIO-ECONOMIC CONDITION THE SUBPROJECT AREA

2.1. NATURAL CONDITIONS

2.1.1. Geographical and Topographic conditions

2.1.1.1. *Geographical location*

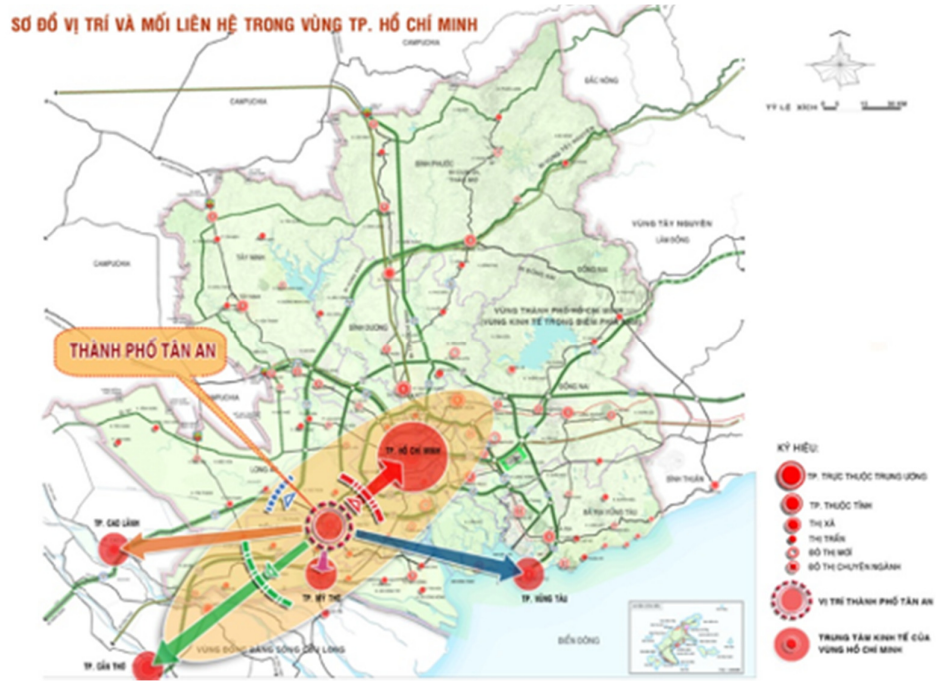


Figure 2.1. Location of Tan An City

Tan An City is the key economic area of the Southern zone, and is also the gateway to the Mekong Delta region, with geographical coordinates from 106°21′ to 106°27′East longitude and from 10°20′ to 10°00′North latitude. The city is located along the National Highway 1A and intersecting Vam Co Tay River with the distances to neighboring and adjacent areas as follows:

To HCM City: 47 Km along NH 1A, to the Southwest
To Can Tho: 122 Km along NH 1A
To My Tho: 25 Km along NH 1A
The North is adjacent to Thu Thua District.
The South is adjacent to Chau Thanh District.
The East is adjacent to Tan Tru District.
The West is is adjacent to Chau Thanh District, Tien Giang Province

The area of Tan An City: 81.9494 km2 (8,194.94 ha). In which: Urban land 3,916 hectares; Suburban land is 4,278.94 hectares

Tan An City has14 administrative units: including 9 wards, 5 communes,in which:

- Urban areas: Ward 1, Ward 2, Ward 3, Ward 4, Ward 5, Ward 6, Ward 7, Khanh Hau Ward, Tan Khanh Ward;
- Suburban areas: Huong Tho Phu Commune, An Vinh Ngai Commune, Loi Binh Nhon Commune, Binh Tam Commune, Nhon Thanh Trung Commune.

The City is linked to the favorable areas with traffic infrastructure, namely river ports, Binh Hiep international border gate which is near Tan Son Nhat International Airport, located in the important economic corridor as HCM city highway - Can Tho, National Highway 1A, Highway 50 , Highway 62, Highway N2, the national waterway linking HCM City with the Mekong Delta through Long An. In the future, HCM City - Can Tho railway, Belt 2, 3 in HCM City, N1 street, Long Thanh international airport ... are available.

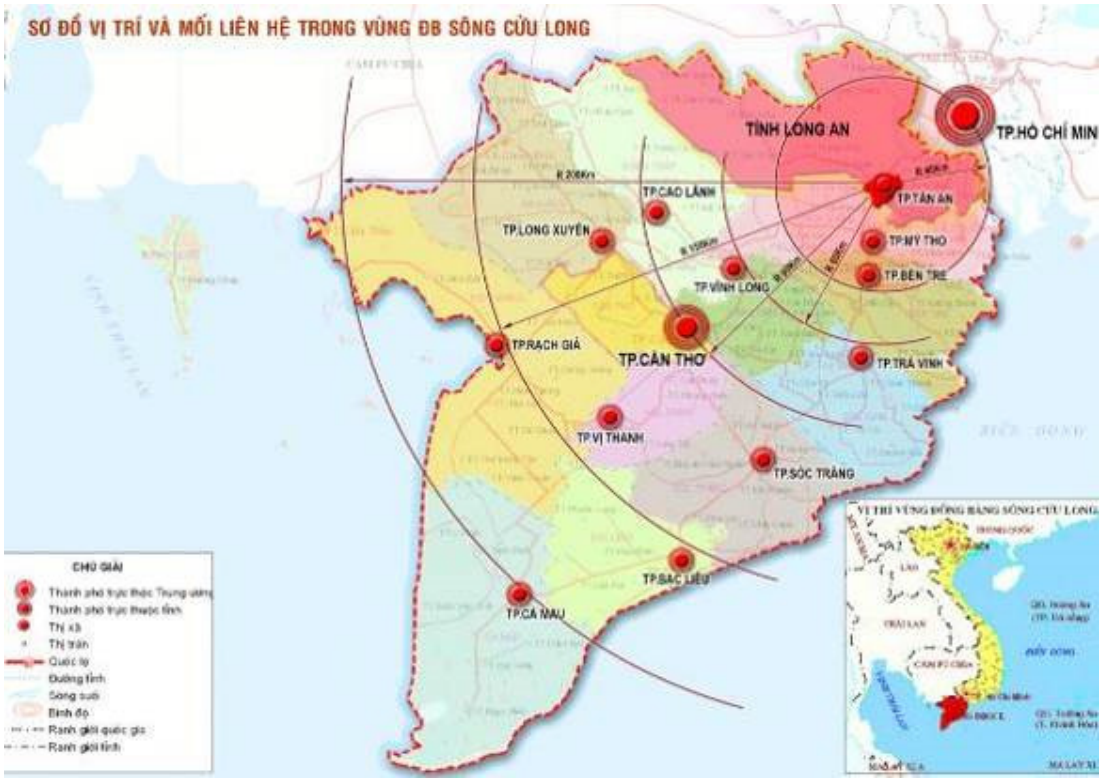


Figure 2.2. Location of Tan An in the Mekong Delta Region

2.1.1.2. ***Topography, geomorphology***

The topography of Tan An city shows the same characteristics as the Mekong Delta region. The terrain is enriched continuously and regularly, which forms the flat and horizontal plain. The absolute height changes from 0.5 – 2m (Mui Nai System) with average height is 1 -1.6 m https://vi.wikipedia.org/wiki/T%C3%A2n_An - cite_note-MS-1.

Most of the existing residential area does not suffer from flooding, scattered with low sites along river banks and canals flooded in the rainy season. However, in general, the City's terrain is relatively low and vulnerable to flooding from high tides or the floods from the Plain of Reeds. Most of the high terrain is located in the existing center and along NH 1A, lower toward the West and South; some of the low-lying areas are located along the Vam Co Tay River.

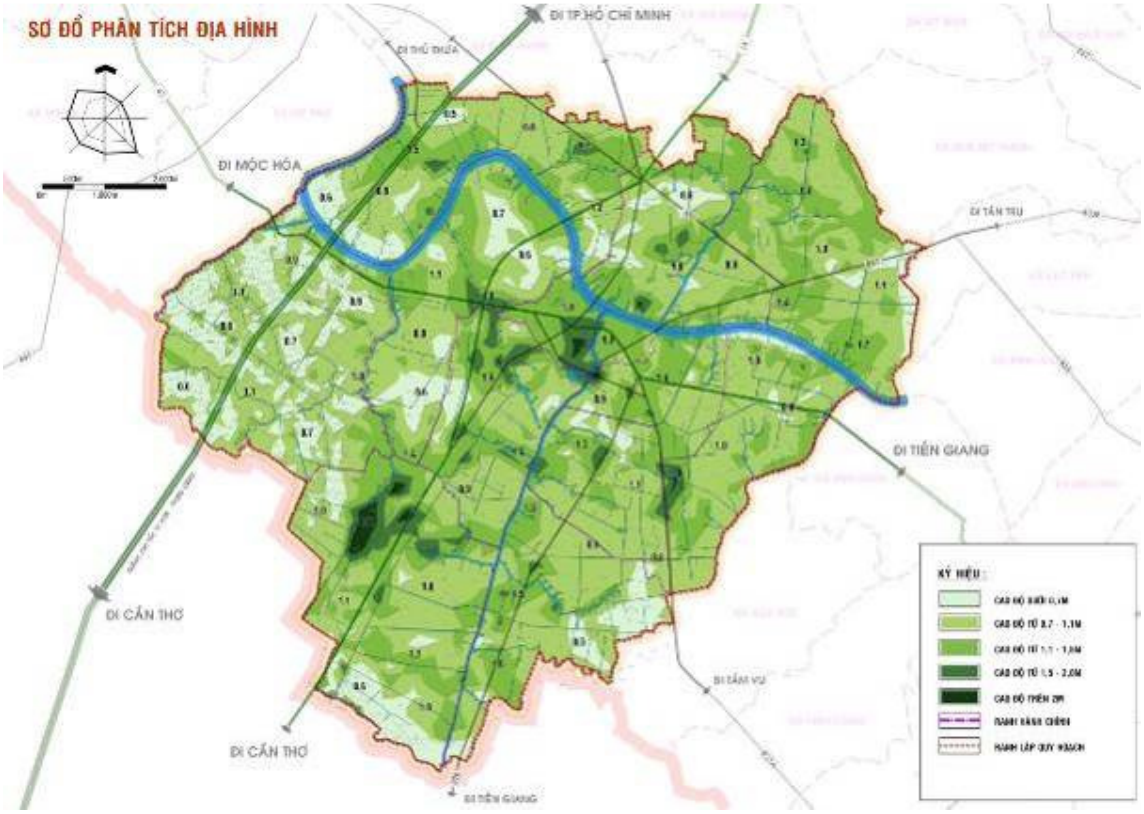


Figure 2.3. Map of Tan An City's terrain

2.1.2. **Climatic and Hydrological Conditions**

2.1.2.1. ***Climatic conditions***

The climate conditions of Tan An city generally features the equatorial monsoon climate regime in the Mekong Delta region. There are 2 distinct seasons –the rainy season from May to November and the dry season from December to April.

❖ **Temperature**

The average annual temperature averages around 26.4°C, with the difference in temperature between the hottest month and the coldest month at 3.5 ^{0}C. The highest temperature is around 28°C, and the lowest temperature is around 24.5^{0}C.

❖ **Rainfall**

The rainfall regime is seasonally distinct. The rainy season accounts for 90 % of the annual rainfall, while rainfall is very low in the dry season (December to April) amounting for below 19 mm per month. Total rainfall in 2015 measured at Tan An City monitoring station is 1,510mm. Average rainfall is 125.9 mm per month.

❖ **Humidity**

Humidity changes according to seasons, with monthly-average humidity at 83.8% in dry season (ranging from 82.2% to 84.8%). In the rainy season, humidity is around 88.9 %. Average annual humidity in Tan An city is above 85% (ranging from 85.8 – 87.3%).

❖ **Sunshine hours**

The annual average number of sunny hours is 2,357 (10 per day). The monthly average number of sunny hours is 196.4, in which, the highest number of sunny hours is March (284.0 hours), and the lowest number of sunny hours is in December (152.0 hours) (Tan An Bureau of Statistics, 2015)

❖ **Wind**

Every year, there are two main types of wind that affects the climate of Long An province as well as Tan An city. Winds from the Northeast monsoon (November to April) is cold and dry. During the Southwest monsoon (May to October), winds fromte sea carry water vapur. The average annual wind speed is 2.8 m/s.

2.1.2.2. ***Hydrological Conditions***

River and canals systems in Tan An City are interlaced, which are characteristic of the Mekong River Delta region, and is influenced by semidiurnal tide from the South China Sea, peak tidal amplitude in the month from 117- 135cm, the maximum tidal peak in December is 150cm, a tidal cycle is about 13-14 days.

- Vam Co Tay River flows through Long An from the Northwest - Southeast. The section flowing through Tan An is 15.8km long, with average depth of 15m. Water is usually from the Tien River to Hong Ngu channel and Cai Co channel.

- Bao Dinh Canal : From Vam Co Tay river to Tien River in My Tho City. The section flowing through the city of Tan An is 8 km long.

- Chanh Canal: From Nguyen Tiep Channel to Vam Co Tay River: The section flowing through the city of Tan An is 2.85 km long.

- Chau Phe Canal: From Vam Co Tay River to Cai Tau canal, Nhat Tao River. The section flowing through the city of Tan An is 4.15 km long.

- Also, Binh Tam Canal (4.1km), Can Dot Canal (4.7km).

In general, water sources from rivers and canals are plentiful. However, water quality in the channels and canals in Tan An City is often saline, alkaline and increasingly polluted from waste. Water from Tien River through the Hong Ngu channel, and Cai Co channel currently meets only part of water demand for production and daily use. Improvement of water quality will help address water demand not only for the city of Tan An but also for 5 districts of Plain of Reeds.

An important surface water source for Tan An city is rainwater. A rainfall of 1,200 – 1,600mm per year is added to important water sources for living activities, especially in areas affected by acidity and salinity. However, the use of rainwater requires measures to build water storage facilities.

❖ **<u>Hydrological influence of Vam Co River:</u>**

Vam Co River system comprises of 2 main tributaries namely Vam Co Dong River and Vam Co Tay River. These two rivers originate from Cambodia, running through Vietnam and merging at Can Duoc before flowing out to the East Sea through Soai Rap estuary.

Most of Vam Co river is located in Long An province, the section of 42 km from Tra river (a branch of Vam Co River) to Soai Rap estuary is part of natural border between Tien Giang and Long An provinces. This section and branch of Vam Co Tay (133 km long) have effects on Go Cong area and the North of Tan Phuoc, Chau Thanh, Cai Lay and Cai Be province.

In flood season, water flows from Tien River to Plain of Reeds, then discharges to the East Sea through Vam Co Tay; however, discharging capacity of the river is not high due to it has so many windings.

In dry season, Vam Co is completedly affected by semidiurnal tide of the East Sea and saline intrusion, can penetrate deeply into inland. Vam Co river has the following features:

- Average water surface slope: i = 1.3 x 10-5.

- Largest average flow in Tan An in 1961: 1173 m^3/s.

- Maximum flow in Tan An: 2224 m³/s.

- Average flow rate: 1 m/s.

Like Tien River, water level of tide peark in Vam Co Tay river is usually lower in June, July, and highest in October, November of each year. The highest level measured in Tan An is + 1.78m dated 17/10/1978 and the lowest water level is 1,84m dated 07/8/1964.

Table 2.1. Monthly-average water level in My Tho and Tan An

Location	Water level (cm)	Month						
		6	**7**	**8**	**9**	**10**	**11**	**12**
Mỹ Tho (Tien River)	Hmaxbq	120	114	129	148	160	167	153
	Hminbq	-186	-172	-161	-129	-107	-96	-115
Tan An (Vam Co Tay River)	Hmaxbq	96	93	98	119	128	133	127
	Hminbq	-176	-173	-176	-134	-83	-60	-86

Remarks: Hmaxbp: Average water level of tide peak
Hminbq: Average water level of low tide

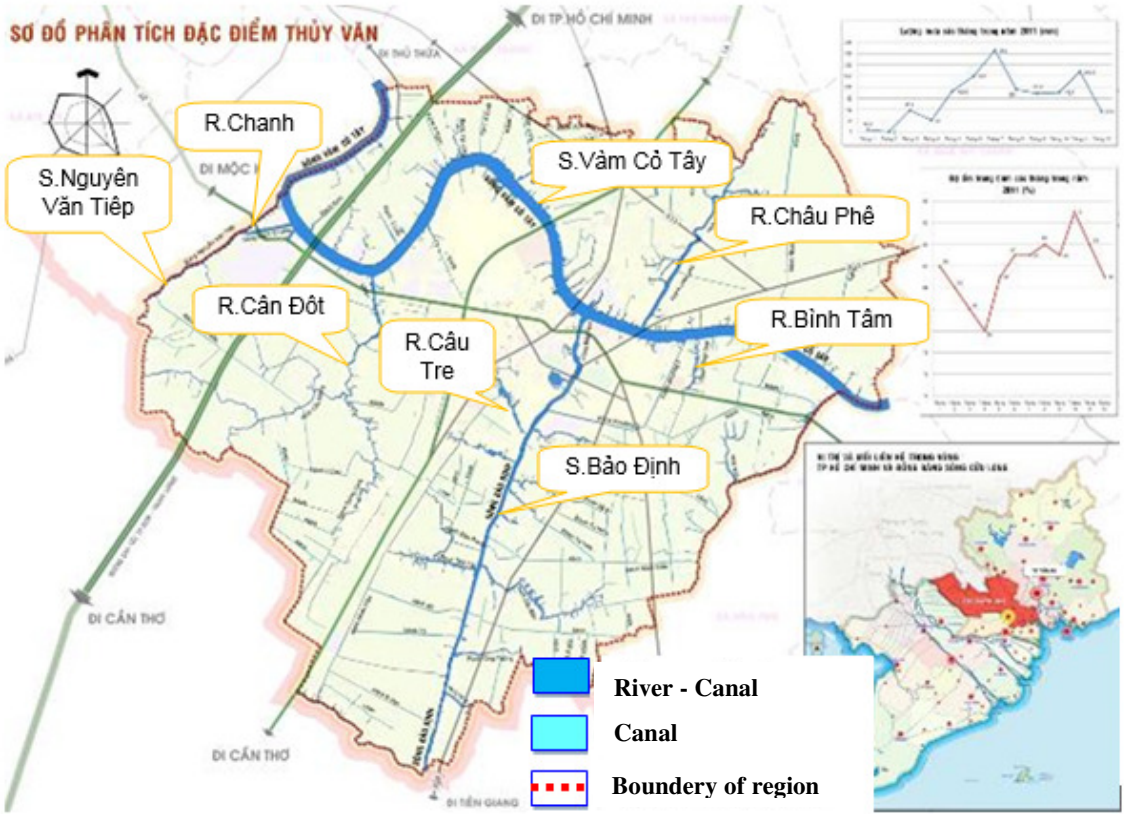


Figure 2.4. Map of hydrological conditions

2.1.2.3. ***Salinization, alkalinity, flooding***

❖ **Salinization**

In flood season, Vam Co Tay River is both influenced by tide and by floods in the Plain of Reeds. In dry season from February to June, Vam Co Tay River water is salinized with, the highest salinity level in May is 5,489 g/liter while, salinity level in January is 0.079 g/liter, pH of Vam Co Tay River Water from June to August is about 3.8 to 4.3, so it cannot be used for agriculture production and domestic usages.

❖ **Alkalinity**

Every year from in May, pH increases from 4 to 4.3 and gradually decreases in July with the advent of the flooding season. Vam Co Tay River's water pH is as follows:

Table 2.2. Vam Co Tay River's water pH

Month	6	7	8
pH	4.3	4.1	3.8

(According to data of Long An Water Resource Department)

Therefore, it is impossible to use Vam Co Tay River to supply water to the City.

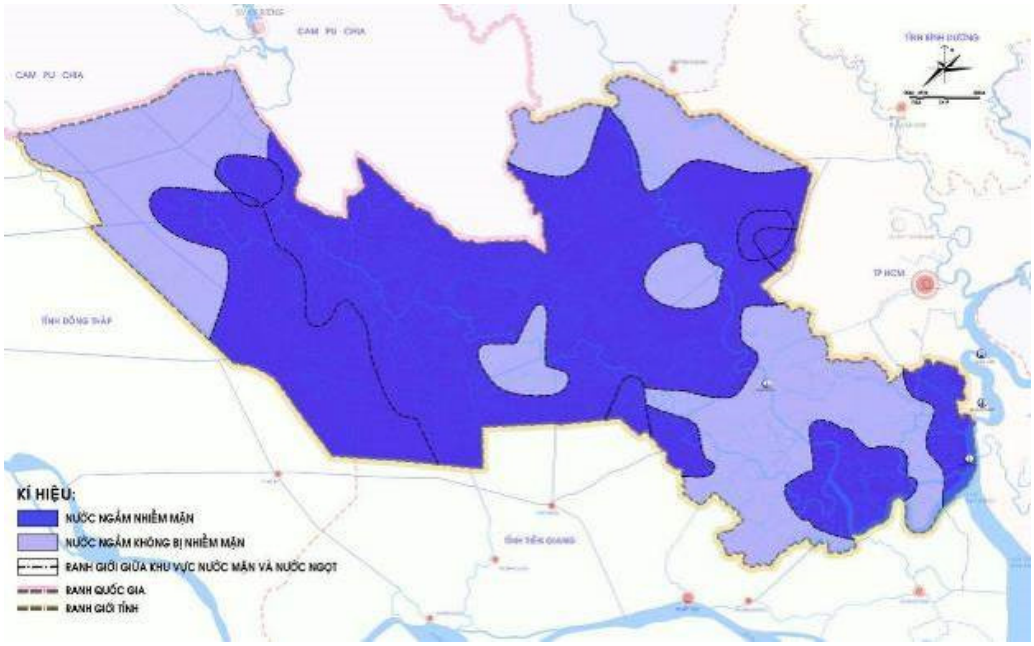


Figure 2.5. Analysis map of underground water's salinization in Long An province

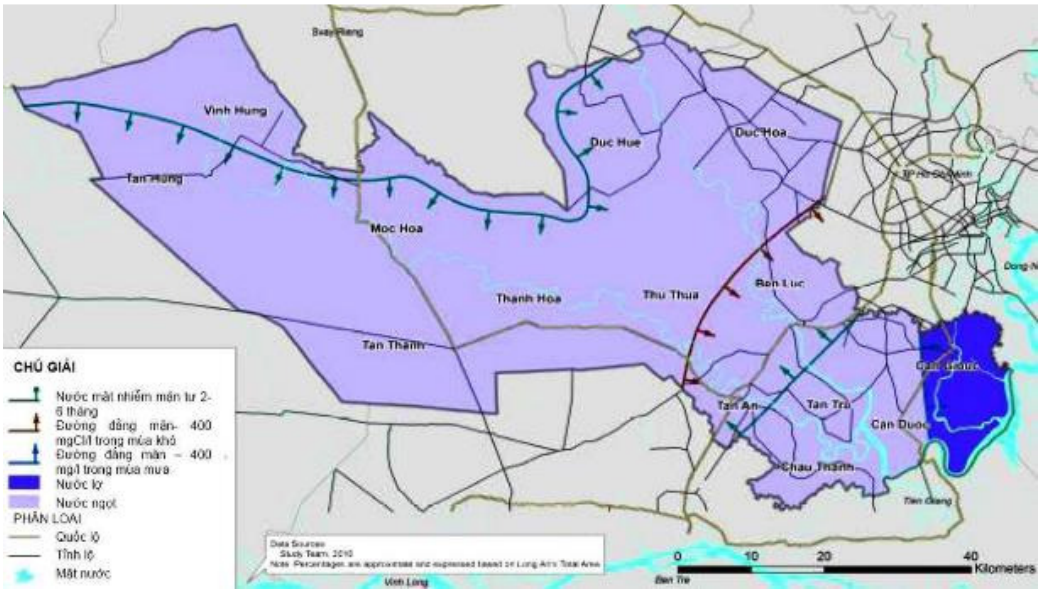


Figure 2.6. Analysis map of intrusion of salinized surface water in rainy season

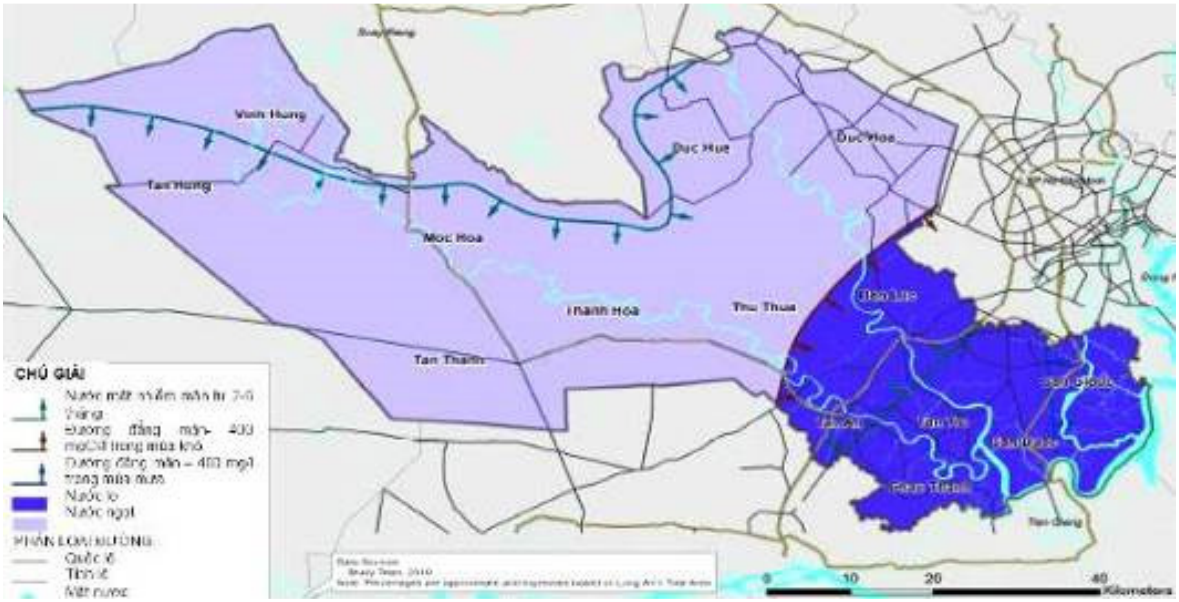


Figure 2.7. Analysis map of intrusion of salinized surface water in dry season

❖ **Flooding**

Currently, in the inner city, local inundation occurs as a result of the combination of heavy rain and high tides and under capacity of the drainage in some areas, especially in the market area in ward 1. Sewage system was built mainly before 1975, being lack of maintenance. The system functions poorly to heavy rain events. In recent years, the city has upgraded roads such as Nguyen Dinh Chieu, Truong Dinh, CMT8, but have not replaced deteriorating sewage and drainage systems.

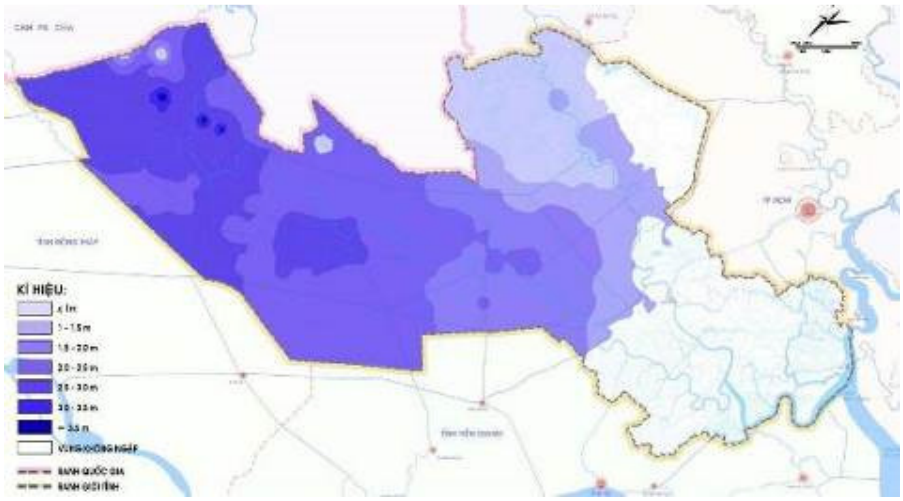


Figure 2.8. Analysis map of flooded area

2.1.3. **Natural Resources**

2.1.3.1. ***Water Resources***

i. Surface water:

Surface water resources are quite rich in Long An. Vam Co Tay river flows through Tan An with 15.8 km long and an average of 15 m deep. Water source is mainly taken from Tien River through Hong Ngu and Cai Co channels. Bao Dinh Canal from Vam Co Tay river links with Tien River in My Tho City and also with Chanh, Chau Phe, Binh Tam, Can Dot canals. In general, surface water source is not suitable for production and daily life due to its saline, alkaline contamination

in dry season. A rainfall of 1200-1600 mm per year is an important supplementationto surface water source.

***ii. Groundwater**:*

Groundwater quality in Tan An is considered quite good and suitable for daily needs. Results of groundwater sampling in the City show that pH ranges from 5.3 to 7.8, organic content reaches 8 - 200 mg/l, and total iron content from 1.28 – 41.8mg/liter. Survey and results from the Geological and Hydrological Federation No. 8 estimates that ground water reserve of Tan An City is above a 133,000m3 per day. In Khanh Hau ward of Tan An City, a mineral water mine at a depth of 400m is being exploited by Vietnam Mineral Water Joint Venture Company for LaVie bottled water. Lavie mineral water is assessed to meet international standards, but continuous research is required to monitor levels of abstraction, and to protect water quality.

2.1.3.2. ***Forest***

Long An Province has 3 types of forests: production forest, special-use forest and protection forest. In 2014, the forest area of the province was estimated at 25,736 hectares, including 2,075.83 hectares of protection forest, 2,094.5 hectares of special-use forest; 21,565.7 hectares of production forest. Forest area above 1000 hectares is found in the districts of Thanh Hoa, Duc Hue, Tan Hung and Tan Thanh, Moc Hoa, Thu Thua, Kien Tuong town. Tan An City and districts of Chau Thanh, Tan Tru and Can Giuoc have no forests; the remaining districts have forest area under 500 hectares each. In recent years, the forest area has tended to decrease as melaleuca forests are of low economic value, causing farmers have switched to other crops.

2.1.3.3. ***Land and soil resources***

Land and soil quality in Tan An City changes according to the terrain. Approximately 86.13% of the land comprises of alluvial soils and under significant cultivation; while other areas have alkaline soils. There are 5 main categories of land and soil conditions, as follows:

- Alluvial soil with organic-rich surface covers 284.43 hectares, accounting for 3.47% of the total land area, and scattered on medium to slightly higher terrain in Khanh Hau Ward and An Vinh Ngai Commune. The soil is suitable for diverse cropping.
- Alluvial soil which is deep, typical, and saturated by groundwater covers 4507.72 hectares, and accounts for 55.02% of the land area. Soil deriving from new alluvial material, freshwater deposits with high terrain is distributed into large areas across the City. The soil is suitable for diverse cropping.
- Alluvial soil which is deep and of groundwater saturation is 1,994.09 hectares, accounting for 24.34% of the natural area. Samples are new alluvial deposits, formed and developed in freshwater environments, distributed over high terrain, scattered in the city.
- Potential alkaline soil covers 267.43 hectares, and accounts for 3.26% of the total land area. It is distributed over medium terrain in Loi Binh Nhon commune, Huong Phu Tho commune and along the Vam Co Tay River.
- Active alkaline soil covers 152.19 hectares, and accounts for 1.86% of the total land area, distributed in Phu Tho commune center, with low average terrain as compared its surrounding.

2.1.3.4. ***Cultural resources***

Long An Province is rich in cultural resources through its development history, particularly the Oc Eo ancient culture and ancient culture of the early Vietnamese explorers in this region. Although not large in scale, Tan An city is famous for its uniqueness in landscapes, style of living and represents a convergence of art culture with a rich ethnic identity. It is also home to many cultural and historical sites such as Nguyen Huynh Duc Mausoleum, Tong Than Housing, Khanh Hau Temple, Minh Xuan Duong Pharmacies, Xuan Sanh Temple and nearly 100 temples and pagodas, shrines.

Tan An city is in the process of industrialization and modernization, aligning with the renovation of the country and province, and focuses on using resources more efficiently, especially land resources, for the purpose of socioeconomic development and national security.

2.1.3.5. ***Landscape resources***

Tan An city has main rivers such as Vam Co Tay River, Bao Dinh River and rich canal system forming characteristic landscape of Southern Rivers. In urban areas, there are areas of agricultural production creating landscapes for urban ecology as planting flowers and crops ...

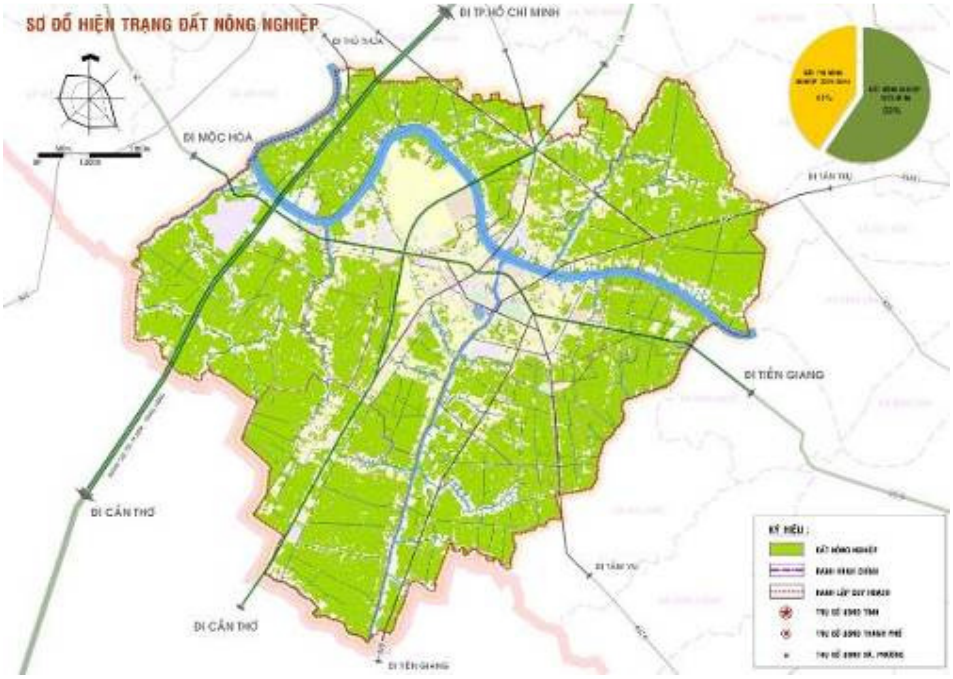


Figure 2.9. Map for current status of natural landscape

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 analysis in accordance with Vietnamese standards.

Table 2.3. Quantity of Samples in the Subproject

No	Survey sample	Quantity	Analysis Parameters
1	Ambient air quality	20	Dust, noise, vibration, CO, NO_2, SO_2.
2	Surface water quality	20	pH, DO, BOD_5, COD, TSS, $N\text{-}NH_4^+$, $N\text{-}NO_2^-$, $N\text{-}NO_3^-$, $P\text{-}PO_4^{3-}$, Cl^-, Fe, Coliform, Surfactants, Ecoli.
3	Sludge and sediment quality	9	As, Zn, Cu, Cd, Pb, Total Hydrocarbon, Chlorinated Pesticides, Phosphorus-based Pesticides
4	Groundwater quality	4	pH, temporary hardness, total suspended solids (TSS), COD, ammonia (fine under N), chloride, nitrite ($N\text{-}NO_2^-$), nitrate ($N\text{-}NO_3^-$), sulphate, Cyanide, As, Cd, Pb, Cu, Zn, Mn, Cr, Fe, *E.coli*, Coliform.

No	Survey sample	Quantity	Analysis Parameters
5	Soil quality	6	Pb, As, Zn, Cu, Cd.
6	Aquatic samples	5	Qualitative, quantitative

Methods of measurements, sampling, storage, transportation, handling and analysing samples in the laboratories are complied with current Vietnam standards.

2.2.1. **Air Quality**

Date of sampling: September 26 and 27, 2016

Weather conditions: Sunny, slightly windy, temperature 27-30^{0}C. Humidity: 60-80%.

Table 2.4. Results of Ambient Air Quality

No	Symbol	Item	Location of sampling	Indicators of measurement and analysis					
				Dust(*)	NO_2(*)	SO_2(*)	CO	Noise(*)	Vibration
				µg/m^3	µg/m^3	µg/m^3	µg/m^3	dBA	(dB)
1	KK1	LIA 1	Alley near Thu Khoa Huan Street - Ward 1	85	33	57	950	61.9	40.1
2	KK2		Beginning point of allye on Nguyen Cong Trung Street	97	49	69	1138	63	41.7
3	KK3	LIA 2	On Hoang Hoa Tham Street	90	42	61	1570	67	42
4	KK4	LIA 3	Alley across National Road 1	92	40	50	860	59.7	41
5	KK5	LIA 4	Intersection point with Nguyen Thi Bay Street near Seafood Factory	105	42	47	1320	68	42.3
6	KK6		In the area of Rot canal (Area in the middle section of Rot canal)	82	30	35	430	51	21.1
7	KK7	LIA 3	In the area of Cau Tre canal (Section under Lia 3 - Binh Cu Street Zone 1 & 2 - Ward 4) near Le Quy Don High School	80	27	33	387	67	27.5
8	KK8	Renovation of Cau Tre canal	In the area of Cau Tre canal (intersection with Nguyen Cuu Van Street – Binh Yen Dong street zone 1&2 – Ward 4)	84	25	57	980	66	28
9	KK9	Construction of extended Tran Phong Sac Street	In the area of Tran Phong Sac Street	87	22	40	670	52	18
10	KK10		In the area of Nguyen Minh Duong Street	86	17	45	890	64	27.9
11	KK11	Construction of Luu Van Te street	In the area of Luu Van Te Street for the section across National Road 1	94	37	57	1200	67	39.8
12	KK12		In the area of Luu Van Te near Thien Khanh pagoda	84	18	32	570	54	21.1
13	KK13	Make embankment and park on two banks of Bao Dinh river	In the area of embanment, park and roads on two banks of Bao Dinh river on the side of Nguyen Cuu Van street under ward 4 near Hung Vuong Street	87	22	60	1200	67	37.9

No	Symbol	Item	Location of sampling	Indicators of measurement and analysis					
				Dust(*)	NO_2(*)	SO_2(*)	CO	Noise(*)	Vibration
				µg/m³	µg/m³	µg/m³	µg/m³	dBA	(dB)
14	KK14		In the area of embanment, park and roads on two banks of Bao Dinh river on the side of Huynh Van Nhut street near Thien Chau pagoda under ward 3	91	23	53	1170	59	27.8
15	KK15	Road under ward 7	In the area of connecting road of embankment of Bao Dinh river (a section from ring road culvert to the boundary line of ward 7) near Long Chau pagoa under ward 7	93	21	22	580	38	19.8
16	KK16	Construction of ring road.	In the area of Mang bridge under Loi Binh Nhon commune	86	18	34	540	50	20
17	KK17		In the area of overpass No 7 under Loi Binh ward	94	27	69	890	52	27.9
18	KK18		In the area of ring road for section 1 (under Loi Binh Nhon commune) near Chanh canal	72	20	25	630	41	25.7
19	KK19		In the area of ring road for section 2 (under Khanh Hau ward) intersectioning with National road 1	94	28	50	1480	62	40.1
20	KK20	Resettlement area	In the resettlement site near Nguyen Dinh Chieu street	90	35	64	1320	67	41.7
QCVN 05:2013/BTNMT (1hour)- National technical regulation on ambient air quality				**300**	**200**	**350**	**30.000**	**-**	**-**
QCVN 26:2010/BNTNMT- National technical regulation on noise				**-**	**-**	**-**	**-**	**70**	**-**
QCVN 27:2010/BNTNMT- National technical regulation on noise				**-**	**-**	**-**	**-**	**-**	**75**

Note: Results of measurement and testing are valid at the time of measurement and on samples

Comments: The results of the tests were within the limits allowed by national standards on ambient air quality (QCVN 05:2013/BTNMT, medium 1h), on noise (QCVN 26:2010/BTNMT) and vibration (QCVN 27:2010/BNTNMT). However, there are some specific characteristics cause differences in measurement values at the position, especially dust indicators:

- At KK1, KK3, KK6 - KK10, KK12, KK13, KK16, KK18, KK20 (type 1): Dust content at the positions is from 72 – 90µg/m³.

- At KK2, KK4, KK11, KK14, KK15, KK17, KK19 (type 2): Dust content is from 91 – 97µg/m³ higher than positions in type 1.These positions locates in alleys intersecting with main transport routes of the city with high transport flows in combination with poor quality of road surface, the dust content is higher. Especially, at KK5 where borders the Long An sea food processing factory in combination with higher flow of vehicles over positions, the dust content highly outstanding. However, the content of pollutants is within allowable limit of the national standard about environment.

The results of environmental monitoring in project area has similarities compared to the results of monitoring of air pollution in areas affected by activities carried out on traffic in Tan An city in 2015. Air quality in the area quite well and are within the permitted limits of the parameters to be

monitored, such as noise, CO, SO^2, NO_x (Noise ranged from 57-74 dBA; dust oscillations from 37 to 131 µg/m^3, CO ranged from 738 to 2778µg/m^3, SO_2 ranged from 36 to 69µg/m^3). *Source: Environmental Monitoring Report 2015 Tan An City.*

2.2.2. **Water Quality**

2.2.2.1. ***Surface water***

Table 2.5. Parameters of Surface Water Quality

No	Symbol	Time of sampling	Indicators of measurement and analysis													
			pH	**DO**	**TSS (*)**	**COD** (*)	**BOD_5 (*)**	**P-PO_4^{3-} (*)**	**N-NH_4^+** (*)	**N-NO_2^-** (*)	**N-NO_3^-**	**Cl^-**	**Fe**	**Surfactant**	**Total Coliform**	**Grease content**
			-	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	MPN/100ml	mg/l
1	NM1		7,41	5,4	40	27	**16,2**	0,08	0,29	0,012	0,12	78	0,08	0,11	$1,2x10^3$	0,7
2	NM2		7,52	4,1	**87**	**32**	**19,2**	0,28	**1,67**	0,008	0,22	85	0,15	0,21	$3,2x10^3$	0,8
3	NM3		7,22	**3,5**	**82**	29,6	14,8	**0,31**	**1,85**	0,004	0,18	83	0,12	0,17	$2,8x10^3$	0,65
4	NM4		7,75	**3,05**	**95**	**57**	**34,8**	**0,324**	**2,86**	0,021	0,28	117	0,17	**0,45**	$4,8x10^3$	1,1
5	NM5	High tide	7,27	4,18	**85**	**47**	**23,1**	0,115	**1,57**	0,011	0,11	102	0,11	0,34	$3,5x10^3$	0,78
	NM6	Low tide	6,84	4,01	**87**	**44**	**22,1**	0,275	**1,02**	0,008	0,08	98	0,12	0,25	$2,7x10^3$	0,67
6	NM7		7,32	4,25	**65**	**34**	17,2	0,182	**2,19**	0,004	0,12	93	0,15	0,19	$1,9x10^3$	0,57
7	NM8		6,8	4,05	45	28	**16,8**	0,008	0,87	0,004	0,07	90	0,13	0,14	$2,1x10^3$	0,53
8	NM9	High tide	7,1	4,7	**69**	**32**	**16**	0,17	0,87	0,007	0,13	89	0,17	0,12	$2,5x10^3$	0,42
	NM10	Low tide	6,7	4,5	**58**	29	14,5	0,09	0,65	0,005	0,11	86	0,15	0,09	$2,1x10^3$	0,38
9	NM11	High tide	7,2	5,80	**75**	**31**	**15,4**	0,123	**0,95**	0,002	0,22	110	0,25	0,15	$3,7x10^2$	0,18
	NM12	Low tide	6,5	5,73	**69**	27	13,5	0,065	0,89	0,001	0,18	104	0,22	0,12	$3,3x10^2$	0,15
10	NM13	High tide	7,7	5,54	**80**	20	12	0,191	0,68	<0,001	0,19	118	0,34	ND	$4,1x10^2$	0,14
	NM14	Low tide	7,3	4,67	**78**	18	10,8	0,162	0,52	<0,001	0,12	113	0,27	ND	$3,8x10^2$	0,11
11	NM15	High tide	7,8	6,7	**75**	**34**	**16,7**	0,131	**2,73**	<0,001	0,09	98	0,28	0,28	$5,7x10^2$	0,10
	NM16	Low tide	7,2	5,8	**72**	**32**	**15,8**	0,071	**2,65**	<0,001	0,14	96	0,26	0,22	$4,3x10^2$	0,09
12	NM17	High tide	6,7	4,53	42	30	**17,8**	0,152	**2,19**	<0,001	0,12	89	0,05	0,23	$1,9x10^3$	0,23
	NM18	Low tide	6,2	5,2	41	28	**16,6**	0,067	**1,87**	<0,001	0,06	82	0,04	0,13	$1,4x10^3$	0,18
13	NM19	High tide	7,1	5,7	40	23	13,8	0,089	**0,92**	<0,001	0,03	92	0,04	0,18	$3,2x10^3$	0,21
	NM20	Low tide	7,08	5,1	38	21	12,6	0,021	0,87	<0,001	0,01	87	0,03	0,16	$2,8x10^3$	0,19
QCVN 08-MT:2015/BT NMT Column B		**Column B1**	**5,5-9**	**≥ 4**	**50**	**30**	**15**	**0,3**	**0,9**	**0,05**	**10**	**350**	**1,5**	**0,4**	**7.500**	**1**
		Column B2	**5,5-9**	**≥ 2**	**100**	**50**	**25**	**0,5**	**0,9**	**0,05**	**15**	**-**	**2**	**0,5**	**10.000**	**1**

Notes:

- *NM1: Surface water of Quan pool (a section near residential area Lia 1 – Ward 1)*

- *NM2: Surface water of Mui Tau canal under area Lia 2 – ward 2 – A beginning point near Mui Tau park*
- *NM3: Surface water of Mui Tau canal under area Lia 2 – Ward 2 – ending section of the canal*
- *NM4: Surface water of Rot canal under Lia 4 – ward 6*
- *NM5, NM6: Surface water of Rot cana for a section near Vam Co Tay river – when the ride increase and decrease*
- *NM7: Surface water of Cau Tre cana under Lia 3 – Street zone Binh Cu 1 &2 – Ward 4*
- *NM8: Surface water of Cau Tre canal for construction of Tran Phong Sac street connecting with Ngguyen Minh Duong – Street zone Binh Yen Dong 1 – ward 4*
- *NM9, NM10: Surface water of Cau Trea towards Bao Dinh river – when tide increase and decrease*
- *NM11, NM12: Surface water of Bao Dinh river – when tide increase and decrease*
- *NM13, NM14: Surface water of Bao Dinh river for a section near Vam Co Tay river- when tide increase and decrease*
- *NM15, NM16: Surface water of Bao Dinh river for a section near ring road channel – when tide increase and decrease*
- *NM17, NM18: Surface water of Can Dot canal for construction of Mang bridge (under Binh Loi Nhon commune) – when tide increase and decrease*
- *NM19, NM20: Surface water of Khanh Hau Tay channel for a section near Nguyen Van Tiep river (under Loi Binh Nhon commune) – when tide increase and decrease.*
- *ST: Spring tide; NK: Neap tide; ND: No detection; LOD: Limits of Detection threshold*
- *QCVN 08-MT:2015/BTNMT: National technical regulation on surface water quality*
- *Class B1:Quality of surface water used for irrigation purposes*
- *Class B2:Quality of surface water used for inland water purposes*
- *ND: Not Detected*

Comments: Water samples were taken at different time period of low tide and high tide in some places. The results from Table 2.5 shows the water quality is varying spatially and temporarily. At 4 locations, it is observed that water in high tide period is more contaminated then that of the low tide which can be explained that during the high tide, sediments which deposited in the previous low tide are flushed with high tide water, increasing turbidity and other substances.

Surface water quality from sampled locations is presented below:

Water quality in Bao Dinh river:

The dredging and embankment work of Bao Dinh river will cause impacts on water quality. Thus, monitoring samples are carried out in three locations at the high tide and low tide, from NM11 to NM16. Results show that:

- At NM11 and NM12: All indicators meet standards, except for TSS exceeding 1.38 – 1.5 times; COD exceeding 1.03 times; BOD_5 exceeding 1.026 times; N-NH_4^+ exceeding 1.06 times over the national standard for surface water for irrigation purpose (QCVN 08-MT:2015/BTNMT collumn B1)

- At NM13 and NM14: TSS exceeding 1,56 – 1,6 times over the NM11+12. This is the intersection between Bao Dinh River and Vam Co Tay river, the water quality will be affected by water pollution in Vam Co Tay river.. The reason is the that there are some works are constructed in the sampling location, increasing the content of pollutants over standards.

- At NM15 and NM16: TSS exceeding 1.44 – 1.5 times; COD exceeding 1.07 – 1.13 times; BOD5 exceeding 1.06 – 1.11 times; N-NH4+exceeding 2.9 – 3.03 times over standards. This might due to the discharge of wastewater from some livestock farms in the areas where Bao Dinh River runs cross the Ring road.

Water quality of Mui Tau, Cau Tre, Rotm Chanh, Can Dot canal:

Analysis results prove the water pollution in canals of Tan An city. Pollutants are organic substances, in which: TSS exceeding 1.16 – 4.75 times; COD exceeding 1.07 – 1.9 times; BOD_5 exceeding 1.07 – 2.32 times; N-NH_4^+ exceeding 1.13 – 3.18; P-PO_4^{3-} exceeding 1.03 – 1.08 times over standards at NM3, NM4, NM5, NM6 and NM8.

The fact that people and facilities along the river still discharge their waste and waste water directly into the without treatment leads to elevated level of pollutants in the river water.

2.2.2.2. ***Groundwater***

Sampled location: Groundwater samples were taken from wells of households in the subproject areas, the depth of wells varies from 30 – 40m. The results of groundwater quality sites are described in the following table.

Table 2.6. Results of Groundwater Quality

TT	Indicators	Unit	NN1	NN2	NN3	NN4	QCVN 09:2015/BTNMT
1	pH	-	7,21	7,34	7,42	7,28	**5,5 - 8,5**
2	Hardness	mg/l	412,50	470,62	414,75	397,63	**500**
3	TDS	mg/l	710	890	750	725	**1500**
4	COD ($KMnO_4$)	mg/l	2	2	2	1	**4**
5	Amoni	mg/l	0,7	**1,25**	0,89	0,68	**1**
6	Clorua	mg/l	175	220	195	185	**250**
7	Nitrit (NO_2^-)	mg/l	<0,01	<0,01	<0,01	<0,01	**1**
8	Nitrat (NO_3^-)	mg/l	0,004	0,007	0,003	0,006	**15**
9	Sunfat	mg/l	95,7	103,21	98,64	91,27	**400**
10	Xianua	mg/l	ND	ND	ND	ND	**0,01**
11	Asen (As)	mg/l	0,024	0,018	0,021	0,016	**0,05**
12	Cadimi (Cd)	mg/l	0,0009	0,0017	0,0013	0,0008	**0,005**
13	Lead	mg/l	0,0018	0,0027	0,0031	0,0014	**0,01**
14	Copper	mg/l	0,005	0,015	0,009	0,007	**1**

TT	Indicators	Unit	NN1	NN2	NN3	NN4	QCVN 09:2015/BTNMT
15	Zinc	mg/l	0,004	0,007	0,013	0,009	**3**
16	Mangan	mg/l	0,27	0,34	0,25	0,21	**0,5**
17	Crom (VI)	mg/l	0,006	0,009	0,011	0,017	**0,05**
18	Iron	mg/l	0,51	0,72	0,63	0,48	**5**
19	E - coli	MPN or CFU/100 ml	0	0	0	0	**No found**
20	Coliform	MPN or CFU/100 ml	0	2	1	0	**3**

Notes:

NN1: Drilled/excavated wells under Lia 4, ward 6
NN2: Drilled/excavated wells under ring road, Khanh Hau ward
NN3: Drilled/excavated wells under ring road, Loi Binh Nhon commune
NN4: Drilled/excavated wells near Rach canal, ward 6
ND: Not Detected

National technical regulation on ground water quality is used for comparison with the quality of underground water is compared with the national technical regulation on ground water quality (QCVN 09:2015/BTNMT). The quality of undergroundwater is monitered as the sources is used by households in communes, wards, and Tan An city, but is connected to the major tap water source of the city. The analysis results show that:

pH samples of water is neutral -slightly alkaline, ranging from 7,21 – 7,48 within the limit of 5,5 – 8,5 as QCVN 09:2015/BTNMT.

The hardness of water is assessed by mineral in water (mainly Mn^{2+}, Fe^{2+}…) and determining whether the water is soft or hard. Then, some applications during water supply are used for other purposes as eating, industry, agricultural irrigation. The results show that content of the substances are low that can be used for dringking purposes .

Amoni: As Content of Amonium in monitoring position, there is 1/5 samples is unsatisfied the 09:2015/BTNMT. At the NN2. The explanation for the result might due to the fact of wastewater is being discharge to the environment, affecting groundwater from an industrial cluster of food processing operating in Loi Binh Nhon commune as well as the runoff from agriculture activities which is contaminated with residual fertilizers and pesticides.

Remaining indicators are under acceptable limits.

2.2.3. **Quality of Soil and Aquatic Environment**

Sampling sites and monitoring results of soil samples and aquatic environment are shown in table below:

Table 2.7. Results of Soil Quality

No	Symbol	Name of work	Location of sampling	Indicators of measurement and analyis				
				As	Cd	Zn	Cu	Pb
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1	Đ1	Construction of ring road	Soil in the area for construction of overpass No 7 – Loi Binh commune	0,056	1,27	72,1	15,72	27,68
2	Đ2		Soil in the area for construction of ring road near national road 1	0,061	0,98	87,2	17,81	25,72
3	Đ3		Soil in the area for construction of Mang bridge	0,048	1,19	68,5	16,24	20,34
4	Đ4	Construction of Luu Van Te street	Soil in the area for construction of Luu Van Te street	0,087	0,73	80,6	18,22	17,64
5	Đ5	Construction of extened Tran Phong Sac street	Soil in the area for construction of Tran Phong Sac street connecting with Nguyen Minh Duong street	0,039	0,59	78,7	21,08	18,23

No	Symbol	Name of work	Location of sampling	Indicators of measurement and analyis				
				As	Cd	Zn	Cu	Pb
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
6	Đ6	Construction of road for ward 7	Soil in the area for construction of connecting road of embankment of Bao Dinh river (a section from ring road culvert at the end of boundary line of ward 7)	0,051	0,68	65,9	19,87	20,46
QCVN 03-MT:2015/BTNMT				**25**	**10**	**300**	**300**	**300**

Notes:

- QCVN 03-MT:2015/BTNMT: National Technical Regulation on the Allowable Limits of Heavy Metals in the Soils.
- LOD: limits of Detection threshold.

Comments: According to the analysis, soil environment is within the allowable limits of QCVN 03-MT: 2015/BTNMT. Thus, during earth leveling duration, the soil sources for construction can be utilized without any cost for treatment.

Aquatic Fauna Sampling Sites below for table:

Table 2.8. Structure of plankton flora in the moniroring area

Branches	***Species***	***Ratio (%)***
Cyanobacteria	5	15,6
Bacillariophyceae	17	53,1
Chlorophyceae	7	21,9
Euglenophyceae	3	9,4
Total	***32***	***100***

Notes: Location of Aquatic Fauna Sampling Sites

TS1: aquatic fauna of Vam Co Tay river for a section near Rot canal
TS2: aquatic fauna of Bao Dinh river for a section near Cau Tre canal
TS3: aquatic fauna of Bao Dinh river for a section near Vam Co Tay river
TS4: aquatic fauna of Can Dot canal for a section in constructing Mang bridge
TS5: aquatic fauna of Nguyen Van Tiep river for a section near Khanh Hau Tay channel

The results show that:

The plankton flora:

By survey, analysis results record 32 species under 4 branches of plankton flora in 5 monitoring position.

In general, the vast majority of plankton flora recorded in the survey has the features of freshwater and brackish water, which are completely in line with the monitoring area where is under influences of freshwater, including *Microcystis aeruginosa*, *Anabaena* sp*, Aulacoseira granulata, Volvox aereus, Pediastrum simplex, Scenedesmus arcuminatus, Closterium acutum, Euglena acus, Eugoxyuris*, and influences of tide (from sea water) such as *Cyclotella stylorum, Coscinodiscus* spp.*, Triceratium favus, Nitzschia paradoxa* Thus, as above comments about entire monitoring area, water environment is affected by tide and inland fresh water.

Plankton fauna:

Table 2.9. Structure of planton fauna in the monitoring area

Branches	Species	%
Rotatoria	1	7,1
Cladocera	5	35,7
Copepoda	5	35,7

Branches	Species	%
Ostracoda	2	14,3
Larvae	1	7,1
Total	***14***	***100***

Freshwater copepod crustaceans (Cyclopidae and Diaptomidae) and the group in river outlets (Pseudodiaptomidae) are adaptive to wider salinity, the number of species in river sections are not differently distributed. Species in the river outlet as *Pseudodiaptomus beieri, Schmackeria bulbosa*, have adapted to freshwater environment in the North of Vietnam (*Schmackeria bulbosa*) and MKRD, including Cambodia (*Pseudodiaptomus beieri*). Typical species in acid water are *Chydorus sphaericus, Euryalona orientalis, Leydigia acanthocercoides*, *Vietodiaptomus hatinhensis*. Indicator species for nutrient environment and organic contaminated environment are *Moina dubia, Mesocylops leuckarti, Thermocyclops hyalinus*.

Large invertebrate in the bottom:

Analysis results show that there are 10 species large invertebrate in monitoring positions. Nails dominate the structure of species.

Table 2.10. Structure of invertebrate branches in monitoring positions

Branches	No. of species	Ratio (%)
Polychaeta	2	20
Oligochaeta	1	10
Gastropoda	4	40
Bivalvia	2	20
Crustacea	1	10
Total	**10**	**100**

Almost all invertebrates recorded in Vam Co Tay are freshwater species, excepting for *Nephthys polybranchia, Namalycastis abiuma, Clea helena* are species living in river outlets and moving into the mainland. Indicators species for nutrient environment and organic contaminated environment include *Nephthys polybranchia, Limnodrilus hoffmeisteri, Branchiura sowerbyi*. Typical species in weak acid water environment are *Sermyla tornatella, Filopaludina (Filopaludina) sumatrensis*.

2.2.4. Existing condition of biological resources

The following is some comprehensive assessment about biological resources based on monitoring results and inspection along the project line and steps for screening biological values in the project area.

a. Species in the Project line

a1. Species along river corridor

Flora: narrow strip flora along the river such as *Arecaceae,Pteridophyta*, *Mimosa pudica L., Musaceae*, *Cynodon dactylum, Juncaceae, Cocos nucifera*, *Dimocarpus longan*, etc. No rare species stated in the Red Book of Vietnam are found.

Fauna: This is the home and the place for searching for foods of some birds and reptiles, amphibians such as *Paser montanus*, *Dicacum concolor, Picnonotus jocosus, Egretta garzetta garzetta*; amphibians as *R.macrodactyla,* Frog *(R.tigrina), Kaloula pulchra,* snake *Xenopeltis unicolor*; Other kinds of animal are not diversified, the dominant animals as hamsters (*Myodes glareolus)*, etc, Invertebrate animals (insects) and species as *Zygoptera*, butterfly (*Lepidoptera*),

Grasshopper (*Orthoptera*), Mantis (*Mantodea), bluebottle (Diptera),* Ant *(Formicidae)…* No rare species stated in the Red Book of Vietnam are found.

a2. Species in rice fields

Flora: species are not diversified and no rare species stated in Vietnam red bood are found. Apart from rice (*Oryza sativa*), there are only some natural species such as *Cyperaceae* http://vi.wikipedia.org/wiki/H%E1%BB%8D_C%C3%B3i

a3. Species of garden and residential areas

In the areas of households interspersed with agricultural land, the structure is house and some plants surrounding their house or in a separately land lot near the house. Flora: jack-fruit *(Artocarpus heterophyllus),* Guava *(Psidium guiava),* Lemon (*Citrus aurantifolia*), longan (*Dimocarpus longan*), Coconut (*Cocos nucifera*), banana (*Musaceae*)…

Fauna: Some species such as sparrow *(Paser montanus),* Red-whiskered bulbul *(Pynonotus jocosus)* and some reptiles, amphibians such as *Bufo melanostictus, etc;* In addition, there are pig, chicken, duck and others such as dog, cat and small pets such as rats and insect, etc. No rare species stated in the Red Book of Vietnam are found..

b. Diversity of species and genes

In general, biological values of the terrestrial ecosystems along the low line. The coastal ecosystem and aquatic species are assessed to be have highest nature and continuity. Some species recoreded in the Vietnam Red Book are found in Vam Co river, but there is no research proving that there rare species in construction area. The species in fields and gardens are not diversed, the flora is poor and no rare species are found.

In general, the effects from the subproject operation will do no harm to the biodiversity of terrestrial and aquatic ecosystem. However, care should be taken for the activities that are close to some lagoons/ponds near the project area as runoff from the construction site might affect the water quality there.

2.2.5. **Sediment Quality**

Results of Sediment Quality show in table below:

Table 2.11. Results of Sediment Quality

TT	Sign	Indicators and analysis							
		As	**Cd**	**Zn**	**Cu**	**Pb**	**Total Hidrocacbon**	**Chlorine plant protection products**	**Phosphorus plant protection products**
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1	TT1	3,75	0,35	77,5	17,5	19,7	ND	ND	ND
2	TT2	4,52	0,42	72,1	16,8	21,3	ND	ND	ND
3	TT3	4,69	0,16	74,7	19,4	29,5	ND	ND	ND
4	TT4	5,12	0,75	82,3	18,5	30,1	ND	ND	ND
5	TT5	5,43	1,21	67,9	20,7	28,4	ND	ND	ND
6	TT6	6,52	0,98	90,8	21,4	32,7	ND	ND	ND
7	TT7	7,14	1,34	102,3	25,6	33,2	ND	ND	ND
8	TT8	5,69	1,24	69,9	23,2	28,4	ND	ND	ND
9	TT9	6,34	0,93	71,8	18,9	24,9	ND	ND	ND
QCVN 43:2012/BTNMT		**17**	**1,5**	**315**	**197**	**91,3**	**100**		

TT	Sign	Indicators and analysis							
		As	Cd	Zn	Cu	Pb	Total Hidrocacbon	Chlorine plant protection products	Phosphorus plant protection products
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
QCVN 07:2009/BTNMT C_{tc} (mg/l)		**2**	**5**	**250**	**-**	**15**			
QCVN 07:2009/BTNMT H (ppm)							**1**		

***Note**:*
TT1: Sediment of Mui Tau canal located in sampling point NM2-NM3
TT2: Sediment of Rot canal under area Lia 4, ward 6, together with point NM4
TT3: Sediment of Rot canal towards to Vam Co Tay river, together with sampling point NM5-NM6
TT4: Sediment of Cau Tre canal under area Lia 3, ward 4, together with point NM7
TT5: Sediment of Cau Tre canal for constructing Tran Phong Sac street connecting with Nguyen Minh Duong, together with sampling point NM8
TT6: Sediment of Cau Tre canal towards Bao Dinh river, together with point NM9-NM10
TT7: Sediment of Bao Dinh river for a section near Vam Co Tay river, together with point NM13-NM14
TT8: Sediment of Bao Dinh river for a section near ring road channel culvert, together with point NM15-NM16
TT9: Sediment of Can Dot canal for constructing Mang bridge (under Loi Binh Nhon commune) together with point NM17-NM18
QCVN 07:2009/BTNMT: National Technical Regulation on Hazardous Waste Thresholds
ND: Not Detected

The quality of sediment is compered with the national technical standard on sediment quality (QCVN 43:2012/BTNMT). The results showed that the levels of heavy metals are lower than allowable limits.

According to the analyses, the sediments from the canals and pond dredged work are not hazardous and contaminated with heavy metals. However, it has high amount of organic compounds and pathogenic microorganisms (e.g. *Ecoli*) thus should not be used directly for agricultural purposes. This could rather be dewatered and kept at least 03 months to allow partial degradation 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 Tan Dong Waste Treatment facility.

2.3. SOCIO-ECONOMIC CONDITIONS

2.3.1. **Socio-economic conditions in Tan An city**

2.3.1.1. ***Economic conditions***

In 2015, production value of economic sectors was mainly 14,235 billion 198 million dong (according to price compared to 2010), increasing by 8.7 % compared to 2014 (where: 10.4% of trading – services, 9.5% of industry – construction; 1.2% of agriculture). The master plan for socioeconomic development of Tan An City until 2020 and vision to 2030 was approved.

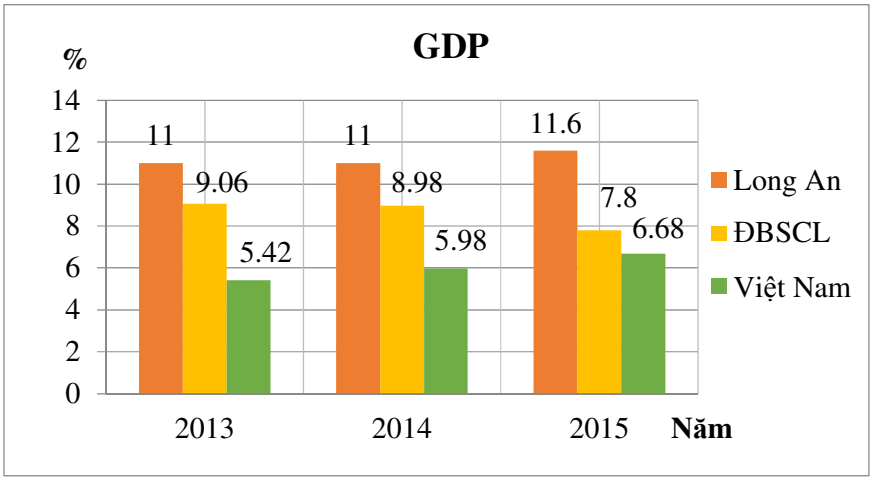


Figure 2.10. Economic growth rate

(*Source: Tan An City statistics of year book of 2015).*

2.3.1.2. ***Socio-cultural conditions***

Population

Tan An city has nine wards and five communes, of which 09 wards are located in the core area of the city including wards of 1, 2, 3, 4, 5, 6, 7, Tan Khanh, Khanh Hau and the remaining five communes situated in the outskirts of the city are Nhon Thanh Trung, Huong Tho Phu, Loi Binh Nhon, An Vinh Ngai and Binh Tan. It has a total natural area of 8,194.94ha, of which the residental land area is 1,849.9ha, agricultural land area is 4,659.19ha and 978.02ha of the specific land. In 2014, the city population reached 136,441 persons, of which men account for 47.6% and women with 52.4%.

The average population densities is 1,665 persons/km^2 and unevenly distributedamong the Wards/Communes of City. Ward 1 is the most densely populated (14,091 persons/km^2), followed by the population density in Ward 2 with 10,301 persons/km^2, Ward 3 with 4,496 persons/km^2, the remaining Wards/Communes have similar population densities with 2,758 persons/km^2. An Vinh Ngai Commune has the lowest population density in the city with 766 persons/km^2. The population densities of the outskirt Communes are relatively lower compared with that in the center area of city.

Average growth rate of urban population in the period 2011-2014 is quite high reaching approximately 1.22% of / year due to the changeover of two communes becoming wards (Khanh Hau Commune, Khanh Tan Commune into Khanh Hau Ward and Tan Khanh Ward), besides that, since 2009, Tan An was upgraded from a town to a city and attracts human resources from other regions inside and outside the province for living and working in the city

In general, Tan An City population in recent years has tended to concentrate the center of the city, according to the trends of urbanization in recent years, leading to increase of population in addition to attracting more high-quality human resources, Tan An city especially the central areas is facing pressures on meeting the needs of infrastructures (housing, transport) compared to the development of the surrounding areas.

Ethnic people

According to Tan An City statistical year book 2014, the majority of the population in Tan An city is Kinh with 96.96%, Chinese, Khmer and others occupy small proportions with 1.19%, 1.8% and 0.05% respectively.

Labor, employment

Tan An City People's Committee has conducted certification and introduce job opportunities to 4791 labors, meeting 159.7% of the plan targets. They also disseminate laws on occupational safety and hygiene, fire safety and social insurance, and notified the labor of recruitment of businesses in and outside the province.

Gender

To learn the role and responsibilities of the gender as well as evaluate gender situation in the project area, Social Advisory Group has conducted a survey on the roles of women in activities such as house works, care for children, participating in community activities, participating in community organizations ... the results show that women still play a key role as house wife in the families, taking care of children, 63.7% of people in charge of taking care of children is women. The proportion of men in major roles in the activities of cooking, cleaning and taking care of children is very small. However, they can support their wives and mothers. The proportion of households with both men and women participating in these works is relatively high, 32.0% for cooking, 31.4% for cleaning, especially for hard works such as taking care children, 56.2%.

For activities providing income for their families, women are involved in small trade and services (hair washing, hairdressing, nail making ...). In the project area, 63.5% of people working in this occupation are women. Vocations with huge proportion of men are hired works (porters, construction workers, ...) accounting for 64.6%, acting as employees (43.8%). The above analysis shows that employment opportunities and the ability to adapt to changing careers are an obstacle for women in the region. In case of resettlement, women are more affected than men, especially single women head of household with dependents (12 PAHs).

For the decisions in the family, the result shows that mainly in the families, women and men join together to discuss and make decisions. This ratio for public procurement and study of children is 53.2% and 68.2% respectively. For decisions about career change, business loans and ownership of land, housing and other assets, men always play a pivotal role and make major decisions in the families.

Surveys about participation in community activities, local organizations show difference between two genders: the ratio of men often joining both of these activities is more than one of women. 48.1% of respondents say that men are main participants in meetings of local communities, while this ratio of woman was 16.9%. Similar to the results of participation in community meetings and local organizations, male and female ratio is 34.8%, and 35.2% respectively..

Poverty

Statistics of poor and near-poor households according to multidimensional approach in the period of 2016 – 2020 are presented in the following table. Results show that the poverty rates inTan An city is quite a low with only 1.72%.

Table 2.12. Ratio of poor and near-poor households according to multidimensional approach in 2016

No	Name of commune/ward	Survey and review results in 2016					
		Poor household			Near-poor household		
		Number of households	Members	Ratio %	Number of households	Members	Ratio %
1	Ward 1	32	89	1.23	20	79	0.77
2	Ward 2	35	97	0.76	55	164	1.19
3	Ward 3	56	193	1.22	112	361	2.44
4	Ward 4	43	120	0.93	113	313	2.45
5	Ward 5	36	104	1.11	54	196	1.66
6	Ward 6	43	113	1.14	14	40	0.37
7	Ward 7	27	76	1.71	79	260	4.99
8	Tan Khanh ward	37	104	2.13	64	194	3.68
9	Khanh Hau ward	30	69	1.20	39	124	1.56
10	Loi Binh Nhon Commune	61	177	2.15	70	221	2.47
11	Huong Tho Phu Commune	65	160	3.44	77	260	4.07
12	Nhon Thach Trung commune	31	89	1.56	20	76	1.01
13	Binh Tam commune	53	139	3.12	43	144	2.53
14	Vinh Ngai commune	35	111	2.38	39	147	2.65
	Total	584	1641	1.72	799	2579	2.27

***Source**: Department of Labor, Invalids and Social Affairs of Tan An City in 2016*

2.3.2. Socio-economic data of affected households

Size of a household

Number of members in affected households is in average 3.7 persons/households; normally 3 person/household; the highest number of member in a family is 8 while the lowest is 1 person/household. Information about average size of household will help to estimate the number of affected extended households to be separated when resettlement. With average size of 3.7 persons/household and common size of 3 person/households, the number of additional land lots for households who are eligible to separate is very few.

Table 2.13. Samples taken for surveying in project area

No	Ward/ Commune	No of AHs surveyed	Total of persons	Total of women		Average population size
				Female	%	
1	Ward 1	30	114	61	53.5%	3.80
2	Ward 2	17	74	43	58.1%	4.35
3	Ward 3	32	109	52	47.7%	3.41
4	Ward 4	102	400	203	50.8%	3.92
5	Ward 6	62	213	107	50.2%	3.44
6	Ward 7	16	56	30	53.6%	3.50
7	Khanh Hau	43	137	70	51.1%	3.19
8	Loi Binh Nhon	64	249	135	54.2%	3.89
Total		**366**	**1,352**	**701**	**51.8%**	**3.69**

Source: Socio-economic data of Tan An city, 2016

Education – training

The SES shows that AHs' educational levels in the project area are quite low. The number of people who have graduated high school or higher levels account for 19.1% (men 12.3%, women 6.8%), the remaining 80.9% (men 45.4%, women 32.2%) belong to the lower levels (who have not graduated high school or lower levels) and 3.3% of people who didn't remember their educational level. The number of people who have graduated secondary school accounts for the highest rate with 48.6% (men 29.8%, women 18.9%), followed by those who graduated the primary school level with 18.6% (men 8.7%, women 9.8%). The illiterate rate is about 2.2%. Gender analysis in education shows that the men's educational levels are higher than that of women.

Career and job

The project area shows that the major sector of employment is service such as sellers, drivers… accounting for 26.8%, followed by farmers, husbandry and workers with 18%, 11.7% respectively; People working as civil servant account for 6.6%, a small business trade with 2.5%. Specially, number of people who were retired with pension accounting for 11.2%. Beside of that, the unemployed persons account for 5.7% and 4.6% of people are housewife.

Poverty, Income and expenditure of PAHs

Main sources of income: The survey shows that the main sources of income of AHs are led by the employment with wages, accounting for 37.7%, followed by trading and services with 32%. The income derived from agricultural activities is quite low with 22.1% mainly for persons located on the outskirt communes of city respectively Loi Binh Nhon (57.8%) Khanh Hau (37,2%). The income sources from pension and social assistance account for 8.2%.

Survey shows that the average income of PAPs in the project area is similar to the oneof Tan An city. The average monthly income of each AH is approximately 10,189,932 VND, which is equivalent to a per capita income of2,758,517 dong per month. AHs with income over 5 million/month, account for 81.8%, followed by the AHs who gain 5-10 million per month with 44% and above 10 million per month with 41.8%. The number of the AHs earning less than 5 million per month is important with 14.2%, of which 13.9% of AHs have income from 2-5 million/month and 0.3% of the AHs only earn from 1- to 2 million/month and fortunately no HH has an income lower than 1 million/month (Table 3.21). The average monthly income per capita in the project area (2,758,517 VND) is much higher compared with the national standard on poor and near poor people regulated by the Prime Minister under the Decision No 59/2015/QD-TTg dated 19 November, 2015 in the stage of 2016 – 2020 (Maximum 700,000 dong or per person per month in rural area and 900,000 dong per person per month in urban area).

Survey shows that the average income of PAPs in the project area is similar to the one of Tan An city. The average monthly income of each AH is approximately 10,189,932 VND, which is equivalent to a per capita income of2,758,517 dong per month. AHs with income over 5 million/month, account for 81.8%, followed by the AHs who gain 5-10 million per month with 44% and above 10 million per month with 41.8%. The number of the AHs earning less than 5 million per month is important with 14.2%, of which 13.9% of AHs have income from 2-5 million/month and 0.3% of the AHs only earn from 1- to 2 million/month and fortunately no HH has an income lower than 1 million/month (Table 3.21). The average monthly income per capita n the project area (2,758,517 VND) is much higher compared with the national standard on poor and near poor people regulated by the Prime Minister under the Decision No 59/2015/QD-TTg dated 19 November, 2015 in the stage of 2016 – 2020 (Maximum 700,000 dong or per person per month in rural area and 900,000 dong per person per month in urban area).

The survey also indicates that the average monthly expenditure of PAPs is 6,885,150 dong and average monthly expenditure per person is about 1,863,879 dong. Among them, the majority of households are spending between 5 million/ to 10 million/month account (49.2%);the number of households spending between 2 million to 5 million account for 32%, the remaining 17.2% have monthly expenditure superior to 10 million and 1.6 % of households spending below 2 millions / month.

Table 2.14 shows the poverty status of PAHs via official record by multi-dimensional measures and the poverty level income based on SES.

Table 2.14. Poor status of PAHs

Items	Sample size	Poor income based on SES	
Component 1 (1)	HHs	HHs	Rate (%)
Lia 1	45	28	62.2
Lia 2	17	9	52.9
Lia 3	51	33	64.7
Lia 4	48	26	54.2
Total (1)	**161**	**96**	**59.6**
Component 2 (2)			
Embankment of Bao Dinh River	34	5	14.7
Cau Tre canal	29	7	24.1
Ring road	37	8	21.6
Luu Van Te road	42	12	28.6
Tran Phong Sac road	43	6	14.0
Connecting road of the embankment of Bao Dinh River	20	4	20.0
Total (2)	**205**	**42**	**20.5**

***Source**: Socio-economic data of Tan An city, 2016*

Current status of sanitation, community health and medical service

Households proportion who have access to clean water (from the city water system) is quite high accounting for 73.5%. The remaining of households use water from drilled well for cooking (26.5%). Especially, in Wards 1, 2 and 3 100% of households use tap water for cooking. While this proportion is decreasing for outskirt communes. Similar, 71% of households use tap water for domestic activities, 29% of households are using water from drill well. Most of households have toilets with septic tanks accounting for 87.5 %, the remaining 12% use Rudimentary toilet and 0.5% of them use toilets on canals.

Flooding situation often leads to infectious diseases for households living in the project area. Survey results for the most common diseases in the project area showed that 13.1% of households having dengue, 9% of common diseases related to scabies, 0.8% of households having dysentery, 0.8% of households have cholera and typhoid 2% households.

Access health care: PAPs recognized that the health care system in the project area is advantageous. 76.5% of the PAPs select the city hospitals to have a health check when they get sick, 50.3% of the PAPs could go to medical center and 21.9% used private health care centers. In addition, 56.6% of the households go to local pharmacies to buy medicines for common sickness.

Current status of house use of affected households

Most of the people believe that their housing condition is relatively good. The percentage of households with normal condition housing status accounts for 46.4%, households with good condition is 44.8% and 5.7% with very good housing condition. Only 2.7% of the surveyed households said that they have poor housing condition.

Situation and use of loan

Of the 366 surveyed households, there were 84 households (23%) who have loans, of which 16.1% of the households borrowed from the State Bank, 6% of loans through credit institutions/organizations and 0.8% belong to personal loan. Loans were being used for the purpose of investing in their business or agricultural production /breeding which accounted for 16.7% and 26.2% respectively. Some households borrowed money for household consumption, building house and others for spending on children's educational fees, accounting for 9.5%, 9.5% and 6% respectively.

Land tenure

The project affects 899 households with 903 plots of land. In terms of the ownership status of affected land, the majority of PAPs have formal legal rights to the affected land. The number of land plots with LURCs is 665 out of 903 the total plots of land, accounting for 73.6%. The number of affected land plots without LURCs but having a claim on the affected land is 156, accounting for 17.3%. The number of land parcels with no recognizable legal right or claim to the land is 82 plots with 9.1%.

2.3.2. **Social Network and Support Systems**

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

2.3.2.1. ***Government Programs***

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

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

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

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

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

2.3.2.2. ***Mass Organizations***

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

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

for women, environmental awareness programs and credit programs to HH, especially for poor HH and women.

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

2.3.2.3. ***Not Governmental Organizations (NGOs)***

Tan An City is the home of a strong network of NGOs both national and international. The main fields where NGOs are involved are climate change adaption (Challenge to Change (CtC)), poverty reduction (East Meet West Foundation, Save the Children in Vietnam, CARE Vietnam) and health care (Family Health International, Health Bridge Foundation of Canada). NGOs may also be key partners for the implementation of the project especially regarding climate change adaptation and income restoration.

2.3.2.4. ***Citizen Groups***

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

2.4. INFRASTRUCTURAL CONDITIONS

2.4.1. **Traffic**

a. External traffic

Expressway Sai Gon - Trung Luong – My Thuan: the 28km section passing Long An has been finished and put into use for (4+2) traffic lanes with 60-140m line demarcation. Access to Tan An city is made via an intersection of different core from National Road 62.

The route detouring National Road 1A has a total length of 6.1km, 12m width. It crosses the west of Tan An City and was built according to standards of plain road grade III. The new Tan An Bridge spanning Vam Co Tay River is about 1.3km from the center of old Tan An bridge to the upstream. It is 413.26m long and 12m wide.

National Road 1A passes through the north of the city, connecting the provinces within Ho Chi Minh City and the Mekong Delta via an important intersection at Trung Luong. Road limit is 56m and 33m in the inner city. Encroachments of curbside and road safety protection corridor and traffic accidents are common. Traffic flow is reduced obviously upon existence of the expressway with a low average vehicle speed. Existing road grade is III.

National Road 62: Tan An - Thu Thua - Thanh Hoa - Moc Hoa, Tan Thanh is the main route connecting Tan An city with the districts of Thap Muoi plain; it is 92.5 km long, ending at Binh Hiep border gate, Moc Hoa District. This road links with National Road 1A, the highway through Long An provinces and connects to Cambodia. Existing road grade is III-IV-II. It is characterized with 2 lanes road (grade IV) with a low pavement quality, the limited width is being upgraded. National Road 62 connects many important routes such as ĐT.820, ĐT.829, ĐT.837, National Road N2, some district roads, communal roads and access to some major inland waterways such

as Duong Van Duong canal and Vam co Tay river, facilitating the combination of inland road and waterway. This is an external route to the western districts of the province.

Road 827A: is the main traffic route of Chau Thanh District, Long An Province, starting from the intersection at Nguyen Dinh Chieu road end, Tan An City and ending at Thanh Vinh Dong wharf. It is narrow and being asphalted to serve majorly provincial freight and passenger transport. It is of grade IV.

Road 827B of Tan An - Chau Thanh facilitates district transport, connecting the district with the province center, following the Economic Corridor along National Road 1. It is narrow and being asphalted to serve majorly provincial freight and passenger transport with a low-volume of traffic. It is of grade IV.

Road 827C is a branch of the provincial road 827A. It's under Chau Thanh district and serves local transport, is of grade IV, asphalted, 6m pavement and 9m ground.

Provincial road 828 starts at Tan An (Chau Thi Kim) to My Tho (Tien Giang).

Provincial road 833 starts at Nhon Thanh Trung Commune (Tan An) to Tan Tru District. It is of grade III and IV.

ĐT 834: From National Road 1, Tan An city outskirt to the center of Thu Thua District, 4.7lm long. It is of grade IV, asphalted.

b. Waterways

- Tan An has Vam Co Tay river and is within the inland waterways under central management. The river is of grade 2.

- Bao Dinh River flows through Tien Giang Province, the gateway to Tien river is of grade 4-5.

Inland wharves, mainly taking advantage of the natural condition, are the destination for load and unload of cargo and passengers. For example, passengers port of Long An (Tan An City).

c. Urban traffic

Pursuant to Decision No 45/2009/QĐ-UBND dated 17/08/2009 of Long An Province People's Committee on promulgating rules for management of urban architect of Tan An Town, Tan An Province, Tan An City has about 149 roads and alleys under management. The density of road and urbanization by pavement structure area as follows:

Table 2.15. Density of urban road

Urban road		**Road network density**		% of asphalted pavement
Total (km)	Asphalted pavement (km)(*)	km/1000 people	km/km^2	
178.3	77.7	1.3	2.2	43.6

Source: LAPIDES

Yards: Tan An Station has been rebuilt with a spacious yard of cement concrete structure, shelters, and new ticketing offices.

Table 2.16. City station

No	Station Name	Area (m^2)	Number of inter-provincial transport route	Number or route per day	Number of passenger boarding per day	Yard structure	Auxiliary constructions
1	Long An	5,000	5	5	225	Cement concrete	Ticketing office, shelters, amenities

Source: Long An Department of Transport

According to the survey results, the current internal traffic system or roads and alleys directly linking the people's houses are mostly asphalted or concrete: asphalt accounting for 28.1%; concrete accounting for 48.7% and roads made of stone / gravel / brick accounting for 19.6%, while soil road / alley (i.e. virtually ground and not upgraded) occupies 3.7%,.

There is no difference between the rates of different wards in the project area; most of the road leading to the households are asphalted or concreted, while a few of other households living in off-center wards the edge of the river still have rock / gravel roads.

Generally, the community has a positive assessment on quality of roads to households (53.0%); 21.6% said they are prone to floods; 22.2% narrow, 18.9% low pavement, 9.4% rough and malfunctioning and 11.0% lack of lighting.

Current status of road traffic:

The traffic system has been basically finished in term of economic zone traffic main frame, operation and connection to the national road system.

The current traffic system center is being developed meanwhile the urban pavement and curbside are downgraded. The density of other area's road network is rather low, failing to meet the traffic demand of an urban area in need of expansion and improvement.

Most areas other than Ward 1, Ward 2 and Ward 3 suffer an under-developed traffic system with soil roads and curbs of channels, ditches which are prone to floods affecting the environment and road structure.

A number of alleys have substandard road limit, failing to assure the travel demand, landscape requirements, fire safety and clearance.

External traffic should be upgraded following the road standard as prescribed.

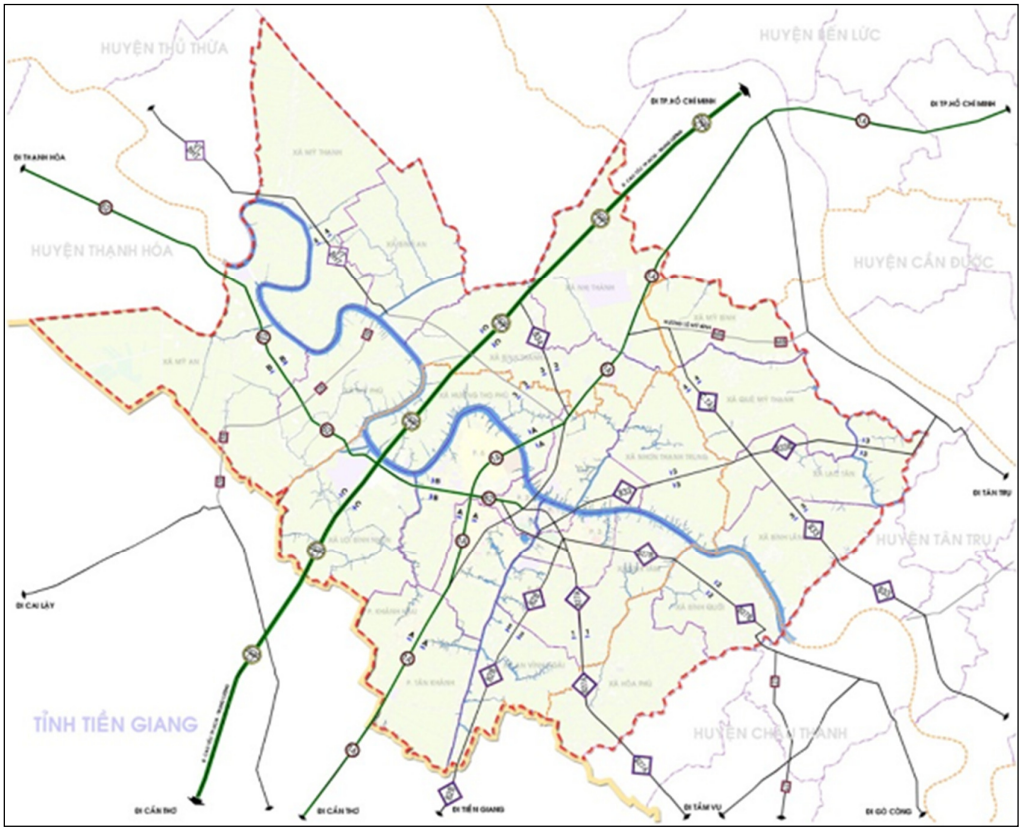


Figure 2.11. Map of traffic system of Tan An City and neighboring area

2.4.2. **Current status of water supply and drainage**

i. <u>Water supply system</u>:

Tan An City has a water supply system consisting of:

Tan An Water Factory with a capacity of 15,000 m^3/day. It taps from the underground water through pumps placed along Nguyen Cuu Van Road. This is the main water supplier of the city.

Binh Anh Water Factory (Thu Thua District) with a capacity of 15,000 m^3/day tapping from the underground water. It caters the water demand of some parts of Tan An City and neighboring industrial parks.

Besides, there are more 6 water supplying stations parochially serving a number of area where machine water is lack or otherwise adding to those poor-functioning water networks.

The system of transmission and distribution within the city has a diameter of (100-400) and total length of 82,653m. City's fountains are out of use presently.

Most parts of the inner city have access to machine water (90%), while the outskirt uses well water, quality of which does not meet the Ministry of Health's standards.

Survey result shows that: in the project area, households majorly use machine water with private water meter (56%), households using drilling well water account for 22% and digging well water accounts for 0.2%). 9% of households use rain water for domestic needs.

Regarding assessment on quality of water under use of households, 82.7% of households said that they were using fresh and clear water; 16.1% clear but odorous water; 1.2% unclear and odorous water.

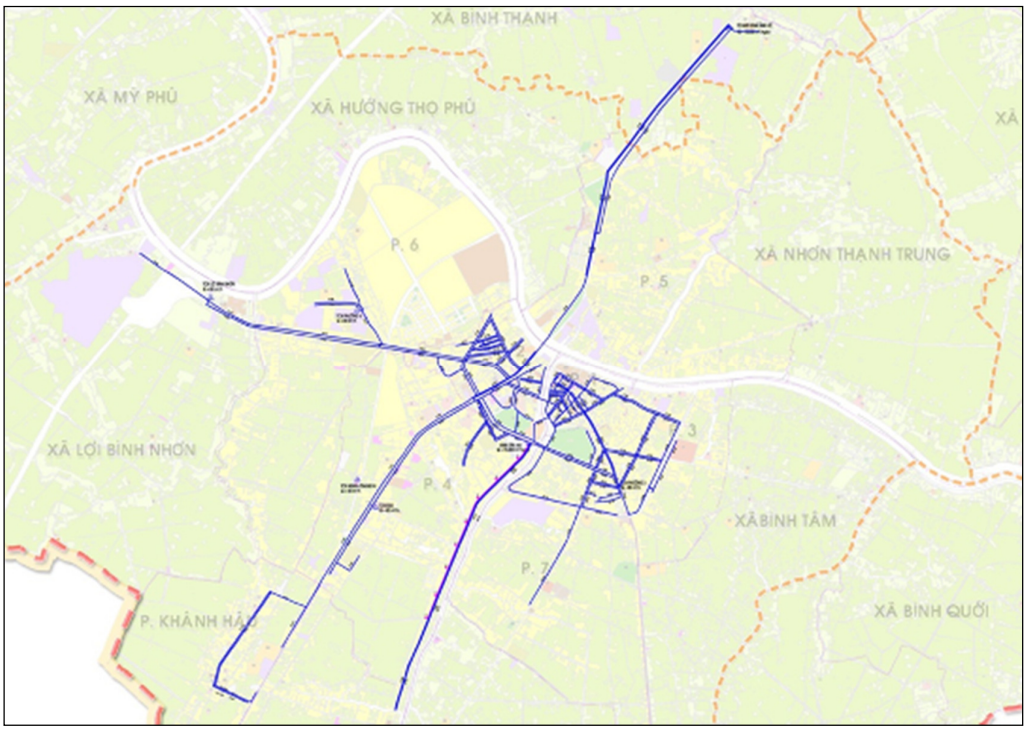


Figure 2.12. Map of Current status of Tan An City water supply system

The current water supply system of the inner city has a capacity of 30,000m3/day, flow q = 120l/person. Most parts (90%) have access to machine water, while the outskirt uses well water, quality of which does not meet the Ministry of Health's standards.

ii. Water drainage system:

Waste water and rain presently share the same drainage system, which has been built over multiple periods of time and multiple forms: round culvert, open ditches, etc. serving the volume as follow:

Table 2.17. Current status of piping volume of Tan An City in 2014

No	*Pipeline (mm)*	*Volume (m)*
1	D400	1,704
2	D500	3,345
3	D600	16,881
4	D800	15,702
5	D1500	481
Total		38,113

***Source**: Long An Water Supply Sewerage Joint Stock Company*

According to the Class III Urban Standard, sewage piping index I > 3.5 meets the sewage standard. The above said non-asynchronous sewage system still makes the inner city prone to spot floods and rising water level, especially the market of Ward 1. This area is flooded because of the low construction elevation, pre-1975 water sewage system not being improved and maintained periodically and underperforming its drainage function in case of heavy rains. Over the recent years, the City has upgraded a number of roads such as Nguyen Dinh Chieu, Truong Dinh and CMT8. But this is not enough to reshape the old sewage system. That's why the water drainage system is so fast downgraded. Other parts of the City are also exposed to spot floods upon heavy rains due to the non-asynchronous sewage system not being correctly maintained.

Network of water body for drainage:

Tan An City has a diverse network of water bodies which is under direct influence of the hydrological regime of Vam Co Tay River. Major streams are as follows:

- Vam Co Tay River flows through the city with a length of about 13,030m receiving rain water and waste water from a vast basin including Tan An City.

- Bao Dinh River connecting Vam Co Tay River to Tien River at My Tho City, crossing a length of 8,000 m through the city. This is the receiver of rain water and waste water from the Southern of the City and provides water for agricultural production.

- In addition, there are a number of canals such as: Chau Phe canal, Ward 3 channel, Binh Tam canal, Cau Dot canal, Nguyen Van Tiep river.

The survey results showed that: 49.3% of households responded that waste water flowed into the regional drainage system, 11.6% of households' waste water is drained into the channels/canals and 39.1% of waste water penetrates into soil itself. There is quite a big difference between results of surveys on household wastewater by wards in the project area. Ward 1 has the highest rate of household waste water into the shared drain/trench (occupying 91.7%); Ward 7 and Loi Binh Nhon Ward have the lowest percentage of drainage into the shared drain/trench (occupying respectively 24.2% and 20.0%).

From the survey results concerning household waste water drainage system, it can be said that in the project area, 39.1% of households drain waste water directly into the river. This is one of the causes of water pollution affecting the habitat and raises the risk of epidemic outbreaks.

According to a preliminary assessment of investigators and technical survey team, in those areas of problematic drainage, since the terrain properties of households are poorly secured, many of them suffer a low elevation compared to would-be upgraded pavement and sewage system. As a result, improvement of sewage system shall be a great deal of challenge. However, in the process of project planning, technical alternates will be recommended to ensure the best drainage capability.

Consulting families about the quality assessment for city drainage system shows that only 30.1% of interviewees considered the current system worked well in all conditions; 57.4% confirmed poor performance under heavy rain.

Thus, it can be said that the community does not appreciate Tan An City's drainage system, which largely underperforms during heavy rains. Ward 2 community appeared most optimistic about their sewage system since 48.1% of the asked considered the current system worked well in all conditions. Loi Binh Nhon Ward and Khanh Hau Ward suffered the worst sewage system with 75.8% and 73.2% of negative opinions.

The overview of project area water drainage system prompts the planers as well as competent authorities to take measures and select appropriate effective investment alternate for these areas under the subproject.

Waste water system: Currently, Tan An City has not had an individual waste water collection and treatment system. Wastewater and rain are collected into a shared water drainage system and discharged directly into the environment. Untreated wastewater discharge is the cause of environmental pollution and spread of disease in the community.

2.4.3. **Power supply**

Power supply: Tan An City is currently powered from the national power gridline through Long An station 110/22 / 15kV - 1x40MVA and Tan An station 110/22/15kV - 2x40MVA.

The entire substation system is outdoor, placed on columns with a capacity range of 10 - 100 kVA, grid station 100 - 560kVA range and ground station 630 - 2000KVA range.

Electricity distribution networks: Tan An City distribution network is currently operating at voltage of 15kV and 22kV. It is directly grounded neutralized with 3-phase 4-wire, mostly overhead lines. Concrete columns are mainly centrifugal type 10.5; 12 or 14m.

Conductors comprise bare aluminum wires: AC-240,185,120,95,70 & 50mm2 and bare copper wires: M-48,38, & 22mm2. Some lines have axial diameter of 120 or 240.185 mm2. 1-phase lines use 50mm2 wire. Inner urban gridlines have loop circuits structure of open normal operation by segmentation devices (LBS, FCO). Suburban gridlines have beam configuration.

Regarding the current use of electricity in the project area, investigators have researched on existing household power supply. It is found that 97% of households answered that they were using the national grid with their own power meter and only 1.8% of households still had to share the power supply with others.

When evaluating the quality of power supply services in the project area, the consultants came up with two criteria, which are the frequency of power cuts and amperage. Below is the opinion of the people.

It is showed that the major part of households within three project area confirmed a low frequency of power cuts (70.9%), 20.6% indicated a frequency of 1 – 2 cuts/month and 3.3% referred to 3 – 5 cuts/month; while only 0.6% of the asked said that they suffered more than 5 cuts/month.

Survey statistics as presented in the below graph shows that the strength of power supply is not the immediate concern for people's demand, since only 3.3 % of the respondents affirmed the essentiality of power, while other 39.1% hinted at the sufficiency of power supply and 56.8% accepted the power supply volume. In general, there is rather no difference between locations of the project areas, as most of the wards feature 70% of their people satisfying the amperage of power for domestic use.

Nowadays, most parts of Tan An City power gridlines are exposed type with elevated or outdoor grid substations, which sufficiently satisfy the electrical technical requirements and offers a low power loss of 10%. However, they fail to assure the urban landscape aesthetics. In the future, it is necessary to develop urban underground power gridline so as to build up a nice city scenery

2.4.4. **Current status of solid waste collection and treatment**

a. Existing conditions of waste collection and treatment

Solid waste - domestic waste is among the problems of big cities, especially such developing cities as Tan An City. Bulk volume of daily household waste should be raised as an issue of concern, so as to find suitable and effective solutions to ensure environmental landscape and quality of life, at the same time assure environmental sanitation of solid waste collection, transportation, disposal and treatment.

Collection

Tan An City has a garbage dump at Loi Binh Nhon Commune, about 7km to the north of City center, with an area of 1.5 ha. It is an exposed landfill without any waterproof layer, collection and treating system for waste gases as well as waste water. Currently, the dump is closed and does not receive any more rubbish.

Currently, the entire city's waste is collected and handled to the waste treatment area in Tan Dong Thanh Hoa district, about 17km to the north of Tan An City. Its scale is 336,051m2 and waste treatment capacity is 400 tons/day. The average amount of garbage stays around 50 tons/day, equal to about 80% of capacity.

According to the survey, 81.1% of people equivalent to 398 households in the project area currently use waste collection services, 18.9% equivalent to 93 households have not used waste collection service. These households are living far from the downtown area in small alleys where the service has narrow access. Besides, some poverty-stricken households stay free of service to

save the cost of living. For 93 households out of access to the waste collection service, the universal treatments are: (i) Bury/landfill in the garden: 19.4% (18 households); (ii) burn: 73.1% of households; (iii) 5.4% and 2.2% of households discharge waste directly into the river and other water bodies arbitrarily. These polluting actions should be eliminated in the community through propagandas to raise the community consciousness.

In general, the local people appeared very excited and eager to answer when asked about the solid waste collection current status, especially those households living in places with waste collection service. During the interview, they boldly proposed plans and measures to guaranty the service in their area. This signifies an active participation of people in environmental hygiene and the recent development of the people awareness of this issue. These poses initial advantages of the project owed to people participation and support at preparation stages.

b. Environmental pollution:

When asked about local environmental issue, 63.5% (312 households) affirmed the signs of environmental pollution in their habitat. Concerning the level of environmental pollution, 57/312 households (18.3%) believed that the environment was heavily contaminated, while 255/312 households (81.7%) considered environmental contamination at a mild level.

Many issues related to environmental sanitation in residential areas such as sewage, garbage, bad odors, dirt, noise, should be raised, yet in different levels for different locations.

42.6% is the major percentage of people who confirmed their vulnerability to floods in rainy season; this percentage is followed by 40.9% who stating their habitat pollution due to stagnated waste water and 33.4% signed off on air pollution in their ambience. Many households shared opinions in raising such problems as: floods stagnated waste water, stench/waste gases from food processing facilities, livestock slaughtering, husbandry farms and noise from transport vehicles - especially in the inter-communal ward roads. The results proves a high degree of environmental pollution in populated areas and this situation is likely to accelerate in the coming years unless in case of prompt interventions.

2.4.5. **Risks and Impacts of Climate Change and Sea Level Rise**

Long An province and Tan An City are located in the Mekong Delta region, which is vulnerable to climate change impacts, including: droughts, salt intrusion, tidal surges, floods and landslides. From 2010 to 2012, Long An province identified a number of action plans to cope with climate change and rising sea level for the period 2010-2030. It is said that the frequency of climate change impacts is unpredictable. Particularly, the local community is encountering with the following risks and challenges:

- Risk of an increasing mortality rate and injury to extreme weather events which occur abnormally and outbreaks of infectious disease such as influenza, diarrhea, and dengue fever.

- A significant portion of plantation in the province may be inundated and exposed to salt intrusion, while the freshwater ecosystem is narrowed in parallelism to the rising salt and brackish water ecosystem will due to sea level rise. Local endemic plants will be likely degraded. In dry season, such regions as Ben Luc, Can Duoc, Tan Tru and Chau Thanh may have a salinity up to 15 ‰.

- The area of rice and vegetables production in southern districts were lost or suffers abortion and reduced productivity (2013 and 2015), about 40,000 ha of summer-autumn rice are sapped by prolonged drought and lack of water.

- 49923.0 hectares prone to deep submerge (over 100.0 cm and over 05 months of submerge) spreads over 04 districts of Tan Hung, Vinh Hung, Moc Hoa and Tan Thanh. Shallow flooded areas (above 60 cm to 100 cm) is 186,762.0 hectares, spreading over districts of Tan Hung, Vinh Hung, Moc Hoa, Tan Thanh Nam and Duc Hoa, Thanh Hoa, Thu Thua and 03

communes in northeastern Vam Co Dong river, Ben Luc district. High emission scenario forecasts the local submerging risk as follows:

Table 2.18. Flooded areas of districts and proportion against the entire province area in high emission scenario

District	Total	Current status		2020		2030		2050	
	(thousand ha)	Area (thousand ha)	%	Area (thousand ha)	%	Area (thousand ha)	%	Area (thousand ha)	%
Ben Luc	287.95	52.03	18.07	90.04	31.27	106.84	37.1	139.03	48.28
Can Giuoc	215.32	74.22	34.47	111.19	51.64	126.77	58.87	156.96	72.89
Tan Thanh	422.95	273.11	64.57	312.84	73.97	320.06	75.67	328.57	77.68
Moc Hoa	503.36	245.32	48.74	292.34	58.08	308.37	61.26	333.93	66.34
Thach Hoa	468.51	220.27	47.01	325.53	69.48	354.7	75.71	392.27	83.73
Tan Hung	500.05	311.8	62.35	336.97	67.39	346.22	69.24	361.87	72.37
Vinh Hung	383.49	112.11	29.23	147.31	38.41	159.76	41.66	177.07	46.17
Chau Thanh	155.24	42.3	27.25	73.95	47.64	86.97	56.02	110.34	71.08
Tan Tru	106.38	12.72	11.96	24.4	22.93	32.18	30.25	49.91	46.92
Tan An	81.74	15.75	19.27	31.19	38.15	39.06	47.78	52.95	64.78
Thu Thua	298.47	113.12	37.9	169.32	56.73	185.76	62.24	207.79	69.62
Duc Hoa	427.28	52	12.17	74.89	17.53	91.32	21.37	130.22	30.48
Can Duoc	219.94	41.85	19.03	74.15	33.72	93.99	42.73	135.4	61.56
Duc Hue	430.82	59.59	13.83	91.03	21.13	104.51	24.26	137.61	31.94
Long An	4501.49	1626.16	36.12	2155.16	47.88	2356.51	52.35	2713.89	60.29

*(**Source**: Report on plans responding to climate change and sea level rise of Long An Province for 2020 – 2030 period)*

- The trend that lowest water level of all months appeared higher, earlier incurrence of salinity and saltwater intrusion against inner fields would adversely affect the agricultural production and freshwater fish farming and exacerbate the lack of domestic water, especially in southern districts of the province, such as Can Duoc, Can Giuoc and Tan Tru.

- Temperature increase raises the risk of forest fires, reduces coverage and biodiversity.

- Heavy rains concentrating in rainy season in combination with the high tidal peak lead to field flooding and water logging. In dry season, occurs freshwater shortage causing significant damage to agricultural production. Furthermore, short-term drought underscores the risk of saltwater intrusion in the southern districts of the province;

- Drought and rising temperatures put pressure on the industry as a result of shortage of water, disrupts production and raises the cost of cooling equipment.

- The increasing demand for water leads to over-exploitation and lowering of groundwater levels.

- Worsened saltwater intrusion affects the quality of underground water, hence degrades products especially of those industries as food processing, textile and dyeing, and escalates the water treatment cost.

- Extreme weather phenomena may destroy the transportation system and constructions.

- Rising sea level increases investment costs, slacks the progress and poses puzzles to construction methodology, thus problematizes the building and development of cities, industrial

parks and clusters, river embankment, water drainage in those low-lying areas, basins of Vam Co Dong and Vam Co Tay rivers and the neighborhood of Soai Rap river gate of Long An.

Impacts of climate change and sea level rise in medium emission scenario:

- *Impacts of change in rainfall and temperature*

Average annual rainfall of Long An province would experience a steady upward trend over the periods. In particular, it was about 1602 ml in 2020 and will increase to 1669.6 ml in 2100. In contradiction to such upward trend of rainfall over years, the precipitation would decrease by the periods within one year over the years. December – February and March – May periods will see downward rainfall and the highest drop up to 2060 would be -13.1% during December – February since this time is the dry season. June-August and September-November would see increasing rainfall and the highest increase would be 11.7% in 2016 during June-August.

Long An province average temperature tends to increase over the years and ranges from 27.8 to 28.4^{o}C in the period from 2020 to 2100. However, temperature increase level would vary among period of time in year and maximum temperature rise in March – May in 2060 would be 1.47^{o}C. The scenario foresees a rise of temperature by 1.47^{o}C by 2100 and a fall of province's rice production down to about 4.743 tons/ha (down by 0.527 tons/ha);

Increased rainfall exacerbates local inundation and causes damage to agriculture, especially vegetables. Unseasonal rains from December to February will occur more repeatedly leading to loss of production of fruit trees and short-term industrial crops. In particular, in response to climate change, farmers in many parts of the province may demolish massively traditional crops and replace by other crops.

- *Impacts of salt water intrusion*

Current state of saltwater intrusion in Long An Province is quite complicated. Some part of Vinh Hung & Moc Hoa districts is exposed to 3‰ salinity, while such districts as Duc Hoa, Thu Thua, Ben Luc, Can Giuoc and Tan An City are prone to 5-10‰ salinity, particularly, Chau Thanh, Tan Tru and Can Duoc districts are influenced by up to 15‰ salinity.

According to the scenario of climate change and rising sea level under a medium emission level, compared to the 2010 Current status, saltwater intrusion in the province would be increasingly worse with increasingly encroaching saltwater bodies in parallelism with new salinized regions such as Duc Hue or Vinh Hung (Vinh Chau A, Vinh Dai and Vinh Buu communes).

Future vulnerability:

As evaluated by the Action plan to cope with climate change and rising sea level of Long An Province for 2010-2030 period:

Since the sea level rises simultaneously with the tide of Mekong River upstream, a major part of districts in Dong Thap Muoi such as: Tan Hung and Thanh Hoa, some parts of districts adjacent to Vam Co river, Vam Co Dong and Vam Co Tay riverside would be flooded.

Livestock yields and production will be reduced by increased fluctuation range of temperature, humidity and other external factors. The livestock feed supply reduction will push down the development of animal husbandry. In addition, some diseases raises threat of outbreaks, such as foot and mouth, anthrax, hemorrhagic septicemia & cholera, which eventually results in the rising cost of husbandry.

The heat causing water temperature rise will lead to aqua-animal mass mortality, especially in those shallow shrimp ponds pursuing advanced extensive farming with depth of only 0.7m. Besides, rising temperatures would reduce dissolved oxygen content in the water at night, thus affect the growth and development of livestock; shrimps may die or grow slowly. On the other hand, higher frequency of disease incurrence will undermine aqua-production.

Persistent shortage of rainfall due to prolonged hot weather will deplete fresh water source and escalate water evaporation in farming ponds, thus driving the lack of fresh water for freshwater aquaculture or rising the salinity of brackish water aquaculture ponds and eventually triggering mass death of aqua-stock. However, in rainy season, storms generating strong waves can destroy the embankment system, while rising sea level make press the freshwater fish farm to be relocated or converted into brackish water aquaculture. Nonetheless, due to the ruined environmental quality of water, aquaculture output would be poor.

Life activities and industrial production today rely on about 35% of the provincial total water supply (approximately 37,100 m^3/day) and tap mainly from groundwater sources. But in some areas the groundwater levels is lowered due to saltwater intrusion, causing water shortages. This disrupts production operation, reduced production quality and increases cost of business. By 2030, demand for industrial water would be 391.743m^3/day. Climate change scenario of high emission level portends a more severe shortage of water for industrial production in case the current status is not better.

According to the survey results of Long An Province's Regional water supply planning toward 2020 and vision to 2030, most urban areas of town or higher levels have centralized water supply system. These water supply systems are almost independent for each municipality and using groundwater. Total capacity of underground water exploitation from drilling wells in Long An province is now about 110,000 m3/day. The exploitation focuses on N22 strata, which is a shallow water bed compared to other parts of the region. Individually calculated for N_2^2 strata, the exploitation capacity is 63,585 m^3/day, despite lower than the potentiality, it exceeds the dynamic reserve of the water bed (40,430 m^3/day), which lowers the static water level of this bed (for example in Ben Luc: the static water level has lowered from 4.0 ÷ 6.0m in 1997 to 10 ÷ 13m). This stimulates further saltwater intrusion and absorption of pollutants from the surface to water beds, at the same time raises the risk of land slump.

Long An locates in the river delta and has a dense canal system and abundant surface water, but ground water is the main source of living for households and businesses. Concerns about the sustainability of groundwater resources come from three factors: 1) Over-exploitation in some regions; 2) The uneven underground water distribution among regions and varied seasonal water volume; and 3) Impaired water quality due to waste water from households and industrial activities and salinization. The salinization problem is particularly apparent and is regarded as one of the biggest risks in Vietnam coastal areas (Dinh et al., 2012).

2.5. ENVIRONMENTAL AND SOCIAL CONDITIONS AT PROJECT SITE

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

2.5.1. Component 1: Low income area (item 1.1) and canal/ponds in Lias (item 1.2); a park in Lia 2 (item 1.3)

- **Lia 1 and Ao Quan**

Invested items for Lia 1 include upgrading for alleys in streets, drainage, lighting, trash bin provision and improvement for about ¼ pond without embankment (dredging and embanking). After upgrading, wastewater from households and runoff rainwater will be collected into drainage sewer lines and discharged into natural canals/channels in the area.

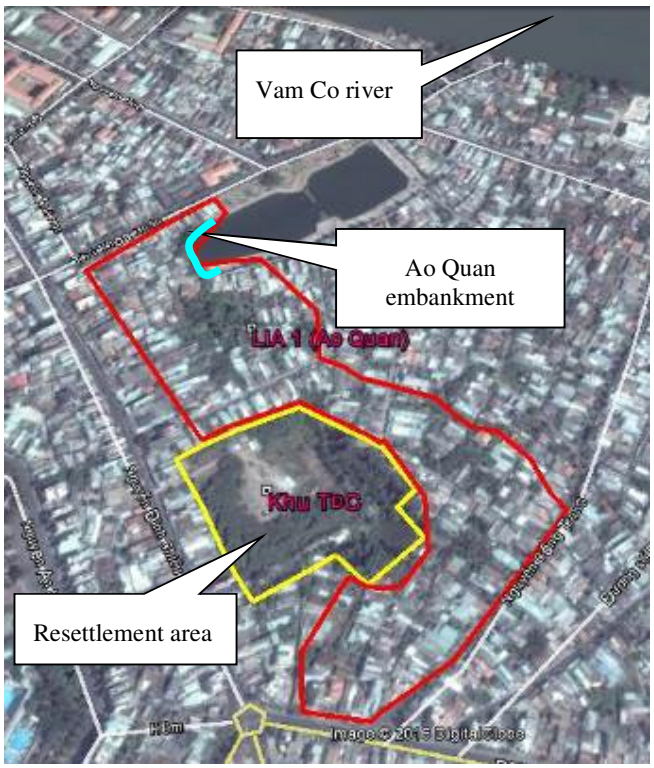
LIA 1 is located in ward 3 with area of 7.8 hectare (mainly residential land and part of garden area); population is about 1064 people in which is mainly Kinh people) and limited by Nguyen Dinh Chieu street; Thu Khoa Huan and Nguyen Thong street. Resident in Lia 1 is relatively dense. Housing types in LIA 1 are mainly temporary house. Roads in alleys are also degraded and at low sanitary conditions.

Ao Quan has about 1.75 hectare with main function of landscape and reserve for part of runoff rainwater in the area. No, about ¾ of pond was embankment; the remaining part has not been embanked has a length of 103m. This section is located at the end of road to the embankment of Thu Khoa Huan street. The surrounding area of pond without embankment was degraded seriously: grass weed with clump to facilitate for waste centralization which is more and more increasing and cause to environmental pollution and lost urban landscape.

The alleys in LIA are degraded concrete roads and the drainage sewer system is not synchronized. In some surrounding routes such as Thu Khoa Huan, Nguyen Cong Trung, the drainage sewer have been installed along two sides; however, alleys in the residential area have not also drainage sewer. Wastewater from households and runoff rainwater is discharged naturally into canal/channel in the project area.

Main transporting route for materials and disposal of the area is as the following: Nguyen Dinh Chieu street →Chau Thi Kim→Hung Vuong →National highway (NH) 62 →Landfilling site in Tan Dong commune.

There is not PCR and sensitive points in LIA1



Current status of Ao Quan

Alleys in Lia 1

Figure 2.13. Specific environmental and social conditions in Lia 1

- **LIA 2. Mui Tau canal and park:**

Invested items for Lia 2 include upgrading for alleys in streets, drainage, lighting, trash bin provision and improvement for Mui Tau canal (dredging and box culvert); construction of green tree park with area of 0.5 ha. After upgrading, wastewater from households and runoff rainwater will be collected into drainage sewer lines and discharged into natural canals/channels in the area.

LIA 2 is located on ward 2 with area of 2.7 hectare (mainly residential land and part of garden land. water surface land in the residential area). population are about 316 people under Kinh people and limited by Hoang Hoa Tham street and NH No.1A.

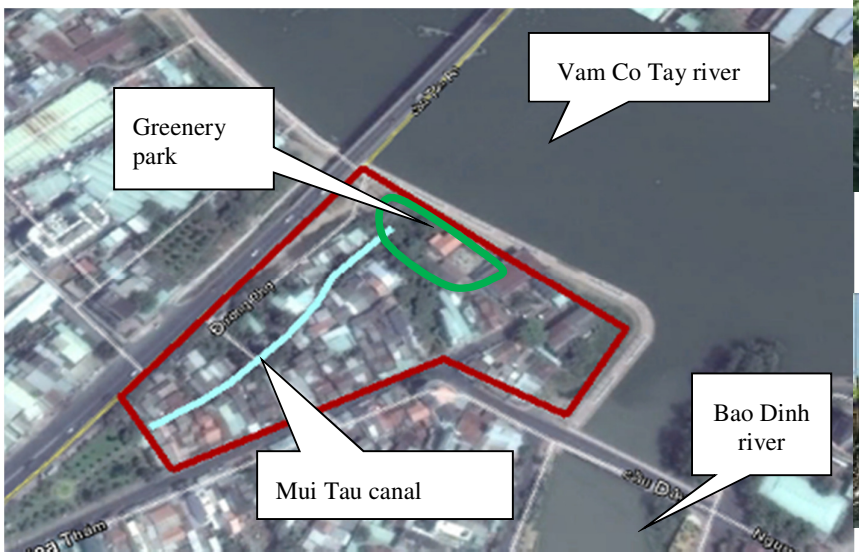
The existing alleys in LIA 2 do not have drainage system. Wastewater and runoff rain water naturally discharged into surrounding canals such as Mui Tau Canal, Bao Dinh river and Vam Co river; population density in LIA 2 is relatively high. Housing structure is mainly temporary. The alley surface is degraded and smaller than 2.5m; sanitary condition is low.

Mui Tau canal is dead-end with function for main drainage in the area. The canal is of 168 m long; 2-4 m wide and, about 1.2 m deep, beginning from alley 80 and connected with QL1 to Vam Co river. The canal is not dredged regularly so canal surface is full of grass weed, reeds, and trees that prevent flow. Wastewater from households and runoff rainwater is freely discharged into canal/channel in the project area

The area of the 0.5 ha park LIA 2 is the vacant land, which is previously belong to form of Long An Power Company. This area is occupied with grass weed, and bushes.

Main transporting routes for materials and disposal of the area is as the following: QL 1→Hung Vương street→Hung Vương street→ QL 62→Landfilling site in Tan Dong commune.

There is no PCR and sensitive points in LIA 2



Mui Tau canal is full of waste

Current drainage of households

Figure 2.14. Specific environmental and social conditions in Lia 2

- **LIA 3 and Cau Tre canal (section 1):**

Invested items for LIA 3 are included upgrading for alleys, drainage, lighting, waste bin and waste trolley provision. After upgrading, wastewater from households and runoff rainwater will be collected into drainage sewer lines and discharged into natural canals/channels in the area.

The rehabilitation of Cau Tre canal includes dredge and construction of box culvert.

LIA 3 is located on ward 4 with area of 20.1 ha with a population of 1944 people in which Kinh people and limited by QL1A and Luu Van Te with Nguyen Van Tao. Population density is relatively thick. Land in the Lia is mainly residential and part of garden land/ surface water in the residential area.

The current status of alleys in LIA 3 is also without drainage system. Wastewater and runoff rain water naturally discharged into surrounding canals such as Cau Tre canal; housing structure is mainly temporary. The allays are degraded and narrow <=2.5m; sanitary condition is low.

Cau Tre canal (section 1) in LIA 3 with total length of 550m is begin from Nguyen Van Tao street to Le Quy Don high school. The canal bottom is full of waste and grass weeds on two sides. Canal width is from 3-8m, and the depth is about 1.5m; average bottom altitude is from -0.2m, embankment altitude is from +1.3 m. The main function of canal is drainage for basin about 2 ha. With current situation of wastewater stagnant leading to environmental pollution and drainage condition prevention in general of the area. Cau Tre canal is connected with Nguyen Van Tao street in Lia 3 at Km 1 +200.

In LIA 3 (toward Luu Van Te street), there are some cultural structures and sensitive points such as Thien Khanh Temple, Phuong Hong kindergartens (detailed description in section 2.6).

Main transporting route for materials and disposal of the area is as the following: Nguyen Van Tao street → NH No.62→Landfilling site in Tan Dong commune.


Drainage system in Lia 3


Dark water in LIA 3

Figure 2.15. Specific environmental and social conditions in Lia 3

- **LIA 4 and Rot canal:**

Invested items for **LIA 4** are included upgrading for alleys, drainage, lighting, waste bin, waste truck and improvement for Rot canal (dredging and box culvert); After upgrading, wastewater from households and runoff rainwater will be collected into drainage sewer lines and discharged into natural canals/channels in the area.

LIA 4 is located on ward 6 with area of 21.4 hectare (mainly residential land and part of garden land and water surface in the residential area). Population is about 2352 with major Kinh people and limited by Nguyen Thi Bay street, Le Van Kiet and Nguyen Thị Hanh street.

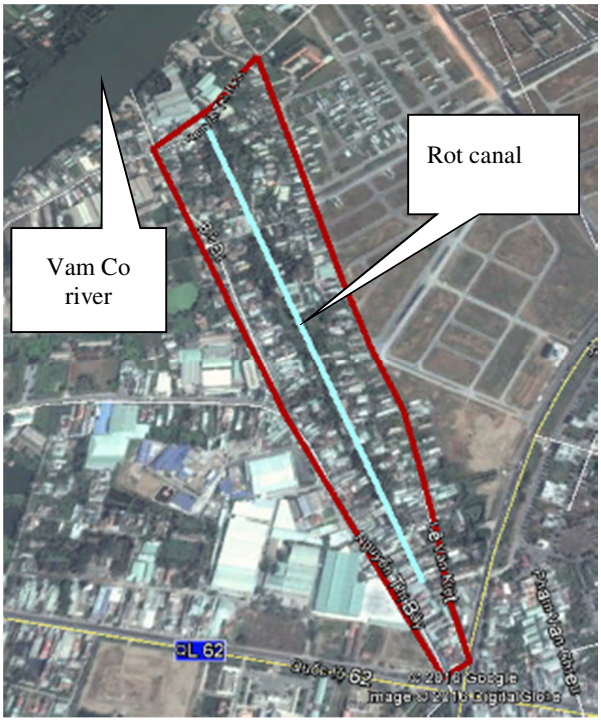
The current status of alleys in Lia 3 is also without drainage system, wastewater and runoff rain water naturally discharged into surrounding canals such as Rot canal and Vam Co river; housing structure is mainly temporary. Alley surface is degraded; there is no lighting system and regularly be flooded.

Rot canal flows along LIA 4 with length of 1211m starting from National Highway QL62 to Vam Co river, of 3-8 m wide, 1.9 m deep, average bottom altitude of -0.2m. The altitude of canal embankment 1.7 m and drainage basin is about 19.3 ha.

Rot Canal is polluted by organic substances and microorganism due to unregulated discharge of the wastes and domestic wastewater into the canal body. During the dry season it is badly smelly and black. The cause of the contamination is due to wastewater discharge from the livestock of the farmers. Along with that, is occupied by the channel, not be dredged regularly, grassy, reed, hyacinth on surface channel preventing from flow, along with consciousness and habits of many households, often throwing all kinds of garbage into the canal, decompose over time, polluted, affecting the habitat of the people around. On the other hand, in recent years, many production facilities (seafood processing) and direct discharge of wastewater into the canal making pollution worse. Rot canal is width over 5m before and now which is all rubbish and grass weed growing for encroachment of canals.

Main transporting route for materials and disposal of the area is as the following: QL 62 →Landfilling site in Tan Dong commune.

In LIA 4, there is not any PCR and sensitive points.



Current situation of drainage condition in Lia

Current situation of Rot canal

Figure 2.16. Specific environmental and social conditions in Lia 4

2.5.2. **Component 2: Prioritized Tertiary and Secondary Infrastructure Areas**

- **Item 2.1: Construction area of Bao Dinh river's Embankment and connecting road:**

Constructing section of Bao Dinh river's Embankment:

Construction of embankment and green tree park on two sides of Bao Dinh river from Bao Dinh bridge to sluice gate under ward 3,4 with total length of upgraded section from 650 m, total length of embankment line on two sides is about 1.3 km. After constructing, runoff rain water will be collected into drainage sewer along embankment and directly flows to Bao Dinh river.

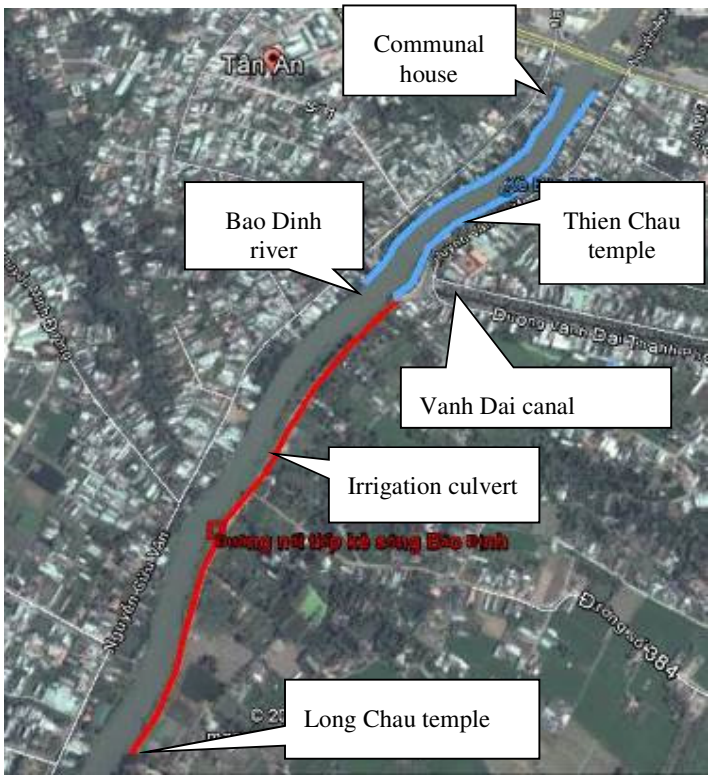
Bao Dinh river is waterway connecting Vung Gu canal with My Tho canal under Tien Giang province, which is main drainage canal for Tan An city. Width of river is from 20-40m, average bottom altitude is 5m, altitude of canal embankment is about +1,7m. Now, Currently both sides of the channel are occurring landslides and erosion, and because consciousness of the people

is not a good result in the garbage thrown into the canal caused environmental pollution, loss of urban landscape.

Current situation of Bao Dinh river bottom is good to participate in transport in waterway, but density of ship/boat travelling is not high, mainly for small ships/boat carrying agricultural products.

Many households live along two sides of embankment, ending section of embankment (side toward Huynh Van Nhut road) far from Thien Chau temple about 50m; side on Nguyen Cuu Van road is far from Binh Yen Dong communal house about 30m (see detail description on Section 2.6).

Main transporting route for materials and disposal of the area is as the following: Hung Vuong street→ QL 62→Landfilling site in Tan Dong commune



Bao Dinh river

Connecting road to Bao Dinh embankment

Irrigation culvert crossing road.

Figure 2.17. Specific environmental and social conditions in Bao Dinh river embankment and connecting road

Constructing section of connecting road with Bao Dinh river embankment:

The location of connecting road with Bao Dinh river embankment is on ward 7 with beginning point from Vanh Dai canal and ending point at Long Cau temple with length of 1km, width of 3-4m. These is rout to connect transport between ward 7 and Hung Vuong street. After constructing, runoff rain water will be collected into drainage sewer along and directly flow Bao Dinh river.

Surface is soil road with many grass seed and become muddy on having rain causing to difficult for travelling of people in the ward 7. One side is Bao Dinh river and remaing side is mainly farmland, only few temporary house along rout.

On drainage, lighting: there is not any drainage system and ligting system, rain water is directly discharged into Bao Dinh river.

There is currently no residential bridge crosssing Bao Dinh river. Section on the middle has Long Chau temple far from 20m by fencing gate and green trees of temple and one irrigation sewer from Bao Dinh river and across conecting road with diameter about D1500 (see detail description on Section 2.6).

Main transporting route for materials and disposal of the area is as the following: Huỳnh Văn Nhứt street →Hung Vương street→QL 62→Landfilling site in Tan Dong commune.

- **Item 2.2. Improvement of Cau Tre canal (section 2):**

Upgrading for Cau Tre canal (dredging and embankment) is under ward 4 limitted by Nguyen Cuu Van street and National Highway QL1A in companied with Nguyen Minh Duong. After constructing, wastewater from households and runoff rainwater will be collected into drainage sewer along rout and directly discharged into Cau Tra canal.

Current situation of Cau Tre canal is length of 1240m starting from Nguyen Cuu Van to National Highway 1, width is currently from 308m, depth is from 1.9m, average bottom altitude is -0.2m, altitude of canal embankment +1.7m, main function of canal is drainage for basin area of 37 hectare.

Cau Tre canal is polluted by organic substances and mircoorganism. because mainly of random discharge of the wastes and domestic wastewater into the canal body. During the dry season it is badly smelly and black. The cause of the contamination is due to wastewater discharge from the livestock of the farmers. Along with that, is occupied by the channel, not be dredged regularly, grassy, reed, hyacinth on surface channel preventing from flow, along with consciousness and habits of many households, often throwing all kinds of garbage into the canal, decompose over time, polluted, affecting the habitat of the people around. On the other hand, in recent years, many production facilities (seafood processing) and direct discharge of wastewater into the canal making pollution worse. Rot canal is width over 5m before and now which is all rubbish and grass weed growing for encroachment of canals.

On waterway transport: because the canal is more and more narrow by encroaching leading to travelling prevention of ships and boats so main function of canal now is only drainage. Currently, there is no residential bridge across the canal.

On lighting system: there is no lighting system;

On resident: there are about 130 households living along two sides, people density is more crowded on two ends where was improved.

Main transporting route for materials and disposal of the area is as the following: Nguyen Van Tao→ QL 62→Landfilling site in Tan Dong commune.

There are no PCR and sensitive point along Cau Tre upgrading line.

Current situation of Cau Tre canal

Figure 2.18. Specific environmental and social conditions in Cau Tre canal (section 2)

- **Item 2.3. Ring Road 2 Construction Area:**

Construction of ring road become asphalt road with drainage insfrastructure, lighting and green trees under Loi Binh Nhon commune and Khanh Hau ward; beginning point is from Rach Chanh canal in Loi Binh Nhon commune to ending point at QL1A of Khanh Hau ward with total length is 5.95 km with width of 33m (consist of pavement). After constructing, wastewater from households and runoff rainwater will be collected into drainage sewer along rout and directly discharged into canals in the area.

Ring road is divided into 2 following sections:

- Section 1 (Km0+00- Km4+200) is length of 4.2 km from Chanh canal to connecting interchange with Nguyen Tan Chinh with length of 4km to Pham Van Tuan street and Nguyen Tan Chinh street. The existing road has width of 3.5m covered by gravel and macadam, and remaining thickness is from 5cm to 8cm, rainy muddy road, walking difficulties, it is dirt and pollute in dry season affecting people's lives on either side. Two roadside are mostly farmland and a small portion of residential land, sparsely populated. This section will be upgraded to be expanded by the asphalt road, with width of 33 m (including sidewalks). It has a irrigation ditches with length of about 4 km and width of 5-6 m, is located to the right of Phan Van Tuanroute, prolonged along Nguyen Tan Chinh Street and ends at the junction with the Can Dot canal. Current canal is the excavated trench, taking water from Chanh canal, Can Dot canal and water supply for agricultural irrigation in the area.

- Section 2, where is length of 1.8km, is newly constructed, current situation is mainly farmland and part is residential land and garden land. Resident is sparsely surround; the section will be filled and newed by asphalted road with width of 33m (including pavement).

Intersection route (other level) with overbridge of National Highway HCM – Trung Luong and Mang bridge with existing scope as follows: overbridge National highway (bridge No.7) at Km4+562; Mang bridge at Km6+023.

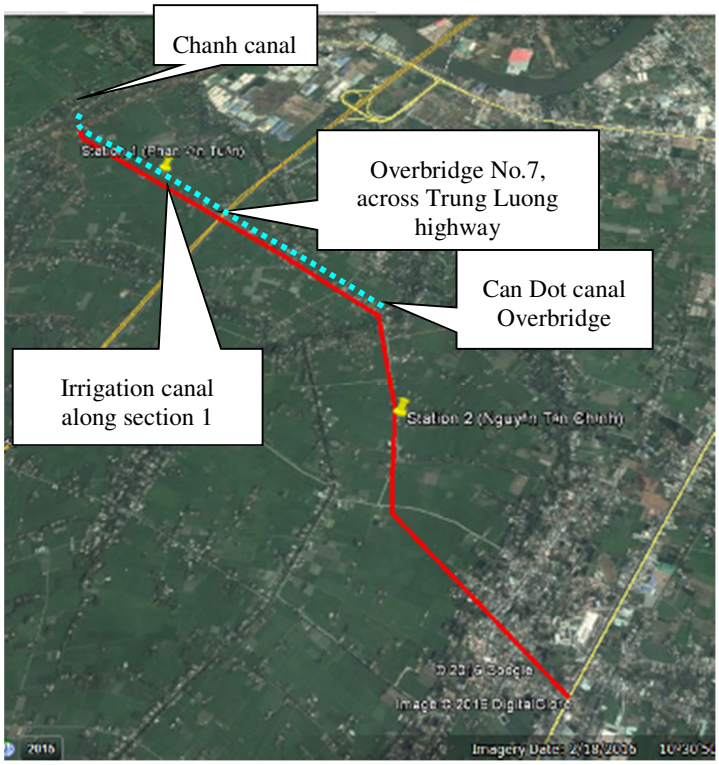
Drainage sewer on the route: it has not invested drainage system on the route, so rain water flow naturally following vertical and horizontal slope of road surface to rice fields, ponds, ditchs and canal and somewhere is low topography. On the route, there has a horizontal sewer at Km7+026.62, Ø100cm, length 8.10m in charge of drainage on flood and serving for irrigation and agricultural production.

Electric poles on the route: along for section of existing road toward left. it is low voltage electric pole system that is constructed with telephone pole far from existing road center at 5m. At Km6+828 on the left is far from road center 23m is high voltage pole with wire line 500kv; at Km8+900 on the left is far from road center 87m is high voltage pole with wire line 110kv. The electric poles on the route is located on distance of 5m and 23m which will be relocated.

Domestic water supply pipeline: along for section of existing road toward left which is far from average road center about 4m having a domestic water supply pipeline Ø49mm invested by the resident for clean water supply in the area.

Main transporting route for materials and disposal of the area is as the following: QL 62→Landfilling site in Tan Dong commune.

There is no PCR along Ring road construction line, only irrigation canal along section 1 as mentioned above.



Nguyen Tan Chinh road section

Section Pham Van Tuan and irrigation canal

Figure 2.19. Specific environmental and social conditions in Ring road

- **Item 2.4. Luu Van Te road construction area:**

Upgrading for Luu Van Te road is located on ward 4 with length of 1.85km with beginning point from QL1A and ending point at interchange of Nguyen Van Tao road. Luu Van Te existing road is soil with width of 3-4m which will be upgraded to become asphalted road with width of 7m, pavement is 7.0m (3.5mx2). It shall construct technical infrastructure for Luu Van Te including rainwater and wastewater drainage sewer, lighting system, green trees. After constructing, wastewater from households and runoff rainwater will be collected into drainage sewer along rout and directly discharged into canals in the area.

Luu Van Te road is surrounding route of Cau Tre canal with section from National Highway 1 to road of Tan An city. It is the route for traffic connection between QL1 and Ngyen Van Tao street. The route currently is degraded (soil road, flooded if having rain) and affects on

travelling of the resident as well as development of infrastructure for LIA's in Cau Tre canal in the future.

The beginning section of Luu Van Te route toward QL1 to section of Phuong Hong kindergarten has population density relatively crowded, mainly is residential land and garden land, the density is scattered in remaining section with few household.

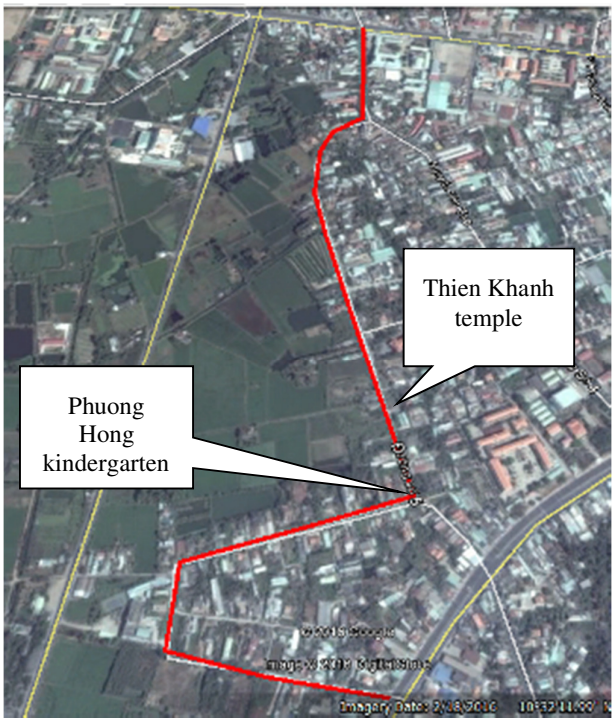
Drainage sewer on the route: it has not invested drainage system on the route affecting on drainage in the area. Wastewater and runoff rainwater directly discharges into surrounding canal, such as, Cau Tre canal, fields.

Lighting system: at the begginning section of the route toward QL1 to section of Phuong Hong kindergarten, there has pole system and ligting system, the poles will be relocated on upgrading for Luu Van Te. The remaining section has not lighting system affecting on travelling of the resident.

Environmental sanitation: it is regularly flooded when it is heavy rain and many bricks, dirt directly affects on the life of the resident in ward 4.

On Luu Van Te route, there are some object-cultural structure and sensitive points, as follows: Thien Khanh temple, Phuong Hong kindergarten (see detail description on section 2.6).

Main transporting route for materials and disposal of the area is as the following: Nguyen Van Tao → QL 62→Landfilling site in Tan Dong commune.




Luu Van Te existing road (beginning section)


Luu Van Te existing road (ending section)

Figure 2.20. Specific environmental and social conditions in Luu Van Te road

- **Item 2.5. Construction area on connecting road between Tran Phong Sac with Nguyen Minh Duong:**

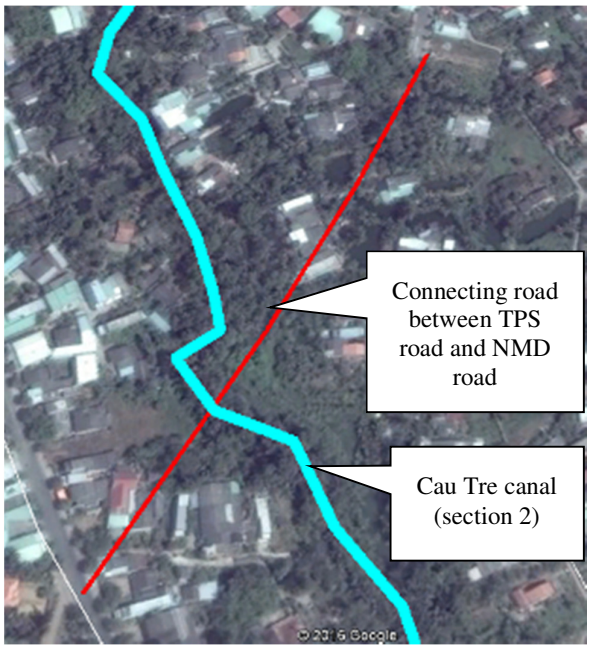
Connecting road area with total length of 450m is located on ward 4 with total length of 500m to become asphalted road, drainage, lighting system, water supply and green trees. The route is located on ward 4, beginning point is connected with Nguyen Minh Duong road and ending point is connected with Nguyen Phong Sac street. After constructing, wastewater from households

and runoff rainwater will be collected into drainage sewer along rout and directly discharged into canals in the area.

Currently, the area is blind land with grass and tree growing surround as well as filled by waste, it is usually flooded when it is heavy rain and waste is badly smelly polluting to surrounding environment causing diseases for the people. People density at two connecting points with Tran Phong Sac road and Nguyen Minh Duong is relatively crowded, there is mainly residental land and garden land of households; at the middle section, populaion density is low and mainly is temporary house and garden land/ water surface. Wastewater and runoff rain water currently is discharged into natural canal in the area such as Cau Tre canal, Bao Dinh river. The road is connected with Cau Tre canal at the position Km 0++100, it will construct a residental bridge across Cau Tre canal with 1 span at the location, width of 7m, length of 10m (see detail description at table 1.2).

Main transporting route for materials and disposal of the area is as the following: QL 1→Hung Vương street→ QL 62→Landfilling site in Tan Dong commune.

There is no PCP and sensitive points along the route.



Connecting point with Tran Phong Sac road

Middle section of connecting road

Figure 2.21. Specific environmental and social conditions in connecting road between Tran Phong Sac road and Nguyen Minh Duong road

2.5.3. **Component 3: Resettlement sites**

Tan An city project will be constructed with full of technical and social infrastructure (traffic road, drainage and water supply, lighting system, social infrastructure) for resettlement area 2 hectare on bordering with ward 1 & 3. After constructing, wastewater from households (after treated by septic tank) and runoff rainwater will be collected by drainage sewer along the rout in the resettlement area and directly flows into channel/canal in the area.

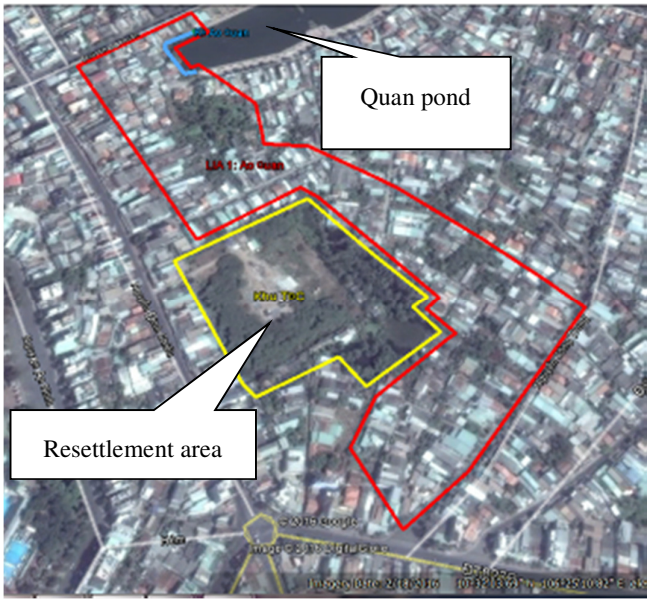
The resettlement area is approved by Decision No.1985/QĐ-UBND dated on 27/4/2015. The area of land used for the resettlement of the project is former base of prison Long An Province. Currently only around 3-4 households living temporarily on the land, 01 cultural houses and 01

temporary market is under construction (expected to be used to do social work for the resettlement of the project).

Location of resettlement area is located on Lia 1 at the center of project so it is quite favorable for displaced households.

Main transporting route for materials and disposal of the area is as the following: Nguyen Dinh Chieu→Chau Thi Kim →Hung Vuong street→ National Highway (QL) 62 →Landfilling site in Tan Dong commune.

There is no any PCR and sensitive points in resettlement area.



Current situation of resettlement area

Figure 2.22. Specific environmental and social conditions in resettlement area

2.6. SENSITIVE CULTURAL RESOURCES AND SITES IN THE SUBPROJECT AREA

2.6.1. **Tan An City Physical Cultural Resources**

Insert paragraphs on the physical cultural resources in the city.

PCRs and sensitive areas in the project location

The Tan An project does not have any direct impact on historical and cultural, religious, schools and health facilities in the process of land acquisition. However, during the construction phase, the transportation of materials can affect the sensitive sites.

In the pre-construction phase, land acquisition will not have any direct impact on religious buildings (temples, shrines, churches, etc.);cultural and historic sites (relic, monument); public facilities (schools, health facilities); and cemetery.However, in the construction phase, transportation and construction activities may have negative affect sensitive sites.

Construction activities may have impacts on these sensitive areas due to dust and noise and traffic disturbance caused in the construction phase. Most of these sensitive sites are away from construction areas from 20m to 50m. Some sites are very close, just 10 – 20m away from construction areas such as Thien Khanh pagoda, Phuong Hong kindergarten, Thien Chau pagoda and Long Chau pagoda. However, material transportation activities do not occur frequently (non-continuous emissions).On the other hand, construction vehicles will be always shielded to avoid spills that affect on the environments. Therefore, transportation activities will be controlled to

minimize impacts on surrounding areas and will not cause negative impacts on sensitive sites. Details of sensitive areas near and within the subproject area are presented in Table 2.19:

Table 2.19. Sensitive Sites within the Tan An project area

No.	Name/Figure	Location	Distance from the Subproject area (m)	Description
I.	**Pagodas, churches**			
1	Thien Chau Pagoda 	Bao Dinh river embankment, together with road and park in Ward 3.	30	The pagoda locates at No 101 Huynh Van Nhat Road, Ward 3, Tan An City, toward Hung Vuong Road. Large number of households along the road, moderate traffic density. The pagoda is about 30m from Bao Dinh river.
2	Long Chau Pagoda 	Make a road continuum to Bao Dinh river embankment and ending at Ward 7 border	10	The pagoda locates at No 157 Nguyen Van Trung road, An Thuan 1, Ward 7, Tan An City toward Hung Vuong Road, Moderate number of households along the road, low traffic density. The pagoda is about 10m - 15mfrom Bao Dinh river.
3	Thien Khanh pagoda 	Upgrade Luu Van Te road in Ward 4.	20	The pagoda locates at No 48 Luu Van Te road, Ward 4, Tan An City, toward Hung Vuong Road. Moderate number of households along the road, low traffic density. The pagoda is about 20m fromLuu Van Te road.
4	Binh Yen Dong Temple 	Bao Dinh river embankment, together with road and park in Ward 4.	30	The temple locates at No 44 Nguyen Cuu Van Road, Ward 4, Tan An City, toward Hung Vuong Road. Large number of households along the road, moderate traffic density. The temple is 25m - 30m far from Bao Dinh river. It is located in the other side of Nguyen Cuu Van Road, opposite to the project site.
II.	**Other constructions**			
1	Phuong Hong Kindergarten	Upgrade Luu Van Te road in Ward 4.	10	The kindergarten is located at No 20 Luu Van Te road, Ward 4, Tan An City. It provides 8 classes to about 150 children aging from 8 months to 5 years. The kindergarten provides preschoolling to people in the ward and neighboring. It is about 10m far from Luu Van Te road.

No.	Name/Figure	Location	Distance from the Subproject area (m)	Description
				

Location of sensitive sites near the subproject area are presented in Figure 2.23:

Figure 2.23. Location of sensitive sites

CHAPTER 3. ANALYSIS OF ALTERNATIVES

Scaling up Urban Upgrading Project – Tan An city sub-project is made in conformity with the national and regional urban upgrading policies and the local urban development planning and socio-economic development plan. By investing in this sub-project, Tan An city will achieve key targets such as roads, drainage and lighting system which will help the city to leapfrog to class III city by 2020. The related policies are stated as below:

- The National Urban Upgrading Program for the period 2009-2020 as promulgated by the Prime Minister in Decision 758/QD-TTg
- The National Urban Development Program as detailized in the Decision 1659/QD-TTg dated November 7, 2012 by the Prime Minister
- Approval of the amendment to the Orientation of the Master Planning for the development of urban system in Viet Nam towards 2025 and with vision of 2050 as in Decision 445/QD-TTg dated on April7, 2009 by the Prime Minister
- Approval on the Proposal for Climate Change adapted Urban Development Program in Viet Nam for the period of 2013-2020, governed under Decision 2623/QD-TTg dated on 31 December 2013 by the Prime Minister.
- Approval on The Action Plan for Viet Nam Green Growth Strategy for the period 2014 – 2020 as specified in the Decision 403/QDD-TTg dated on 20 March 2014 by the Prime Minister.

The analysis of the alternatives of the project plays an important role in the process of environmental and social impact assessment. This analysis activity includes the description, identification and comparison of design alternatives, which are important to support the decision-making choice of construction activities in the Project area of Tan An City. Accordingly, the options selected are considered for the least negative impacts while they are still technical sound and cost-effective. Further, alternative analysis also maximizes positive impacts in terms of environmental and social aspects.

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

3.1. “WITHOUT PROJECT” ALTERNATIVE

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

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

- Traffic congestion in rush hours due to an inadequate and degraded urban transport network leading to the restrictions of local and regional transportation and trading activities;
- LIAs still suffer from the lack of road and waste management service, inadequate drainage and sanitation systems. Low connectivity between LIAs (narrow and zigzagging streets which are without or partially covered with concrete surfaces) and other areas of the city will pose persistent isolation for the poor in LIAs.
- The discharges into and encroachment of the main drainage canal in the City’s inner area (Mui Tau, Rot, Cau Tre canals and Quan pond) will continue to pose and cause serious environmental pollution, stream blockage and spreading epidemic disease.

- In addition, the city of Tan An city is being also affected by climate change impacts (local inundation, erosion of river banks, etc.).

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

- Enhance the commuting conditions of local people, reduce traffic jam, and create force for economic development;
- Increase the accessibility of LIAs to surrounding area;
- Improve the living conditions of people via providing them access to basic technical and social infrastructure;
- Reduce local flooding, improved hygiene and sanitation conditions in project area through canal dredging and drainage system improvement.
- Improve urban landscape in the project area with the increase of green space; and thereby, facilitate tourism development. Additional economic, social, environment and aesthetic benefits from the construction of linear parks along Mui Tau, Rot, Cau Tre canals and Quan pond i.e. open space for recreation of local people.
- These investment construction works will bring benefits for Tan An City, aiming to become a resilient city to climate change impacts and to mitigate vulnerabilities due to sea level rise, flood risks, and soil subsidence, among others.

The analysis results are shown in Table 3.1.

Table 3.1. Analysis of the alternatives - "Without Subproject" and "With Subproject"

Major Environmental and Social Issues	WITHOUT SUB-PROJECT	WITH SUB-PROJECT
Environmental issues		
Air Pollution	Air pollution from the following sources: - Emission of odorous compounds from the decomposition of waste disposed/ discharged directly into the canals and bare land in LIAs; - Emission of exhaust gas from vehicle, dust along degraded, dirt roads	Air quality can be improved by ways of: - Upgrading and widening of alleys in LIAs will enable the accessibility of trucks for collecting garbage daily, preventing pollution - Upgrading and renovating alleys and roads will increase transport connectivity, which minimizes congestion during rush hours; - The sub-project will cause some environmental negative impacts on ambient air however these effects are short term and will cease upon the completion of the construction phase.
Water Pollution	Canal water is seriously polluted by the direct discharge of domestic wastes and effluent from households along the canals.	Canal dredging and embankment will help improve water quality. Encroached households will be relocated to new resettlement site.
Soil erosion	Soil erosion risks increase due to heavy rains, strong tide, sea level rise and climate change consequences.	Soil erosion risks reduce by new embankments that provide protection to river and canals.

Major Environmental and Social Issues	WITHOUT SUB-PROJECT	WITH SUB-PROJECT
Drainage Capacity	Urban areas are still flooded due to the combination of upstream floods, high tides and heavy rains while drainage system is under capacity.	Flooding situation is prevented as new and adequate drainage system is being installed in 04 LIAs, 04 roads and upgrading 03 canals.
Climate Change Adaptation	Tan An city is severely affected by climate change, 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; and land subsidence.	The subproject will brings positive effects on urban infrastructure development, urban management, being prepared and built up city resilience to climate change.
Social issues		
Land Acquisition and Resettlement	Not affected by land acquisition and resettlement.	About 899 households are estimated to be affected, including 727 partially affected households and 172 fully affected households
Disturbance of daily community activities	No impacts on the lives and activities of local people in Tan An city and community relationships.	Livelihoods and daily activities of local people as well as community's relations will be affected by relocation and construction activities.
Accessibility of social infrastructure	Local communities (LIAs) suffer from risks and incidents such as fires, natural disasters, diseases, etc. due to the limited accessibility to technical and social infrastructure.	Improved technical infrastructure (traffic, drainage, lighting, etc.) will enable the connectivity between areas and among areas of the region. Losses of lives and property will be minimized due to risks and incidents.
Health and Sanitation Improvement	Environmental sanitation conditions are exacerbated due to flooding and poor water quality, which might spread epidemic diseases.	Improved environmental sanitation conditions will minimize the spread of diseases, especially for households living along Mui Tau, Cau Tre, Rot canals, Quan pond.
Increasing Land Value	Low land value	Upgrading and renovation of roads will lead to the formulation of new residential areas and social infrastructure. Value of land in these areas will increase. Constructing the embankment of Tan An subproject: Mui Tau, Cau Tre, Rot canals, Quan pond, Bao Dinh river will create more public spaces and better landscape.
Urban Landscape	Poor urban landscape without infrastructure improvement	Encroached households will be relocated, creating open spaces along the river banks with riverside landscape architecture, public spaces, planting and restoration of traditional architecture.

Major Environmental and Social Issues	WITHOUT SUB-PROJECT	WITH SUB-PROJECT
Benefits	None	About 98,000 and 370,000 people are direct and indirect beneficiaries. Additionally, living condition of households along canals will be stable.

3.2. "WITH PROJECT" ALTERNATIVE

This section will provide alternative analysis of technical options for the Project's components, including: (i) Upgrading tertiary infrastructure in LIAs (Component 1 – subcomponent 1.1); (ii) Rehabilitation of polluted canals ponds in LIAs (Component 1 – subcomponent 1.2); and (iii) Embankment of Bao Dinh river (Component 2 – subcomponent 2.1); (iv) Renovating Cau Tre canal (Component 2 – subcomponent 2.2).

There is no alternative analysis for the investment items of road construction of Component 2 (subcomponents 2.3 – 2.5) and Component 3 as they mostly in line with the planning. However, with the proposed civil construction works of these components, a wide range of benefits and advantages were recognized in the above-mentioned in Section 3.1. The alternatives analyses are conducted considering a combination of technical, economic, environmental, and social criteria.

3.2.1. **Component 1 – Upgrading Tertiary Infrastructure in Low Income Areas**

Subcomponent 1.1: Upgrading, widening of alleys

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

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

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

Table 3.2. Alternative Analysis of Component 1 – item 1.1

Content	Option 1	Option 2	Option 3 (selected)
Description	▪ Expanding all alleys in LIAs with 4 m wide. The expansion will be made toward both sides from the current centerline. ▪ Technical infrastructure will be installed coupled with road expansion, including: elevation and surface concrete,	▪ Upgrading and improving existing alleys/lanes with current width of 2 – 3 m. ▪ Installing technical infrastructure, including: water supply, drainage and lighting systems, and trees.	▪ Widening main alleys with minimum width of 4 m will be prioritized; small alleys will be improved based on current status with the width is more than 2 m. ▪ Installing technical infrastructure, including: elevating and surfacing with concrete, installing

Content	Option 1	Option 2	Option 3 (selected)
	installation of sewerage and lighting systems, and trees).		drainage and lighting systems and trees.
Technical assessment	▪ The 4 m wide alleys will allow the fire trucks, ambulance cars access to houses in case of emergency. ▪ Construction activities may be delayed due to lengthy compensation and site clearance processes. ▪ Good landscape, wide alley and easy travel.	▪ The narrowness of alley width makes difficult access for fire trucks, ambulance car in case of emergency. ▪ It is easy for construction activities as in line with the current baseline. ▪ Poor landscape because the alleys are narrow.	▪ The 4 m wide alley makes accessible for fire trucks and ambulances. ▪ Small lanes and alleys can be easily connected with main roads. ▪ Ensuring landscape and public amenities.
Social assessment	▪ Living conditions of local people are significantly improved because of convenient and easy accessibility to social infrastructure services. ▪ Land acquisition and resettlement are high ▪ Causing disturbance of daily activities and livelihood for local people due to great volume of land acquisition ▪ It could result in conflicts and compensation complaints during the pre-construction phase as the amount land acquisition is the highest	▪ Living conditions of local people are not much improved due to the alleys are still narrow. ▪ No land acquisition and resettlement is required ▪ Low disturbance of local daily and livelihood activities as the construction work is simple and no land acquisition ▪ Conflicts and grievance will be minimized as construction works are in line with current baselines.	▪ Living conditions of local people are improved ▪ Land acquisition and resettlement are moderate. ▪ Moderate impact on social disturbance as the construction work and volume of land acquisition is moderate. ▪ Conflicts and grievance will be moderate since there is moderate amount of land acquisition
Environmental sustainability	▪ Environmental hygiene and sanitation conditions are improved substantially. ▪ Better landscape and waste management ▪ Local flooding is improved because storm water runoff and wastewater will be collected ▪ Construction related impacts (noise, dust,	▪ Environmental hygiene and sanitation conditions are improved substantially. ▪ Landscape and environmental management would not be much improved ▪ Urban flooding will no longer occur because storm water and wastewater will be collected	▪ Environmental hygiene and sanitation conditions are improved substantially. ▪ Better landscape and waste management ▪ Flooding is eliminated because storm water and wastewater will be collected ▪ Construction related impacts (noise, dust,

Content	Option 1	Option 2	Option 3 (selected)
	construction solid wastes) are highest due to its highest volume of demolition and construction activities ▪ Accessibility will be greatly enhanced	▪ Construction related impacts (noise, dust, construction solid wastes) are lowest due to lowest volume of demolition and construction activities ▪ Accessibility would be difficult for emergency, fire safety, evacuation or waste collection purposes.	solid wastes) are moderate due to moderate volume of demolition and construction activities ▪ Accessibility will be relatively enhanced
Investment effectiveness	▪ The price of land and house will significantly increase. ▪ Compensation and resettlement costs are higher due to more affected households. ▪ High cost for a large amount of construction works.	▪ Land value will not much increase. ▪ Compensation and resettlement costs are minimized. ▪ Low costs for construction.	▪ House and land values will increase moderately. ▪ Compensation and resettlement costs are higher due to more affected households. ▪ Construction cost will be higher in between Option 1 and 2.
Evaluation	Overall, the analysis shows that: ▪ Option 1 will significantly enhance the landscape, accessibility and local travel within LIA. However, it has the highest cost of investment and land clearance ▪ Option 2 has the lowest cost of investment and land clearance. However, this option does not thoroughly address environmental problems, i.e. uncollected solid waste still remains due to narrow alleys limiting the accessibility of collection trucks. ▪ Option 3 presents more advantages than both option 1 and option 2 because of reasonable cost for investment and land clearance. In addition, there will be improvements on landscape, accessibility and local traffic. The environmental impacts are moderate and manageable. Therefore, Option 3 is selected.		

Subcomponent 1.2: Rehabilitation of polluted canals ponds in LIAs

(i) Embankment of Quan pond (in Lia 1):

According to the current satus and consideration in the extension of existing the embankment, the options are revealed as follows:

- Option 1: The embankment is winding according to the public land boundary, sidewalks of the embankment are not spared for building concreted road.

- Option 2: Rehabilitaion of straight embankment. Sidewalks of the embankment are concreted with a width of 2m.

The analysis results are shown in Table 3.3.

Table 3.3. Analysis on the options for the structure of Quan pond embankment

Criteria	*Option 1*	*Option 2 (selected)*
Description	- Revetment with concrete vertical retaining wall. - Sidewalk by brick tiles along the canal	- Revetment with concrete slope on pile foundation. - Concrete sidewalk and operation road along the canal
Technical	- Highest stability. - Require an installation of a dewatering cofferdam - Lengthy construction time - Require reinforcing foundation toward the household side to ensure the stability, increasing construction cost. - Difficult for construction handling at some embankment bends - There is no connection with Thu Khoa Huan road thus traffic is not easy	- High stability. - Higher demanding of backfilling volume to straighten out the bended segment of the canal - Does not require dewatering cofferdam - Ensure the harmonization with the existing section of Quan pond embankment. - Connect with Thu Khoa Huan road making traffic easily.
Environmental	- Smaller vibration impacts on neighborhood households. - Construction related impacts (dust, noise, waste) are higher due to higher volume of construction work.	- Higher volume of dredged materials - The progress of piling can cause vibration or even crack for neighboring households. - Construction related impacts (dust, noise, waste) are average due to average volume of construction work.
Social	- Land acquisition and resettlement is low	- Land acquisition and resettlement is moderate.
Investment cost	- Highest construction cost	- Medium construction cost
Conclusion	By analysis, option 2 has outstanding advantages such as requiring small number of affected households and shortening implementation schedule; Have insignificant impacts on living conditions of local people while construction. Therefore, **option 2** is selected.	

(ii) For Mui Tau canal (in Lia 2) and Cau Tre – section 1 (in Lia 3):

The comparison of options aim at selecting a construction and rehabilitation method which are in line with the current status of the area and meet requirements about stability, environmental beauty and the purposes as well as low cost. Thus, options are proposed as follows:

- Option 1: Construction of box culvert and a road on top of the culvert
- Option 2: Ecological soft embankment with grass/tree landscaping

The analysis results are shown in Table 3.4.

Table 3.4. Analysis on the options for the rehabilitation of Mui Tau canal and Cau Tre canal– section 1

Criteria	*Option 1 (selected)*	*Option 2*
Description	- Construction of boxculvert coupling with a road on top	- Ecological soft embankment with grass/tree landscaping

Criteria	*Option 1 (selected)*	*Option 2*
Technical	- Matching with local topography of small canals. It requires small amount of earthworks. - The foundation of culvert is reinforced by concrete piles, making it highly stable, durable and sustainable - Create a wide space and turn it to a road. - Simple construction method however it requires longer contruction time - Difficult for O&M of box culvert because the culverts are placed underground.	- It is not suitable as canals are small and narrow, small slope. Higher amount of dredging materials - The embankment roof is not very highly stable, bearing some risk of erosion and landslide. - Use environment-friendly materials. Beautiful and low cost. - Hard to control construction quality because of unclear process, regulations and standards. Shorter construction time. - Regular but easy mainatenance of grass and landscaping trees.
Environmental	- Less permeable due to concrete embankment surface - No risk of bank erosion.	- Better soil surface permeability - Low risk of bank erosion.
Social	- No land aquisition and site clearance - Affected households: 0 household	- Require higher land acquisition. - Affected household: 21 households
Investment cost	- Construction cost is lower	- Construction cost is higher
Conclusion	By analysis, the option 1 is suitable with the current status as well as satisfy requirements: stability, environmental beauty and purposes of the area as well as low cost. Thus, **option 1** is selected.	

(iii) For Rot canal (in Lia 4):

There are 2 options for Rot canal embankment, follow:

- Option 1: Revetment with concrete retaining wall

- Option 2: Ecological soft embankment with tree landscaping. The analysis results are shown in Table 3.5.

Table 3.5. Analysis on the options for the structure of Rot canal embankment

Criteria	*Option 1*	*Option 2 (selected)*
Description	Revetment with concrete retaining wall	Ecological soft embankment with tree landscaping
Technical	- Embankment stability is ensured and is higher than the option 2. - More difficult in construtrion - Longer construction duration Operation and maintenance is moderate. - Might have some delay due to lenthy compensation and site clearance processes.	- Embankment stability is ensured as the flows of the canals are small and there is no traffic waterway activity. - High aethetics with green appearance - Easy control over construction quality. Construction time is short term. - Regular and easy O&M.

Criteria	*Option 1*	*Option 2 (selected)*
Environmental	- Higher environmental impacts from pilling operation, material transport and construction of embankment. - Minimized risk of bank erosion	- Insignificant impacts, using ready-made materials, environment-friendly materials. - Low risk of bank erosion
Social	- 140 affected households; Disorder living activities of local people.	- 108 affected households. Do not have much impacts on the living activities of local people.
Investment cost	Construction cost is higher	Construction cost is lower
Conclusion	By analysis, option 2 is suitable with current status of the area as well as meet requirements: statbility, environmental landscape and purposes of the area as well as low cost. O**ption 2** is selected.	

3.2.2. **Component 2 – Priority primary and secondary infrastructures**

Subcomponent 2.1: Embankment of Bao Dinh river

Pursuant to current status of embankment and consideration in the extension to the existing embankment, options are proposed as follows:

- Option 1: Vertical hard embankment in combination with precast concrete blocks.
- Option 2: Hard embankment by RC retaining wall.

The analysis results are shown in Table 3.6.

Table 3.6. Analysis on the options for the structure of Bao Dinh river embankment

Criteria	**Option 1**	**Option 2 (selected)**
Description	Revetment with slope pre-fabricaed concrete Sidewalk and park after the canal bank	Revetment with concrete retaining wall Sidewalk and park after the canal bank
Technical	- Structure stability is lower. - Less beautiful than option 2 because the embankment foot is widely reinforced, allowing smaller space for sidewalks - Construction method is more complicated; Construction of embankment foot depends on tidal level - Construction time is longer because of depending on tidal level while construction. - Not consistent with the existing section of Bao Dinh river embankment.	- Structure stability is higher - Beautiful because the embankment foot is small, creating more space for the sildewalk. - Construction method is easier because of having not many items to be carried out; - Construction time is faster (do not depend much on the tidal level while construction). - Conform with the existing section of Bao Dinh river embankment
Environmental	- Less noise impact than option 2 - Construction related impacts (dust, noise, waste) are higher due to hihger volume of construciton work	- Higher noise and vibration impacts due to pile driving operation - Construction related impacts (dust, noise, waste) are lower due to lower volume of construction work.

Criteria	Option 1	Option 2 (selected)
Social	- The impact on land acquisition, resettlement, and livelihood restoration are lower	- The impacts on land acquisition, resettlement, and livelihood restoration are higher.
Investment cost	- Construction cost is higher	- Construction cost is lower
Conclusion	By analysis, option 2 is low-cost, suitable, durable and environmental friendly. It is also in conformity with the existing section of Bao Dinh river embankment. Therefore, **option 2** is selected.	

Subcomponent 2.2: Embankment of Cau Tre canal – section 2

Two design options for embanking Cau Tre - section 2 are proposed as below:

- Option 1: Revetment with concrete retaining wall
- Option 2: Ecological soft embankment with tree landscaping

The analysis results are shown in Table 3.7.

Table 3.7. Analysis on the options for the structure of Cau Tre canal-section 2 embankment

Criteria	*Option 1*	*Option 2 (selected)*
Description	Revetment with concrete retaining wall	Ecological soft embankment with tree landscaping
Technical	- Structure stability is higher - Beauty and landscape is moderate. Have beautiful landscape at high water level but look stiff at low water level. - More complicated construction with concretizing large volume - Easy for maintenance because it is structured of concrete blocks.	- Structure stability is lower. - Beauty and landscape is higher. The landscape along canal sides is beautiful thanks to sodding and green trees. - Easy construction by stacking sandbags - Regular maintanence required.
Environmental	- Higher environmental impacts due to piling operation, material transport and construction of embankment - Minimized bank erosion.	- Insignificant impacts on environment as using available and environment-friendly materials. - Small risk of bank erosion
Social	- The impacts on land acquisition, resettlement, and livelihood restoration are higher (23 affected households)	- The impacts on land acquisition, resettlement, and livelihood restoration are lower (15 affected households)
Investment cost	- Construction cost is higher	- Construction cost is lower
Conclusion	By analysis, option 2 – ecological and soft embankment conforms with currenet status of the area, being low cost, easy to implement, durabe and environmental friendly. Thus, **option 2** is selected.	

CHAPTER 4. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

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

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

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

4.1. ENVIRONMENTAL IMPACT ASSESSMENT

4.1.1. **Positive impacts**

Positive impacts brought about by the project comprise of:

Development of technical infrastructure, enhancement of people's living conditions, attraction of investors, promotion of Tan An city to be a socio-economic development center and motivation of Long An province.

When these infrastructures complete, the city will experience high economic growth, thereby reducing the social costs, improving social welfares and living standards of people in LIAs as a result of raising their awareness and improving their life. Living condition and employment stability will be an important factor to help the poor to better their life and find jobs with higher income.

The city's proposal on construction of technical infrastructures (construction of road, rehabilitation of canals, drainage improvement, urban rehabilitation, etc) will have reciprocal effects on the general development of urban infrastructure, strengthening the infrastructure and increasing the project sustainability. Drainage canals rehabilitated and put into operation along with the development of public transport will create more favorable living conditions for local people in Tan An city. This ensures the city's urban rehabilitation towards modernity and the compliance with the objective of becoming a green-clean-beautiful city.

The project will have a domino effects on the development of urban infrastructure broadly in both scope ande sectors; especially capacity building of state institutions for urban management, administrative reform, transport, land and climate change will benefit industrial, agricultural, fisheries and ecotourism.

The project will create temporary/long-term jobs for the community in the project area (traders, masons, etc) during the project construction and operation period.

Currently, Tan An are calling for more investors to the city in order for additionally investing in projects regarding bridges, roads and wastewater treatment, contributing to the improvement of urban infrastructure, sanitation and climate change resilience. These projects have been more or less brought positive impacts. Therefore, the project in combination with other project will make greatly contribution to stimulating the development of the city in various fields.

4.1.2. **Negative impacts**

4.1.2.1. ***Identification, assessment of types and scales of impacts***

The project implementation will cause negative impacts on the environment, thereby affecting environmental elements and components, urban landscape, people's health and natural resources surrounding project area. The identification of environmental impact sources is carried in 03 phases.

Phase I -Preparation: preparation of reports for investment, design, compensation and site clearance and mine clearance.

Phase II - Construction: leveling, construction of items, technical works, installation of equipment, etc.

Phase III - Operation.

Potential negative impacts of the Project are presented as follows:

- None (N) – No impact;
- Low (L) – Low level: Small work, small impacts, localized, reversible, temporary.
- Medium (M) – medium level: Small works in sensitive/urban areas, medium-scale with medium impacts, reversible; mitigable and manageable localized, temporary.
- High (H) – negative impact at high level: medium-scale works in sensitive/urban area, large-scale works with significant impacts (social and/or environment, many of which are irreversible and require compensation.
- 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 from subproject implementaion

Component	Physical			Biological		Social				Others	
	Air, noise, vibration	*Land, soil, water*	*Solid waste, sludge*	*Forest, Natural habitats*	*Fish, aquatic species*	*Land acquisition and resettlement*	*Native ethnic group*	*Physical Cultural Resources, the sensitive points*	*Livelihoods, community disturbance*	*Local flooding, traffic, safety*	*Off-site impacts*
Component 1: Tertiary infrastructure upgrading for 4 LIAs, total investment capital 5,7 million USD (Ward 1, 3, 4, 6)											
- Upgrading, expansion of main lanes and branch lanes with full of technical infrastructure such as electricity, water, environmental sanitation; drainage system; - Canals/ ponds in LIAs: (i) Ao Quan Embankment; (ii) Rehabilitation – upgrading of 03 Canals: Mui Tau canal, Cau Tre canal, Rot canal; - Power supply system: Displacement of electricity poles, low voltage lines in new positions suitable to expanded alleys/lanes. - Total area of 52 ha; Total length of rehabilitated roads and construction of new extension with a length of 2,2 km; 348 affected households; 11 resettled and displaced households.										
Pre-construction stage	N	N	N	N	N	M	N	N	N	M	L
Construction stage	M	M	M	N	L	N	N	N	M	M	M
Operation stage	L	L	L	N	N	N	N	N	N	L	N
Remark	- Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2nd note below) - Pre-construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement (see 4.2) - Construction stage: (i) Local flooding; (ii) Offensive odor from sediment dredging small canal in LIA; (iii) Road traffic disturbances and increased traffic risks; (iv) Healt and safety risk to the community; - Operation stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe; (iii) Environmental sanitation at waste sites.										
Component 2: Upgrading prioritized primary and secondary infrastructure, including embankment and construction of a park in both banks of Bao Dinh river from Bao Dinh culvert to the saltwater prevention gate and construction of an extension of the embankment in a side; Upgrading of Cau Tre canal (dredging and embankment of canal sides); Construction of ring road; Upgrading of Luu Van Te road; Construction of a link connecting Tran Phong Sac to Nguyen Minh Duong road.											
Sub- Component 2.1: Embankment and construction of a park in both banks of Bao Dinh river (ward 3, 4, 7) - Hard embankment and construction of a park in both river banks from Bao Dinh culvert to saltwater intrusion gate with a length of 1,3 km. Construction of asphalted road extending the embankment in ward 7 with a length of 1 km, width of pavement 7 m, sidewalk with a width of 2 m. Total investment capital of 4,7 million USD. - Land acquisition and resettlement: There are 173 AHs and145 DPs; Area of affected residential land of ward 3 is 18018m^2, ward 4 is 20924 m^2, ward 7 is 3761 m^2; No impacts on agricultural land. - Sensitive locations: Thien Chau pagoda with a distance of 40 m; Long Chau pagoda with a distance of 20 m; Binh Yen Dong Temple with a distance of 20 m.										

Component	Physical			Biological		Social				Others	
	Air, noise, vibration	*Land, soil, water*	*Solid waste, sludge*	*Forest, Natural habitats*	*Fish, aquatic species*	*Land acquisition and resettlement*	*Native ethnic group*	*Physical Cultural Resources, the sensitive points*	*Livelihoods, community disturbance*	*Local flooding, traffic, safety*	*Off-site impacts*
Pre-construction stage	N	N	N	N	N	H	N	N	M	N	N
Construction stage	M	M	M	N	M	N	N	M	M	M	M
Operation stage	L	L	L	N	N	N	N	N	L	L	L
Remark	- Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2nd note below) - Pre-construction stage: (i) Risk of UXO; (ii) land acquisition and resettlement (see 4.2) - Construction stage: (i) Offensive odor from dredged material; (ii) Risk of subsidence during construction; (iii) Construction collapse due to piling for cut-of dike; (iv) Risk of damage the existing infrastructure; (v) Local flooding. - Operation stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe.										
Sub-Component 2.2: Upgrading Cau Tre canal (ward 4) - Dredging and embankment of Cau Tre canal with a length of 1.2 km. Total investment capital of 1.1 million USD. - Land acquisition and resettlement: The are 15 AHs and 03 DHs; area of affected residential land of ward 4 is 1415m^2; No impacts on agricultural land - Sensitive locations: Residential area with a distance of 10 – 500m from the construction site;											
Pre-construction stage	N	N	N	N	N	L	N	N	M	M	M
Construction stage	M	M	M	N	M	L	N	N	M	M	M
Operation stage	L	L	L	N	L	N	N	N	L	M	L
Remark	- Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2nd note below) - Pre-Construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement (see 4.2) - Construction Stage: (i) Offensive odor from dredged material; (ii) Risk of subsidence during construction; (iii) Construction collapse due to piling for cut-of dike; (iv) Risk of damage the existing infrastructure; (v) Local flooding - Operation Stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe.										
Sub-Component 2.3: Construction of a ring road (Khanh Hau ward and Loi Binh Nhon commune) - Construction of a ring road with a length of 6 km and width of 33 m. Total investment capital 12.5 million USD.											

Component	Physical			Biological		Social				Others	
	Air, noise, vibration	*Land, soil, water*	*Solid waste, sludge*	*Forest, Natural habitats*	*Fish, aquatic species*	*Land acquisition and resettlement*	*Native ethnic group*	*Physical Cultural Resources, the sensitive points*	*Livelihoods, community disturbance*	*Local flooding, traffic, safety*	*Off-site impacts*
- Land acquisition and resettlement:There are 256 AHs; 37 DPs. Area of affected residential area in Khanh Hau ward is 15020m^2. in Lơi Binh Nhon is 1769 m^2; Area of affected agricultural land in Khanh Hau ward is 55877 m^2. Loi Binh Nhon commune is 96580 m^2. - Sensitive locations: Residential area with a distance from 30-500 m away from the construction site;											
Pre-construction stage	N	N	N	N	N	M	N	N	L	L	L
Construction stage	M	M	M	N	M	L	N	N	M	M	M
Operation stage	M	N	L	N	N	N	N	N	L	L	L
Remark	- Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2nd note below) - Pre-Construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement (see 4.2) - Construction Stage: (i) Risk of flow blocking; (ii) Downgrading the water quality causing by constructing bridge on route; (iii) Impacts on shrimp farmer; (iv) Impacts on PCRs and sensitive Points. - Operation Stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe.										
Sub-Component 2.4: Upgrading of Luu Van Te road (ward 4) - Upgrading of the road with a length of 1.85 km, a width of 14m and adequate infrastructure. Total investment capital of 2,07 million USD. - Land acquisition and resettlement: there area 133 Ahs, and 0 DHs; Area of affected residential land in ward 4 is 11130 m2;No impact on agricultural land. Sensitive locations: Concentrated residential area with a radius within 50 – 300 m, Thien Chau pagoda, Phuong Hong Kintengarden, Long An Electricity Company											
Pre-construction stage	N	N	N	N	N	L	N	N	L	L	L
Construction stage	M	M	M	N	M	L	N	N	M	M	M
Operation stage	M	N	L	N	N	N	N	N	L	L	L
Remark	- Impacts of low or medium levels from construction operations can be mitigated with ECOPs (see 2nd note below) - Pre-Construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement (see 4.2) - Construction Stage: Impacts to PCRs and sensitive sites. - Operation Stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe.										

Component	Physical			Biological		Social				Others	
	Air, noise, vibration	*Land, soil, water*	*Solid waste, sludge*	*Forest, Natural habitats*	*Fish, aquatic species*	*Land acquisition and resettlement*	*Native ethnic group*	*Physical Cultural Resources, the sensitive points*	*Livelihoods, community disturbance*	*Local flooding, traffic, safety*	*Off-site impacts*
Sub-Component 2.5: Construction of a link connecting Tran Phong Sac road to Nguyen Minh Duong road – ward 4 - Construction of a link connecting Tran Phong Sac to Nguyen Minh Duong road with a length of 0.5 km and a width of 12m. Total investment capital of 0.7 million USD. - Land acquisition and resettlement: there are 11 AHs; and 0 DHs; Area of affected residential land in ward 4 is 550 m^2 - Sensitive locations: Residential area with a radius between 20 - 300 m.											
Pre-construction stage	L	M	L	L	L	M	N	N	L	N	N
Construction stage	M	M	M	M	M	N	N	L	M	M	M
Operation stage	L	L	L	N	N	N	N	N	N	L	N
Remark	- Impacts of low or medium levels from construction operations can be mitigated with ECOPs. (see 2nd note below) - Pre-Construction stage: (i) Risk of UXO; (ii) Impacts from land acquisition and resettlement (see 4.2) - Construction Stage: (i) Risk of flow blocking; (ii) Impacts on shrimp farmer; (iii) Impacts on PCRs and sensitive Points. - Operation Stage: (i) Risks of flooding from lack of O/M; (ii) Traffic safe.										
Component 3: Resettlement site - Construction of resettlement site with an area of 2 ha and 159 land lots; synchronous investment includes: backfilling, transport road network, water drainage and supply, power supply, public lighting system and open space. **-** Land acquisition and resettlement**:** None - Sensitive locations**:** residential area with a distance between 50-500m from the construction site;											
Pre-construction stage	N	N	N	N	N	N	N	N	N	N	N
Construction stage	M	M	M	N	N	N	N	N	L	M	M
Operation stage	L	L	L	N	N	N	N	N	N	L	N
Remark	- Danger of remnant bomb and mine. - Impacts from land acquisition and resettlement (see 4.2) - Impacts of low or medium levels from construction operations can be mitigated with ECOPs (see 2nd note below)										

Component	Physical			Biological		Social				Others	
	Air, noise, vibration	*Land, soil, water*	*Solid waste, sludge*	*Forest, Natural habitats*	*Fish, aquatic species*	*Land acquisition and resettlement*	*Native ethnic group*	*Physical Cultural Resources, the sensitive points*	*Livelihoods, community disturbance*	*Local flooding, traffic, safety*	*Off-site impacts*
	- Solid waste and wastewater										
- Notes: For small and medium scale works, most of the impacts are local, temporary and mitigable though the application of technical solutions and good construction management practice with strict supervision, inspection and consultation with the local community											

According to the above table: Impacts identified and assessed in each work items and each phase from preparation to operate for the three components, impacts are at low levels or have no impacts. Some works have impacts at medium level, some at high level because of 18 ha land acquisition which initially affect people's livelihood and social aspects.

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

Investments in synchronous infrastructure for 04 concentrated LIAs. Pursuant to investments, activities cause environmental impacts of this component include rehabilitation, upgrading and expansion of alleys regarding transport, lighting system, drainage, dredging of canals of 4 LIAs. For the component, almost all environmental impacts are common ones (environmental impact repeated in all project items), rehabilitated alleys with small scale, short-term construction, current status of construction areas and characteristics are similar. Typical impacts mainly taken place in construction period with items as rehabilitation and upgrading of canals in LIAs shall be specifically assessed.

4.1.3.1. *Component 1 –Impacts in preparation phase*

4.1.3.1.1. *Impacts from land acquisition*

Land acquisition and resettlement will affect physical and spiritual life of affected households, even causing social problems and prolonged litigation. Although technical options and designs have been selected based on one of the principles of minimizing resettlement the Tan An subproject still affect in total 348 households of which 26 households are to be relocated due to land acquisition impacts. Land acquired will be 12,521 m2 of residential area and 551 m2 are acquired and other effects on structures, assets on land such as fences, cash crops, animal barns of households in construction area. Details are assessed in Section 4.2 – Social impact assessment.

4.1.3.1.2. *Impacts from Unexploded ordnance (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 wartime, 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 from construction period*

A. General environmental impacts

Construction phase including the following activities: dredging 2,1 km of small canals in LIA; 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, etc. 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. Such negative impacts are assessed as follows:

4.1.3.2.1. *Impacts on air environment*

Activities in this phase involved in the construction of a drainage system; road base, curb, sidewalk; lighting system and tree landscaping. These activities will generate significant level of dust and gas emission and Assessment of negative impacts on air environment in Component 1 is as follows:

a1. Dust from demolition of existing works and structures for site clearance

Dust is mainly generated from the demolition of buildings. According to the FS of Tan An city Subproject, the amount of demolition work of needed structures and estimated timeline are provided in table 4.2.

The generated dust volume from these activities is calculated by application of following equation:

Volume of generated dust emissions from the demolition of houses and structures:

Appliable equation: **W = E×Q×d** **[1]**

Including: W: Average generated dust emissions (kg);

E: Particulate emission factor (kg dust/ton);

Q: Emission volume (m^3);

Determination of particulate emission factor- TSP (E):

The particulate emission factor is determined in accordance with is determined according to the guideline document of Environmental Impact Assessment of the World Bank (Environment assessment sourcebook, Volume II, Sectoral guidelines, environment, World Bank, Washington DC, 8/1991) and AP 42 , Fifth Edition Compilation of Air pollutant Emission Factors, Volume 1: Stationary Point and Area Sources as follows:

$$\mathbf{E = k\ x}\ 0{,}0016\ \mathbf{x}\ (U/2{,}2)^{1,4} \div (M/2)^{1.3}\mathbf{,\ kg/ton} \qquad [2]$$

Of which:

E: Particulate emission factor (kg/ton);

k: Structure of medium-size particle (k = 0.35 with dust size <10µm – Structure of dust particle (k) page 13.2.4-4 AP 42, Fifth Edition Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources);

U: average wind speed (m/s) (wind speed is taken as 3m/s);

M: Average humidity of content of debris (%) (Choose the average humidity content of 11% - Table 13.2.4-1 AP 42, Fifth Edition Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources)→ E = 0.03752 kg/ton

Pursuant to the algorithm on determination of dust volume generated from each item. Results of the calculation is shown in Table 4.2

Table 4.2. Estimation of dust volume arising from the demolition for site clearance

No.	Items	Volume of demolition work (m3)	Emission load(kg)	Duration of demolition (day)	Dust emission (kg/day)	Dust emission (mg/m3)	QCVN 05:2013 (mg/m3) *(Average amount in 1h)*
1	LIA 1	92.8	6.27	30	0.209	**2.22**	0.3
2	LIA 2	72.5	4.9	30	0.163	**0.62**	0.3
3	LIA 3	23.9	1.61	30	0.107	**0.37**	0.3
4	LIA 4	354.9	23.97	60	0.4	**0.93**	0.3

In general. the dust emission amount depends on many factors such as structure materials. size of work. humidity and weather conditions in dry or wet season. The above calculated results in the dry season show the dust emission from the demolition activities exceeds acceptable limits under QCVN 05:2013/BTNMT from 1.2 – 7 times varying for each LIA. Dust from demolition work is often at coarse size thus will be quickly deposited. The dust concentration meets allowable limit at the distance from 30 – 40 m away from the demolition area. The dust emission will last about 1 - 2 weeks during demolition process thus the impacts are temporily and can be mitigated.

Dust emission from the leveling activities: On sunny, windy days, the dust emission volume from the leveling activities is quite huge, exceeding the allowable limit with a distance from 40-50m away from the outer edge of the site upon weather conditions. Therefore, the during

the site clearance, the project owner shall take some mitigation measures to control the dust generation and impacts on workers and people who are involved in the demolition.

a2. Dust emission from the backfilling and excavation activities

Construction proccesswill includestripping of the topsoil and excavating soils for installation of water drainage system and underground technical infrastructure. Different types of machines and equipment will be used such asexcavator, roller, hack, shoves that emit dust and exhaust gases.

Based on equation **[2]** the particle emission factor applied for the construction phase under component 1 is: E = 0.0272 kg/ton (of which the parameters used as k = 0.35; U (wind speed) = 3m/s; M (Average humidity content) = 14%).

Thus, the dust emission at each LIA is calculated and summarized in the Table 4.3

Table 4.3. Estimation of dust generation from excavation and backfilling

No.	Items	Excavation, backfilling and ground leveling volume (m3)	Emission load (kg)	Duration of excavation and backfilling (day)	Emission (kg/day)	Emission(mg/m3)	QCVN 05:2013 (mg/m3) *(average value in 1h)*
1	LIA 1	1814.12	74.61	360	0.207	**2.2**	0.3
2	LIA 2	1711.56	70.4	360	0.196	**0.74**	0.3
3	LIA 3	2264.08	93.12	360	0.259	**1.77**	0.3
4	LIA 4	2686.4	110.49	360	0.307	**0.71**	0.3

The results show that dust emission from backfilling and excavation is above to acceptable limits set in QCVN 05:2013/BTNMT from 2.2 – 7.3 times varying at each LIA. The coarse particles are deposited quickly. The dust level is at acceptable limit at a distance of 40 - 60m from the backfilling and excavation area. The dust emission will last about 2-4 weeks along with the use of sucessitive construction method during the excavation process thus the impacts are temporily and can be mitigated.

a3. Dust emission from the transportation of construction materials and disposal of waste

-Transporting materials: To build items of Component 1 (road, sewer, lighting, etc. in the alleys of each Lia), a large volume of basic materials such as cement, sand, backfilling soil, stone, steel, etc will be used. The volume of materials will be bought at the gathering yards of materials and materials stores near the project area of Tan An city, with a distance of 15 km, and transported by 10 ton trucks

- Disposal materials: Debris from the construction period of the Component 1 are mainly debris from the demolition of existing structures (brick, mortar, steel scraps, waste, etc.); Excavated spoil, debris from the construction (cement, redundant mortar, iron and steel scrap, wastes, etc.). The disposal volume in the construction phase will be transported by 10 ton truck at the distance of about 15km to the Long An solid waste treatment and recycle and other available disposal areasin surrounding areas at the boundary of Tan An city and Ho Chi Minh city.

Particulate emissions occur whenever vehicles travel and direct emission is from the loaded construction materials and from vehicles' exhaust, brake wear and tire wear. Particle emission from vehicle transportation can be determined by the following formula (US Environmental Bureau, 1995):

$$L = 1{,}7 \times k.[\frac{s}{12}] \times [\frac{S}{48}] \times [\frac{W}{2{,}7}]^{0{,}7} \times [\frac{w}{4}]^{0{,}5} \times [(365-p)/365], \text{ kg/(xe.km)} \quad [3]$$

Where: L –Dust emission factor (kg/km/trip);

k –Particle size, k = 0.2;

s – Road silt loading, s = 5.7%;

S –Mean vehicle speed, S = 40 km/h;

W –Mean vehicle weight, W = 10 tons;

w –Number of tires, w = 10 tires.

→ L = 0.3309 kg/km/trip.

Applying formula [3] with input parameters such as the volume of materials, debris,transportation time, dust emission loads due to vehicle transportation are calculated and ewreported in Table 4.4

Table 4.4. Load of dust generated from the transporation of debris of site clearance

Construction works	Volume of waste disposal (m3)	Transport duration (month)	Number of transport vehicles (trip/day)	Load of dust generation (kg/km/day)	Dust emission (mg/m.s)
LIA 1	92.8	1	1	0.3309	0.01
LIA 2	72.5	1	1	0.3309	0.01
LIA 3	23.9	0.5	1	0.3309	0.01
LIA 4	354.9	2	2	0.6618	0.02

Besides, in order to calculate the concentration of dust generated from vehicles by distance and different heights, apply the model of road-source pollution diffusion in the modified model of Sutton [4]

The calculation results of dust concentration generated from the transport of waste from the demolition of component 1 by the distance (x) and the height (z) are shown in Table 4.5 and table:

Table 4.5. Concentration of dust emission from the transportation of demolition waste

Items	L(m)=W (m)	Dust concentration (mg/m^3)				QCVN 05:2013/BTNMT (average 1h)
		H=1.5	H=2	H=3	H=3.5	(mg/m^3)
LIA 1	5	0.0021	0.0016	0.0007	0.0004	0.3
	10	0.0016	0.0015	0.0011	0.0009	
LIA 2	5	0.0021	0.0016	0.0007	0.0004	
	10	0.0016	0.0015	0.0011	0.0009	
LIA 3	5	0.0021	0.0016	0.0007	0.0004	
	10	0.0016	0.0015	0.0011	0.0009	
LIA 4	5	0.0042	0.0032	0.0015	0.0009	
	10	0.0032	0.0029	0.0022	0.0018	

Comments: The concentration of dust concentrations emitted from vehicle transportation of demolition materials under component 1 are within the allowable limit of QCVN 05:2013/BTNMT - National Technical Regulation on ambient air quality

Similarly, applying the equation [3], [4], the concentration of dust from the transportation of materials and excavated soil of component 1 according to the distance (x) and the height (z) is shown in Table 4.6 and table 4.7 below:

Table 4.6. Load of dust emission from the transporation of excavation and backfilling materials under the Component 1

Items	Volume of materials (ton)	Volume of backfilling and excavation materials(tons)	Transport duration (day)	Total trips (trip/day)	Emission load (*) (mg/m/s)
LIA 1	2298.88	1814.12	360	2	0.6618
LIA 2	2666.95	1711.56	360	2	0.6618
LIA 3	2740.19	2264.08	360	2	0.6618
LIA 4	9583.18	2686.4	360	4	1.3236

Table 4.7. Concentration of dust generated from transportation of excavated materials and soil in Component 1

Construction work	L(m)=W(m)	Dust concentration (mg/m^3)				QCVN 05:2013/BTNMT (Average 1h)
		H=1.5	H=2	H=3	H=3.5	(mg/m^3)
LIA 1	10	0.107	0.096	0.071	0.059	**0.3**
	20	0.071	0.068	0.061	0.057	
LIA 2	10	0.107	0.096	0.071	0.059	
	20	0.071	0.068	0.061	0.057	
LIA 3	10	0.107	0.096	0.071	0.059	
	20	0.071	0.068	0.061	0.057	
LIA 4	10	0.213	0.192	0.143	0.117	
	20	0.141	0.136	0.122	0.113	

For Lia 3, Lia 4, Lia 5, Lia 6: The concentration of dust arising from the material transportation and excavation is within the allowable limit of QCVN 05:2013/BTNMT - National Technical Regulation on ambient air quality.

a4. Dust from the material gathering. unloading and loading activities

The unloading and loading materials mainly are: gravel, sand, cement. Based on document AP 42, Fifth Edition Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, the dust load from the material unloading and loading activities is as following:

Consider the air mass at site area to be imagined like one box-like with all dimensions: length L (m), width W (m) and height H (m), one bottom edge of the air case-like that parallel to the wind direction. Assume that the wind flow blows into the box that is the pollutant air and air at the site area at the time that the work has not been constructed that is quite fresh that the mean generated dust concentration in 01 hour that calculated under the equation.

$$C = \frac{E_s . L}{u . H}(1 - e^{-ut/L}) \quad \textbf{[5]}$$

*Source***:** *Tran Ngoc Chan. 1999. Air pollutant and waste gas treatment (Volume 1). Ha Noi Science and Technics Publishing House.*

Table 4.8 presents the 1 hour average dust concentration in 1 hour (mg/m3) considering base concentration of air pollutants in the baseline environment. This emission concentration issued to identify the level of impact to the surrounding environment due to the material gathering, unloading and loading processes.

Table 4.8. Dust emission concentration due to loading and unloading construction materials under Component 1

Item	L(m)=W(m)	Dust concentration (mg/m^3)				QCVN 05:2013/BTNMT (The average in 1h)
		H=1.5	H=3	H=6	H=9	(mg/m^3)
LIA 1	10	0.2620	0.1810	0.1400	0.1270	**0.3**
	50	0.1130	0.1070	0.1030	0.1020	
	150	0.1030	0.1010	0.1010	0.1000	
LIA 2	10	0.3180	0.2090	0.1540	0.1360	
	50	0.1180	0.1090	0.1050	0.1030	
	150	0.1040	0.1020	0.1010	0.1010	
LIA 3	10	0.2970	0.1980	0.1490	0.1330	
	50	0.1160	0.1080	0.1040	0.1030	
	150	0.1030	0.1020	0.1010	0.1010	
LIA 4	10	0.7810	0.4410	0.2700	0.2140	
	50	0.1570	0.1280	0.1140	0.1090	
	150	0.1110	0.1060	0.1030	0.1020	

Comments: The results show that dust concentration during the material unloading and loading processes undercomponent1in the area that is 10 m away from the site and at the height level of 1.5 - 3 m exceeds allowable limits as according to QCVN 05:2013/BTNMT from 1.06 - 2.6 times in 2LIAs (LIA 2 and 4); At a distance greater than 30 m, the dust concentration meets the acceptable limit. However, due to the construction time lasts long (on average of 18 months) and the "successive construction method" applied thus the level of dust emission impact from the loading/unloading of materials is at LOW and can be mitigated

a5. Waste gas and dust generated from the activities of transportation means

Transportation activities by 10-ton truck in the removed waste or material transportation process – the construction phase-Component 1 that will arise all pollutant airs with the product from the fuel burning process of all combustion engines such as dust, NO2, SO2, CO, VOC. All types of those exhaust gases will worsen the air environment quality at all project construction areas.

Pollutant load depends on the numbers of trucks travel and types of engine fuel that used. At current time, typical fuel used for transportation means is Diesel Oil (DO) with sulphur content smaller than 0.25% so the concentration of SO_2, NO_2 in the exhaust gases significantly limited. Moreover, emission source is the mobile source so the waste gas concentration is not focused, but it will be dispersed on whole road line.

At current time, there is no standard value for emission source that generated by all those means. Thus, The fast assessment method of WHO that used to evaluate all impacts.

Specifications for diesel oil-run vehicles, load is from 3.5 to 16 ton, average speed is 10km/h, at the average distance of 1km, the pollutant load for a (01) vehicle is as follows: Dust: 0,90 g/km; SO2: 4,29*S g/km; NOx: 11,80 g/km; CO: 6,00 g/km; VOC: 2,60 g/km.

The excavatation and demolition volume, transportation for removed waste (10 ton truck using diesel) are shown in the following table:

Table 4.9. Demolition volume and transportation distance for the removed waste

No	Item	Demolition volume (m^3)	Demolition volume (ton) *density of 1.8 tons/m^3*	Total (car time)	Time (day)	Flow (car/day)	Transportation distance (km)
1	Lia 1	92.8	167.04	1	30	1	30
2	Lia 2	72.5	130.5	1		1	30
3	Lia 3	23.9	43.02	1		1	30
4	Lia 4	354.9	638.82	1		1	30
	Tổng	**544.1**	**979.38**	**4**	**30**	**4**	**30**

(Source: Basic design)

Therefore, with total 4 trips/day as calculated above, it needs 02 trucks with frequency of 4trips/day, the transportation distance is about 30km/truck (outward and return journey). Load of daily generated dust are presented in the table below:

Table 4.10. Load of all waste gas that generated from the transportation of debris from the demolition activities of Component 1

No	Target	Pollutant load (kg/day)
1	Dust	0.108
2	SO_2	0.1287
3	NO_x	1.416
4	CO	0.72
5	VOC	0.312

The time for the activity in pre-construction phase is short and by successive construction method – move to another area after completed. By this method, only certain area will be contaminated but in short-time and negligible.

- ***Waste gas from backfill, excavation soil and material transportation means*:**

The transportation means as well as machine, equipment for construction work that uses the fuel, mainly, DO oil so it will arise all pollutant air with the product from the fuel burning process of combustion engine such as NOx, SO2, CO. This waste gas quantity is the mobile source so it will directly impact on the person who takes part in the traffic on the transportation line, disperse into the surrounding air that effects the worker and people surrounding the project area. According to the data: Type of filled-up soil and backfill soil transportation car with the load of 10 m3 and specific consumption of fuel of 0,4 liters of oil/car.km. (1 diesel oil liter = 0.832 kg). Alll parameters on transportation car quantity, transportation distance, the consumed fuel volume that presented in Table 4.11

Table 4.11. Volume of fuel consumed by the transportation of excavated soil

Items	Expected time (day)	Number of transportation vehicles (trip/day)	Transportation distance (km)	Fuel consumption (ton/km. day)	Load of SO_2 generated (mg/m.s)	Load of NO_2 generated (mg/m.s)	Load of CO generated (mg/m.s)
LIA 1	360	2	15	0.00067	0.00012	0.00022	0.00021
LIA 2	360	2	15	0.00067	0.00012	0.00022	0.00021
LIA 3	360	2	15	0.00067	0.00012	0.00022	0.00021
LIA 4	360	4	15	0.00133	0.00023	0.00044	0.00043

Because the load of exhaust gases is low; however, for assessing activities' impacts on ambient air, Sutton model is applied to calculate the content of pollutants in the exhaust gases according to the distance (x) and height (z) of the load of NOx which has the highest content. Calculation is shown in the following Tables:

Table 4.12. Content of NOx in the exhaust gases from the transportation of excavated soil

Item	L(m)=W (m)	Content of NOx (mg/m^3)				QCVN 05:2013/BTNMT (Average 1h) (mg/m^3)
		H=1.5	H=2	H=3	H=3.5	
Rehabilitation of LIAs	5	0.000093	0.000071	0.000032	0.000020	**0.3**
	10	0.000071	0.000064	0.000048	0.000039	
	20	0.000047	0.000045	0.000043	0.000041	

Comments: Content of NOx generated from the transportation of excavated soil is much lower than allowable limit of QCVN 05:2013/BTNMT – National technical regulation on ambient air quality. The results reveal that impacts of exhaust gases from the means of excavated soil transportation in the component 1 is negigible.

a6. Waste gas generated from activity of the constructional machine. equipment

The constructional phase-Component 1that will need one large quantity of the constructional machine, equipment such as: bulldozer, loader, concrete mixing machine,.. The operation process of all those equipements that will generate the waste gas in fuel burning process (normally, DO oil). With the quantity of the estimated constructional machine, equipment as mentioned at Chapter 1 and based on the norm of the diezen oil fuel consumption of the constructional machine, equipement under WHO, the demand for using the DO oil for all constructional machine and equipment – Component 1 like the following:

- ***For the plan cleaning, clearing and demolishing section***

For project, it will clear the plan about 2,3 ha, total oil quantity for this activity that estimated about 76 l/ha. Based on the document of NATZ about the poisonous waste gas that generated from the oil burning, 1 ton of oil that used for the combustion engine that estimated for the emission load into the adjacent area, the plan cleaning and clearing time is about 30 days. The calculation result and estimated load of the waste gas in this phase that presented in all following Tables:

Table 4.13. The generated waste gas load from the activity of the plan clearing machine

The used oil quantity (tons/day)	Pollutant load (mg/m3)		
	SO_2	NO_2	CO
0.14	0.43	1.87	0.01
QCVN05:2013 average 8h (mg/m^3)	**-**	**-**	**10**

Comments: Concentration of **SO_2, NO_2,CO** generated from operation of machines and equipment for site clearing are much lower than the allowable limit of QCVN 05:2013/BTNMT - National technical regulation on ambient air quality. The results show that impacts of exhaust gases from site clearing means in the component is inconsiderable.

- ***For all construction sections for all items***

The waste gas and dust pollutant load from the fuel burning activities of all types of machine in one working shift that calculated under Table 4.14.

Table 4.14. Coefficient and pollutant load due to DO oil burn from all constructional means machine in Component 1

	Emission	Pollutant load coefficient (g/kg DO)	Work			
			LIA 1	LIA 2	LIA 3	LIA 4
Load (g/s)	SO_2	20*S	0.0046	0.006	0.0051	0.0023
	NO_2	2.84	0.0026	0.0034	0.0029	0.0013
	CO	0.71	0.0006	0.0008	0.0007	0.0003
	Coal-dust	0.28	0.0003	0.0003	0.0003	0.0001
	VOC	0.035	0.00003	0.00004	0.00004	0.00002

In which: S is the sulphur content in fuel (0.25%).

Comments: Most of the content in exhaust gases are within the allowable limit of the QCVN 05:2013/BTNMT - National technical regulation on ambient air quality (average 1 hour) and QCVN 06:2009/BTNMT – National technical regulation on hazardous substances in ambient air. With a distance about 100m from the construction site, the content of pollutants tends to slightly increase then sharply dropts at the distance of 200m. However, for items constructed in existing roads and near residential area, impacts from exhaust gases will partly affect people living in the site.

4.1.3.2.2. ***Impact due to noise, vibration***

The noise generated (arisen) in the constructional phase-Component 1, mainly, from 3 sources: (1) from the work bust process, move the technical infrastructure work; (ii) from the removed waste and waste material transportation means; (iii) from the constructional means, machineThus, the noise level is calculated in the following table:

Table 4.15. Noise level according to the distance of equipment and means

Work	Machine	Quantity machine	Distance to noise source (m)								
			1	15	30	60	90	120	150	180	300
Lia 1	**Total noise level**	26	**99**	**75**	**69**	**63**	**60**	**57**	**55**	**53**	**49**
	Bulldozer	3	97	73	67	61	58	55	53	51	47
	Excavator	3	91	67	61	55	52	49	47	45	41
	Truck	5	94	70	64	58	55	52	50	48	44
	Concrete mixer	4	87	63	57	51	48	45	43	41	37
	Excavator	2	81	57	51	45	42	39	37	35	31
	Electric generator	1	77	53	47	41	38	35	33	31	27
Lia 2	**Total noise level**	18	**98**	**74**	**68**	**62**	**59**	**56**	**54**	**52**	**48**
	Bulldozer	2	96	72	66	60	57	54	52	50	46
	Excavator	2	89	65	59	53	50	47	45	43	39
	Truck	3	92	68	62	56	53	50	48	46	42
	Concrete mixer	3	86	62	56	50	47	44	42	40	36
	Excavator	1	78	54	48	42	39	36	34	32	28
	Electric generator	1	77	53	47	41	38	35	33	31	27
Lia 3	**Total noise level**	18	**98**	**74**	**68**	**62**	**59**	**56**	**54**	**52**	**48**

	Bulldozer	2	96	72	66	60	57	54	52	50	46
	Excavator	2	89	65	59	53	50	47	45	43	39
	Truck	3	92	68	62	56	53	50	48	46	42
	Concrete mixer	3	86	62	56	50	47	44	42	40	36
	Excavator	1	78	54	48	42	39	36	34	32	28
	Electric generator	1	77	53	47	41	38	35	33	31	27
Lia 4	**Total noise level**	18	**98**	**74**	**68**	**62**	**59**	**56**	**54**	**52**	**48**
	Bulldozer	2	96	72	66	60	57	54	52	50	46
	Excavator	2	89	65	59	53	50	47	45	43	39
	Truck	3	92	68	62	56	53	50	48	46	42
	Concrete mixer	3	86	62	56	50	47	44	42	40	36
	Excavator	1	78	54	48	42	39	36	34	32	28
	Electric generator	1	77	53	47	41	38	35	33	31	27
QCVN 26:2010/BTNMT (from 6h-21h) – normal area		**70**									
QCVN 26:2010/BTNMT (from 21h-6h) – Normal area		**55**									

The results show that:

The noise of the vehicles operating within distance of more than 15 m (daytime) and more than 120m (night) is within the allowable limits of QCVN 26:2010/BTNMT - National Technical Regulations on noise (70dBA for normal areas from 6 - 21h, 55dBA for normal area from 21h - 6h)

The resonant noise of the vehicles operating within the distance of more than 50m (daytime) and more than 150 m (night) is within the allowable limit of QCVN 26:2010/BTNMT - National Technical Regulation on noise (70dBA for normal areas from 6 - 21h, 55dBA for normal area from 21h - 6h)

In general, households in 4 LIAs of Tan An city subproject mostly live in the positions at 20-30 distance from the alley surface (excepting for some routes in LIA1 and LIA2 with the nearest distance from 10-20m), in another hand, construction activities in LIAs are insimultaneously and dispersedly implemented in alleys, the noise level is LOW-MEDIUM.

Impacts from vibration

The constructional activities may cause the impact, vibration of groud surface at the different levels that depend on all constructional method and equipments, however, the vibration strength will decrease under the propagation distance. All architecture works, residential area near the project area will be impacted by the vibration level during the construction process for project. The vibration level classified into all classes as following : from none-organoleptic effect at the lowest level, the low roaring sound and organoleptic vibratiion at all medium class and little damage at the highest level.

As the result, the vibration in the constructional phase should be evaluated for quantitative aspect, if any significant impact ability. All those activities include the pile-driver, destroy and drill or excavation that near to all sensitive structures, operation of all types of heavy lorry, roller, loader, compactor, etc. not only effect the constructional area, but also effect the surrounding areas.

Refer the vibration level of means, machine, equipment in the report: Transit Noise And Vibration Impact Assessment, FTA, 2006, that the vibration level of all means, machine, equipment that presented in the following table 4.16:

Table 4.16. The vibration level of all means, machine and equipment

No	Equipment	Vibration level of all sources 7.5m (dB)	QCVN 27:2010/BTNMT (From 6h-21h) - Common area
1	Lorry	86	**75dB**
2	Bulldozer/earthmover	87	
3	Excavator	94	

***Source**: Transit Noise And Vibration Impact Assessment. FTA. 2006.*

Table 4.17. Vibration level under the distane of all means

No	Equipment	Vibration level of all sources D(m) (dB)											
		7.5	**10**	**12.5**	**15**	**17.5**	**20**	**22.5**	**25**	**27.5**	**30**	**32.5**	**35**
1	Lorry	**86**	**82**	**79**	**77**	**75**	73	72	70	69	68	67	66
2	Bulldozer/earthmover	**87**	**83**	**80**	**78**	**76**	74	73	71	70	69	68	67
3	Excavator	**94**	**90**	**87**	**85**	**83**	**81**	**80**	**78**	**77**	**76**	**75**	74
QCVN 27:2010/BTNMT. (6h-21h) - Common area		**75dB**											

From the results above, the following comments could be given:

At the distance of 7.5 - 17.5m from the vibration source, the vibration levels of all vehicles are outside the allowable limits of QCVN 27:2010/BTNMT - normal area from 6 - 21h.

At the distance of 20m - 32,5m from the vibration source, the vibration level of excavator is beyond the allowable limit of QCVN 27:2010/BTNMT - normal area from 6 - 21h. The vibration level of the remaining vehicles is within the allowable limit.

With the above vibration level, the vibration impacts on people around the construction site only take place within a radius of less than 35 m from the source of vibration. Outside the 35m radius, the vibration impacts on local people are negligible. In general, as evaluated above, the impact level of the dust is LOW and of noise is LOW → MEDIMUM.

4.1.3.2.3. ***Impacts on water environment***

During the construction phase of the work items under component 1, there are three main sources of impact on the aquatic environment, including: (1) Stormwater runoff at construction site; (2) Wastewater of construction workers; (3) construction wastewater.

Wastewater in the phase is mainly generated from stormwater runoff seewping pollutants on the surface of the project area and from domestic activities of workers for site preparation. Domestic wastewater contains residues, suspended soil (SS), organic compounds (BOD/COD), nutrients (N, P) and microorganism

c1. Stormwater runoff at the construction site

Stormwater is considered fresh water if it is not exposed to pollution sources such as wastewater, exhaust gas, contaminated soil/dredged material, etc. During the construction process, the Stormwater runoff on construction sites will drag soil, sand, waste discharged by construction workers, debris, ... and become a source of pollution to surface water, soil, groundwater.

Total rainfall generated from the project area during the site preparation is estimated by the following equation: $Q = \varphi \times q \times S$ **[6]**

In which: S : Total stormwater drainage area (m^2).

φ : Flow coefficient of covers (the covered area is soil, φ = 0,2, the covered area is gravel (without adhesives) , φ = 0,4 the covered area is asphalt, concrete, φ = 0,6).

q : Rainfall intensity (l/s.ha), q = 166,7 x i

166.7 : the module transferring from the rainfall intensity calculated by water layer into

q: rainfall intensity = 166.7 x i, in which ithe highest water layer in the highest rainfall month (according to Hoang Hue – 1996). According to hydrological data, the highest rainfall is in September with 336.2 mm (Environment Monitoring Report of Tân An province in 2015) with total 25 raining days and 3hour each day, then i = 0.078 mm/minute.→ q = 13.003 (l/s.ha)

Table 4.18. Flow of stormwater runoff during construction in Lias

Item	Stormwater drainage area (m^2)	Flow coefficient	Stormwater runoff flow rate (l/s)
LIA 1	2350	0.6	1.83
LIA 2	6592.8	0.6	5.14
LIA 3	3656	0.6	2.85
LIA 4	10752	0.6	8.39

Normally, the first stormwater will contain a large amount of of impuritiesaccumulated on the surface such as oil, grease, dust, soil.According to data of WHO (1993), content of pollutants in stormwater runoff is approximately 0.5-1.5mgN/l, 0.004-0.03mg P/l, 10-20mg COD/l và 10-20 mg TSS/l. The stormwater is considered to be clearer than domestic waste; and it takes about 01 month for demolition and site preparation for the component in each LIA, impacts from stormwater are insignificant. However, to minimize the impacts, the contractor will have to distribute appropriately the area for gathering machines, materials and solid waste in order to avoid leakage of pollutants.

c2. Wastewater discharged by construction workers

The flow rate of wastewater from domestic activities of workers based on the average water supply norm for each worker stated in QCXDVN 01:2008/BXD is 45/l/person/day including wastewater from washing, cooking and personal hygiene. Generated wastewater is calculated as 100% of daily using water volume. Therefore, wastewater from domestic activities ranges from 1.35 m3/day to 2.25 m3/day. As Particulate emission factor in wastewater per capital for developing countries in accordance with WHO (1993) and the number of wokers and water flow rate in the table below, the concentration of pollutants in wastewater is calculated in the following equation:

$$C = C_0/Q \qquad [7]$$

The domestic wastewater mainly comprising residues, suspended solid (SS) organic compounds (BOD5), nutrients (NO3-), bacteria, load and content of pollutants in wastewater which are primarily treated by septic tank are shown as follows:

Table 4.19. Load and concentration of pollutants in domestic wastewater (before treated)

No.	Pollutants	Particulate emission factor (g/person/day)	Lia 1	Lia 2	Lia 3	Lia 4
			Load (kg/day)	Load (kg/day)	Load (kg/day)	Load (kg/day)
1	Number of workers		30	30	30	50
2	BOD5	45 – 54	1.35 - 1.62	1.35 - 1.62	1.35 - 1.62	2.25 – 2.7
3	COD	72 – 102	2.16 - 3.06	2.16 - 3.06	2.16 - 3.06	3.6 – 5.1
4	TSS	70 – 145	2.1 - 4.35	2.1 - 4.35	2.1 - 4.35	3.5 – 7.25
5	Grease	10 – 30	0.30 - 0.90	0.30 - 0.90	0.30 - 0.90	0.5 – 1.5
6	Total Nito	6 – 12	0.18 - 0.36	0.18 - 0.36	0.18 - 0.36	0.3 – 0.6
7	N-NH4	2.4 – 4.8	0.07 - 0.14	0.07 - 0.14	0.07 - 0.14	0.12 – 0.24
8	Phosphorus	0.8 – 4.0	0.02 - 0.12	0.02 - 0.12	0.02 - 0.12	0.04 – 0.2

No.	Pollutants	Particulate emission factor (g/person/day)	Lia 1	Lia 2	Lia 3	Lia 4
			Load (kg/day)	Load (kg/day)	Load (kg/day)	Load (kg/day)
9	Total Coliforms	10^6 - 10^9	$30x10^3$-$30x10^6$	$30x10^3$-$30x10^6$	$30x10^3$-$30x10^6$	$50x10^3$-$50x10^6$

(Source: WHO. 1993)

Concentration of pollutants in domestic wastewater after being treated by septic tanks are presented in the following table:

Table 4.20. Parameters and concentration of pollutants in domestic wastewater

Pollutants	Concentration of pollutants (mg/l)		QCVN 14:2008/BTNMT (collumn B)
	Untreated	Pretreated by septic tank	
pH	5 – 9	5 – 7	5 - 9
BOD_5	450 – 540	100 – 200	50
TSS	700 – 1450	80 – 160	100
Nitrate (NO_3^-)	50 – 100	20 – 40	50
Total coliform	10^6 – 10^9	reducible	5.000

(Source: Hoang Hue -Wastewater treatment. Construction Publisher)

According to the above results, after treated through septic tank, the quality of domestic wastewater from workers' activities still contains some parameters exceeding the allowable limit such as BOD (exceeding 2-4 times), TSS (may be exceeding 1,6 times). Unless there is a appropriate management plan, the domestic wastewater will deface the city beautiful landscape and pollute the soil, water, air environment as well as the pathogen proliferation. Consequently, people's and the community's health will be affected significantly.

Because LIAs in the component 1 are dispersed in different locations, domestic wastewater generated is negligible. Thus, the level of impacts from domestic wastewater is LOW. However, in spite of small volume, if there is no appropriate treatment measure, wastewater discharged by domestic activities of workers in the phase will be the local pollution sources of the construction site, especially the area of worker camps. The impact level is MEDIUM and is under control.

- ***Construction wastewater***

During the construction phase, a small amount of wastewater is generated from the maintenance of equipment, trucks,... or washing construction tools/ instruments which are mainly grease, suspended solids and a number of other substances. To prevent the construction wastewater flowing into the water source, the maintenance and washing area should be shielded and collected for separate treatment.

4.1.3.2.4. ***Impacts from solid waste***

Solid waste generated in the construction phase of component 1 includes 3 main types as follows: (1) Construction solid waste (debris); (2) Domestic solid waste; (3) hazardous solid waste. The generated volume is assessed as follows:

- ***Solid waste (debris) from the construction activities***

Waste from construction activities of component 1 are generated mainly from the demolition of existing buildings and excavated soil/rock on the alleys. The amount of construction solid waste is calculated and shown in the following table:

Table 4.21. Volume of solid waste generated from the demolition and excavated soil of component 1

No.	Item	Volume of demolition (m^3)	Volume of demolition (ton) *(the specific weight is 1.8 ton/m^3)*	Volume of excavated soil (m3)	Volume of excavated soil (ton) *(specific weight is 1.5 ton/m^3)*	Total (ton)
1	LIA 1	92.8	167.04	760.24	1140.36	1.307.40
2	LIA 2	72.5	130.5	1104.9	1657.35	1.787.85
3	LIA 3	23.9	43.02	1674.4	2511.6	2.554.62
4	LIA 4	354.9	638.82	1196	1794	2.432.82
	Total	**544.1**	**979.38**	**4735.54**	**7103.31**	**8082.69**

In addition, during construction period, a small amount of debris is generated such as lime, mortar, pieces of steel and iron, soil and stone, cement package, etc.

The constructional solid waste volume generated in the constructional process for all items in one Lias area at small level → mean (average, normal) in comparison with all other urban infrastructure construction works. In general, impact of the constructional solid waste in the constructional phase for Component 1 that is LOW, the reason for this, Lias areas is not focused, but, dispersed at all project districts, on other hand, the estimated construction method is "successive construction method" so the daily constructional solid waste volume will be much smaller than one that calculated above. Beside that, under the soil quality analysis result at all project areas, it all has the content of heavy metal indices that lower than QCCP (as mentioned in Chapter 2) and under the soil observation result within 5 recent years in Tan An province. However, because the nature of the excavation soil at all existing alley lines in all Lias areas that all are the stable grounds that mixed with rock/pebble/garbage/,… it can not utilize this excavation soil for the agricultural purpose, but, it can use it to aggrade the hollow place, floor (if all households/units have the demand) or the sign the treatment and collection contract Tan An city Urban Company.

- ***Solid waste discharged by construction workers***

Domestic solid waste are mainly packages, plastic bags, bottles, cans of food, etc. The volume is assessed by rapid assessment method of the World Health Organization, the volume of solid waste discharged every day is 0.5kg/person/day. The estimated volume of the total solid waste generated daily in the construction process in Lias is shown in the table below:

Table 4.22.Volume of domestic solid waste generated during the construction of component 1

No.	Item	Number of workers (person)	Construction duration (month)	Standard of 0.5 kg/person/day	Daily generation (kg/day)
1	Lia 1	30	360	15	5400
2	Lia 2	30	360	15	5400
3	Lia 3	30	360	15	5400
4	Lia 4	50	360	25	9000
	Total	**140**	**1440**	**70**	**25200**

The volume of domestic solid waste generated during construction in each Lia is small, which is about 15-25 kg/day. This is the main source of pollution due to the decomposition of organic matters that creates bad odor, leachate and pathogenic microorganisms. If this source is not collected reasonably, it will cause environmental pollution. However, the Lias are not centralized but distributed within the wards of the project, on the other hand, with the successive construction method, there will be a much smaller amount of domestic solid waste generated daily compared to the calculations above. Therefore, the impact level is assessed as LOW.

- ***Hazardous solid waste***

Hazardous solid waste generated during construction process are mainly barrels/plastic containers containing motor oil, oil, gasoline, used fluorescent bulbs, greasy rags from the means of transportation etc. Hazardous waste generated during the construction process includes fluorescent bulbs, batteries, waste oil, greas, greasy equipment, etc. Amount of hazardous waste is estimated equal to 2% of total domestic solid waste, which is equivalent to 0,3 – 0,5 kg/day.

Although volume of hazardous waste generated on site is not much, due to its hazardous nature, 100% of the volume must be collected, stored and handled in accordance with regulations on hazardous waste.

4.1.3.2.5. ***Impacts on existing technical infrastructure in the region***

As calculated in the assessment of impacts on the air environment, during the construction process of works under Component 1, the number of vehicles to transport wasteed materials from the construction site to the dump sites as well as the construction materials from the supplier to the work is not much. However, as they are heavy motor vehicles and have to pass through the residential area to access to construction site so the effects to local transportation infrastructure is inevitable, which causes damage to the public utilities such as roads, water supply and drainage pipes, electrical wire/fiber cable/network, assets of the local residents, etc,.

The impact duration of these activities will take place throughout the construction process, and mainly concentrate in the area of construction work items. To minimize these impacts, the contractor must fully comply with the provisions set out in the ECOPs of the project and have to analyze and select the suitable transport route to limit the travel through the residential areas. In case of causing damage, the contractor must take measures to repair, remedy or compensate appropriately.

4.1.3.2.6. ***Health and Safety Risk to the Community***

Population density in LIA 1, LIA 2, LIA 4 are 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, LIA 2, LIA 4 are considered the highest. Risks include:

(i) Risks of accidents caused to the residents by travelling/transportation using vehicles during construction must also be taken into account of by the construction contractors. Transportation activities using trucks need to have support of traffic regulator upon passing through residential areas. Since there are many households leaving along the roads within immediate proximity to the construction areas, the likelihood of the safety risk to the community is high. This impact is assessed as moderate.

(ii) Various and operations would generate domestic wastewater and wastes giving rise to large populations of flies and mosquitoes, and possibly forming epidemic nests of diarrhea, dengue fever, and malaria. Workers coming during the construction process, etc. will result in dirty pools and pits, polluting water sources and the air, giving rise to large populations of flies and mosquitoes, and possibly forming epidemic nests of diarrhea, dengue fever, and malaria. Such impacts could only be mitigated or minimized with good prevention, treatment and sanitation measures. Concentration of workers in the area may result in increased contraction of HIV/AIDS and other sexually transmitted diseases, especially through

prostitution, posing risks to the local community. However, as the work is at a small scale with 20 - 30 workers to work at the construction site, and construction would not last long, this impact is low and controllable.

4.1.3.2.7. ***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. Specific Impacts

4.1.3.2.8. ***Subcomponent 1.1 – Tertiary Infrastructure Upgrading in LIAs***

Local flooding

The existing alleys in the LIAs are relatively small, narrow with the drainage system is partially installed. Wastewater and storm water currently run off freely and discharge into nearby canals. The construction and upgrading of alleys in LIAs include gathering construction materials and machineries at construction site and concreting the surface. Given the small cross section of alleys, these activities might hinder water flow, especially in rainy days during wet season. In additional, the area is lack of a proper drainage system. Local flooding therefore will likely happen.

However, the magnitude of impact is small because the construction of alleys will be implemented in a sequencing manner from one LIA to the next one during dry season. The construction work will be divided into several small packages, being implemented at different locations and time in each LIA for 3 months. The impact thus can be controllable if mitigation measures as specified in the ESMP are adopted.

Social disturbance and traffic safety concerns

The construction works on LIA upgrading are of small scale and do not require mobilization of heavy machine and large work force. However, they will be carried out in a very limited space i.e. small, narrow alleys from 1.5-3.0 m width. Daily activities of local people in all LIAs, especially in LIA1, Lia 2 and LIA 4 of higher population can be temporarily disrupted during the construction period in a number of ways: (i) storage of materials and construction work could cause some damage to the existing alleys and limit traffic access of people (ii) increased dust to households and goods/foodstuff in some food stands; (iii) unwanted accidents can happen; (iv) social conflict between the construction workers and local people. Likelihood of this impact is high however it will be short term and ceasing upon the completion of the construction, thus the impact can be assessed moderate to local people.

Impact on current technical infrastructures

Upgrading alleys will cause relocation of some existing infrastructure such as water pipeline or power lines. According to the RP, there will be a need for relocating 75 electrical poles in LIAs and replacing 4,153 m electrical line. In addition, the mobilization of construction machineries and equipment to the site and the increase of traffic due to vehicle transportation of materials and waste could damage roads and other public facilities.

During the construction phase, these impacts will cause some temporary disruption to local people's daily routine however the impact is reversible and considered moderate.

Impact on PCRs and sensitive receptors

Impacts on Phuong Hong Kindergarten (at a 50m distance from the construction site in LIA 3)

The kindergarten is located in the immediate vicinity of the alley construction work, being exposed directly to dust, noise and vibration from the construction site. Noise impacts can cause disruption to learning and playing activities and sleeping of small children. At drop in and pick up hours of kids at the kindergarten, there will be big flows of parents traversing at the school crossings near the site. Apart from being traffic accident risk, the following concerns should be taken into account: (i) hindrance the access to schools; (ii) traffic congestions at school crossings; (iii) increase of dust, noise, vibration and waste; (iv) disruption of school's hours and lessons; (v) safety risk to teachers, parents and children. Although the work will be done in sequencing manner and happen in a short time thus the impacts are temporary. As the impact sensitivity to the teacher, children and parents are high, the magnitude impact is assessed as moderate.

Impacts on the Thien Khanh Pagoda (at a 30m distance from the construction site in LIA 3)

Thien Khanh Pagoda and its visitors are under the impacts from the construction work in a numbers of aspects, such as: (i) hindrance to access to the pagoda; (ii) increased dust, exhaust gases, noise, vibration, solid waste, and wastewater due to construction activities; (iii) traffic congestion and accident risk and community safety due to construction and transportation; (iv) interference with pagoda religious practices especially those organized on the 1st and 15th day of every month according to the Lunar calendar.

The impact sensitivity of the local people is high however the magnitude of impact could be ranked as moderate. The impacts can be minimized.

Vibration Impact on PCRs:

The concerned PCRs and sensitive points are located at least 30m far from the construction site. Widening small alleys in the LIA will only deploy small machineries as the work mainly requires manual labors. It is assessed that these PCRs and sensitives areas would not be impacted by vibration during the construction process and risk on infrastructures collapse is not likely to occur.

4.1.3.2.9. ***Subcomponent 1.2 – Rehabilitation of polluted canals and pond in LIAs***

For Tan An city subproject, upgrading LIAs also includes canal rehabilitation works on Mui Tau Canal in LIA 2, Cau Tre Canal in LIA 3 and Rot Canal in LIA 4 (item 1.2 as indicated in Table 1.2). Currently, these canals are seriously polluted because domestic wastes and wastewater are discharged directly. The canals are not dredged regularly.

Activities for rehabilitation of the canals comprise of: (i) canal dredging, (ii) construction of underground box culverts for collecting wastewater from households for Mui Tau and Cau Tre canals and sewer pipes along Ao Pond and Rot canal, (iii) construction of operation roads along sides of Quan Pond and Rot Canal and the roads on top of the sewer box culverts of Mui Tau and Cau Tre Canal, and (iv) soft embankment of Quan Pond and Rot Canal. These activities will cause the following impacts:

Odors from dredging process and management of dredged materials

Upgrading of Mui Tau, Cau Tre – section 1 and Rot Canals would generate small amounts of dredged materials, respectively of about 739 m3, 515 m3 and 12,110 m3 dredging materials. The dredging is to be carried out in successive manner, at every 50-100 m canal's segment. For these canals, there is not direct access to the construction sites, therefore for each canal segment the work is to be carried out by excavator in combination with manual labor. Excavated sediments will be transported to small work boats with volume of 15-20 m3 and then conveyed to the intersection with the road. There it will be transferred into trucks and transported to the disposal site.

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

The dredging, and transportation of the sediment could cause bad odor, nuisance, leakage and unsanitary conditions to the local residents along canals, at the transfer sites and along the transportation routes. Local residents and workers are exposed to the bad smell for a short period of dredging at each 50-100 m canal's segment. However, this impact can be assessed as medium, localized and short term intermittent.

Local flooding

Flooding is potentially occurred when the embankment works affect to existing drainage capacity of the canal, especially at each 50-100m canal segment. However, the likelihood of the impact is generally low as the work happens one at a time in a short period. The impact can be mitigated if the water flow can be carefully diverted to ensure the canal's drainage capacity.

Risks on shore erosion and subsidence; infrastructures collapse and cracking during the embankment process of Quan Pond (in Lia 1) and Rot canal (in Lia 4)

The Quan Pond and Rot Canal have natural earth banks. The embankment of the pond and canal may encounter the risks on shore erosion and subsidence. The main reasons include: (i) construction on weak soil structure; (ii) placing of heavy machineries and equipment on canal banks; (iii) vibration during the piling process. In case of bank erosion and embankment subsidence, the workers and residents nearby Quan Pond and Rot Canal will be affected. Impacts are in terms of human and asset losses.

Shore erosion and embankment subsidence would be mostly due to poor geotechnical surveying, poor detailed design or poor construction. These activities are to be implemented correctly from the start and are to be approved by relevant authorities and are therefore

controllable. The works are to be carried out section by section, so the scope of impact is not significant and the magnitude of impacts is assessed as low.

The embankment of Rot canal involve the timber pile jacking process. According to the technical evaluation, this process does not result in the risk on collapsing and cracking of nearby infrastructures.

The embankment of Quan Pond involve the pile jacking of concrete pile to the depth of 8 m. Based on the weak soil structure in Mekong region, it is calculated that the risks on infrastructure cracking and collapse may happen within the radius of 3 – 5 m from the embankment. Within that area of influence, it is estimated that 07 households are located within the affected area. However, they will be relocated out of the affected area for operational roads and sidewalks (4m wide). Thus, the risks on infrastructure collapse and cracking are assessed as low if land acquisition is completed prior to construction.

Social disturbances and traffic safety concerns

Concentration of workers and equipment, construction plants, temporary loading of materials and wastes, traffic disturbance, dusts and odor pollution etc. will disturb daily activities and the lives of local residents. Beside, conflicts may also be arisen if workers, waste, materials, equipment etc. are present outside the construction corridor.

For Quan Pond areas, access to the construction site and nearby is easy as there is the road along with 75% of the embankment length of Quan pond. So, the impact on social disturbance can be considered as low.

In contrary, at Mui Tau, Cau Tre – section 1, Rot Canals, there is no direct access to the construction sites therefore the construction process will cause social disturbance at the two ends of the canal where local people live at high density. Daily routine and traffic convenience of local people around these areas will be affected. However, this impact can be from low to medium and can be mitigated as the construction will take place in a successive manner and complete in short time to each canal's segment.

4.1.3.2.10. ***Subcomponent 1.3 – Construction of a green park in LIA 2***

The impacts during construction period are generic and not beyond those as described in the ECOPs.

4.1.3.3. ***Component 1 - Impacts during operation phase***

4.1.3.3.1. ***Subcomponent 1.1 – Tertiary Infrastructure Upgrading in LIAs***

Risk of local flooding due to the poor operation and maintenance

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

Risk of traffic accidents

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

4.1.3.3.2. ***Subcomponent 1.2 – Rehabilitation of polluted canals and pond in LIAs***

Water pollution and decreased landscape due to direct waste disposal into the canals

During the O&M, there might be some risks of pollution and flow stagnation due to disposal of waste from households living along the canal if their behaviors are not change and

there is lack of enforcement from local authority. The level of impact can be from low to moderate. The impact however can be mitigated if proper O&M practices adopted and enforcement enhanced. Besides, behavior changes can happen as local people can be proud of new green design of the canal and want to collaborate to maintain the canal's clean and beauty.

Embankment subsidence risk during operation of Rach Rot Canal

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

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

4.1.3.3.3. ***Subcomponent 1.3 – Construction of a green park in LIA 2***

Domestic waste

The rest and entertainment activities from local residents at the park will be generated domestic waste. Total domestic waste volume is very small. However, if there is no reasonable measures for collection and treatment, it will be affected to residents and environment in park. The impact can be considered as low.

4.1.4. **Environmental impacts for component 2 - Upgrading Priority Infrastructure**

This component aim to improve water quality, drainage capacity and sanitation conditions around the canal of the inner area of Tan An city (Cau Tre canal at the section from Bao Dinh river to National Highway No.1) by dredging, embankments and construction of routes on 2 sides. Embankment and construction of Bao Dinh river park. The component also build streets (Construction of Ring road; Upgrading of Luu Van Te street; Construction of connecting road between Tran Phong Sac and Nguyen Minh Duong 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 from the preparation phase***

4.1.4.1.1. ***Impacts from the land acquisition***

Land acquisition, relocation and resettlement will cause impacts to local households, potentially resulting in social problems and even litigation, if not undertaken successfully. People need time to settle in, adapt and integrate into new living conditions, making new relationships in the local community and even new ways of living and earning income. According to survey data, there are 555 households affected by the project, of which 185 displaced households. Residential land affected is about 68,821 m^2 and agriculture and garden land acquired is 152,457 m^2.

92 PAHs whose business is being affected by Bao Đinh embankment, of which 52 PAHs have their business licenses and the remaining 29 PAHs are not registered. Of the 92 affected businesses, 81 units have to relocate.

Especially, construction of the Ring road will requires relocation of 40 graves. To the Vietnamese, grave is the religious and spiritual matters, which are highly respectful. Household and individual graves are considered PCRs, and the Bank's OP/BP 4.11 applies for this subproject. However, the consultation with the households affected by grave relocation reveals that people are still willing to move the graves to another location to give land for construction if the

subproject owner supports sufficiently to ensure the grave relocation. The level of the impact caused by this activity is medium.

Detailed impacts will be assessed in Section 4.2 – Social impacts assessment.

4.1.4.1.2. ***Impacts from Unexploded ordnance (UXO)***

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

4.1.4.2. ***Component 2 - Impacts during construction period***

A. General environmental impacts

4.1.4.2.1. ***Impacts on air environment***

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

a1. Dust generated from the demolition of existing structures for site clearance

Dust generated mainly from the dismantling of buildings, structures, existing architectures to clear the site for construction work. According to the feasibility study of the Tan An city project, the total volume of demolition of structures and expected time are specified in the Table 4.23.

Applying the equation [1] and [2] to calculate the amount of dust generated from the demolition of construction site for works of the component 2, in which the dust emission factor is E = 0.03752 kg/ton. The calculation results of dust generated from the demolition activities of component 2 is presented in Table 4.23.

Table 4.23. Forecast of dust volume generated from the demolition of component 2

No.	Item	Volume of demolition (m3)	Expected duration of demolition (day)	Volume of dust (kg/day)	Volume of dust (mg/m3)	QCVN 05:2013 (mg/m3) *(the average 1h)*
1	Construction of embankment and park on Bao Dinh river sides	4734.7	150	2.132	**0.67**	0.3
2	Rehabilitation of Cau Tre canal	121.2	60	0.137	**0.14**	0.3
3	Construction of ring road	1021.5	180	0.383	**0.03**	0.3
4	Construction of Luu Van Te road	173.6	60	0.195	**0.04**	0.3
5	Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road	119.2	30	0.268	**0.13**	0.3

The calculation results show that: content of generated dust meets or negligibly exceed the allowable limit of QCVN 05:2013/BTNMT, for the items of embankment and construction of a park on Bao Dinh side is 2,2 times over the standard. As the areas have available site and the improvement is based on the current status, it requires small demolishing volume.

Volume of generated dust depends on many factors, such as used materials, work scale, humidity and weather conditions, and especially the season (dry season or rainy season. In rainy season, thanks to increased rainfall, the ability to settle down suspended dustin the air will be better, helping limit the amount of generated dust. Dust contents will be about 1.5 - 2 times lower compared with dry season, for each construction location of Component 2.

a2. Dust generated from excavation and backfill of works

In construction process, there is the organic part extraction section for soil and excavate the soil for constructing the water drainage system, install all underground technical infrastructure works. This process will use some types of machine, equipment such as: Excavator, roller, hack, shovel,… that generates the soil dust at site area that directly impacts on the worker at site and people who live around the project area.

Based on equation **[2]** to define the dust pollutant emission coefficient, and based on all above-mentioned algorithms to define the generated dust volume for each item. Summarize all calculation results for this parameter that presented in Table 4.24.

Table 4.24. Forecast of dust generated from excavation and backfill of component 2

No.	Item	Volume of excavation, backfilling and ground leveling (m3)	Expected time for excavation and backfilling (day)	Load of dust (kg/day)	Load of dust (mg/m3)	QCVN 05:2013 (mg/m3) *(average value for 1h)*
1	Construction of embankment and park on Bao Dinh river sides	19250	720	1.1	**0.35**	0.3
2	Rehabilitation of Cau Tre canal	1680	360	0.192	0.19	0.3
3	Construction of ring road	22691.76	720	1.296	0.12	0.3
4	Construction of Luu Van Te road	51931.75	540	3.955	**0.83**	0.3
5	Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road	11722.5	360	1.339	**0.65**	0.3

Comments:

The calculation results showed that the dust concentration generated from the excavation and backfilling exceeds the allowable limits of QCVN 05: 2013/BTNMT at approximately1.2 – 2.8 times, depending on each construction site but it settles quickly and exists in a short time. The range of dust concentration reaching the allowable limits is estimated at 40 - 60m away from the earthwork area. The dust generation takes place in a long time (about 4 to 6 weeks in each construction location), the roads will be constructed by the “successive construction method". Thus, the degree of impact is at MEDIUM level and can be minimized.

a3. Dust in the removed waste and constructional material transportation process

From equation **[3],** calculate the dust generation coefficient in the transportation process L = 0.3309 kg/km/time. With all input parameters such as the volume of material, dirty beam,… transportation time, dust load generated from the transportation process for all items- Component 2 that defined in Table 4.25

Table 4.25. Load of dust generated from the transportation of removed waste (waste) from the demolition in component 2

Item	Volume of waste (m^3)	Transportation duration (days)	Number of transportation vehicles (trip/day)	Load of dust generation (kg/km/day)
Construction of embankment and park on Bao Dinh river sides	4734.7	150	4	1.758
Rehabilitation of Cau Tre canal	121.2	60	1	0.4395
Construction of ring road	1021.5	180	1	0.4395
Construction of Luu Van Te road	173.6	60	1	0.4395
Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road	119.2	30	1	0.4395

Besides, applying the model of road-source pollution diffusion in the modified model of **Sutton**. The calculation results of dust concentration generaeted from the transportation process at the distance (10 – 20 m) and elevation (1,5 – 3,5 m) as follows:

- For Construction of embankment and park on Bao Dinh river sides Dust concentrations vary between 0.005-0.009 mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3).
- For Rehabilitation of Cau Tre canal; Construction of ring road; Construction of Luu Van Te road; Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road: Dust concentrations vary between 0.001-0.003 mg/m^3.

Comment: The concentration of dust generated from the transport of waste from the demolition of component 2 is within the allowable limit of QCVN 05:2013/BTNMT - National Technical Regulation on ambient air quality.

Similarly, applying the equation [3], [4], the concentration of dust generated from the transport of materials and excavated soil of component 2 with the distance (x) and elevation (z) is shown in Table 4.26 and table 4.27 below.

Table 4.26. Load of dust generated from the transportation of materials and excavated soil in component 2

Item	Volume of material (ton)	Transportation duration (day)	Volume of excavated and backfill soil (ton)	Total number of vehicles (trip/day)	Load of dust (*) (mg/m/s)
Construction of embankment and park on Bao Dinh river sides	20865.62	720	19250	4	1.758
Rehabilitation of Cau Tre canal	130950.65	360	1680	26	11.427
Construction of ring road	69699.54	720	22691.76	10	4.395
Construction of Luu Van Te road	9117.26	540	51931.75	9	3.9555
Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road	2112.1	360	11722.5	4	1.758

Table 4.27. Dust concentration generated from the transportation of the removed waste from the demolition in component 2

Item	L (m)=W (m)	Dust concentration (mg/m^3)				QCVN 05:2013/BTNMT (The average in 1h)
		H=1,5	H=2	H=3	H=3.5	(mg/m^3)
Construction of embankment and park on Bao Dinh river sides	10	0.37	0.28	0.13	0.08	**0,3**
	20	0.19	0.18	0.16	0.15	
Rehabilitation of Cau Tre canal	10	1.84	1.66	1.23	1.01	
	50	0.65	0.64	0.63	0.61	
	150	0.30	0.30	0.29	0.29	
Construction of ring road	10	0.71	0.64	0.47	0.39	
	40	0.29	0.29	0.28	0.27	
Construction of Luu Van Te road	10	0.64	0.57	0.43	0.35	
	40	0.26	0.26	0.25	0.24	
Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road	10	0.37	0.28	0.13	0.08	
	20	0.19	0.18	0.16	0.15	

Comments:

- For the upgrading and rehabilitation of Cau Tre canal: the content of dust generated from the transportation of materials and excavation is about 3.4-6 times compared to the allowable limit at the distance of 10m; 2.03 – 2.2 times at the distance of 50m; and meet the allowable limit at the distance of 150m (over the QCVN 05:2013/BTNMT -National technical regulation on ambient air quality)
- For upgrading and rehabilitation of road (Ring road, Luu Van Te road, Tran Phong Sac road connecting Nguyen Minh Duong road): content of dust meets allowable limit at the distance of 10 m from 1.2 – 2.3 times and satisfies allowable limit at the distance 20 m for the Tran Phong Sac connection road, about 40 m for the construction of ring road line.

Generally, due to the long construction time of each project area in component 2 (the average is 18 - 24 months), the area is ventilated and using successive construction method, the flow of daily transport vehicles is low (the average of about 10 trips/day), the level of impact due to dust generated from the transport of materials and excavated soil of component 2 is at MEDIUM level and may be reduced.

a4. Dust generated from gathering and loading/unloading of materials

Materials are mainly rubble, sand and cement. Similar to the evaluation method for Component 1. Based on documents AP 42, Fifth Edition Compilation of Air pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, we have load of dust generated from the loading and unloading of materials as follows:

Applying the equation [5], the dust concentration generated from the loading and unloading of construction materials according to the method of *Tran Ngoc Chan, 1999, air pollution and exhaust treatment* (volume 1), *Hanoi Science and Engineering Publishing House* with the following results:

Table 4.28. Dust concentration generated from the loading and unloading of construction materials in component 2

Item	L(m)=W(m)	Dust concentration (mg/m^3)				QCVN 05:2013/BTNMT (The average in 1h)
		H=1,5	H=5	H=10	H=23	(mg/m^3)
Construction of embankment and park on Bao Dinh river sides	10	1.090	0.397	0.249	0.165	0,3
	50	0.183	0.125	0.112	0.105	
	150	0.116	0.105	0.102	0.101	
Rehabilitation of Cau Tre canal	10	0.669	0.271	0.185	0.137	
	50	0.148	0.114	0.107	0.103	
	150	0.109	0.103	0.101	0.101	

For Construction of ring road; Construction of Luu Van Te road; Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road: Dust concentrations vary between 0.01-0.25 mg/m^3 (compared with permissible standard limits of 0.3 mg/m^3).

Comments: The calculation results showed that the concentration of dust generated from the process of loading and unloading of construction materials in component 2 at the 10 m distance and at the height of 1.5 - 5 m exceeds allowable limit of QCVN 05:2013/BTNMT from 1.07 - 3.6 times upon each project area; at the distance of over 50 m, the dust concentrations reaches the allowable standard. However, due to the long construction time in each project site of component 2 (the average is 18 - 24 months), the construction area is open space, using successive construction method ", this work is not continuous so the level of impact due to dust generataed from the process of loading and unloading of construction materials of component 2 is MEDIUM and may be reduced.

a5. Exhaust gas and dust generated from the activities of transportation means

The transportation activities by 15-ton lorry in the material transportation process or the removed wasted in the constructional phase-Component 2 that will generate all pollutant gas with the product from the fuel burning process of all combustion engine such as NO2, SO2, CO, VOC. The demolition volume will be counted under the following table:

Table 4.29. Volume of demolition in component 2

No.	Items	Demolishing volume (m^3)	Demolishing volume (ton)	Flow rate (trip/day)	Transportaiton distance (km)
1	Construction of embankment and park on Bao Dinh river sides	4734.7	8522.46	1	30
2	Rehabilitation of Cau Tre canal	121.2	218.16	1	30
3	Construction of ring road	1021.5	1838.7	1	30
4	Construction of Luu Van Te road	173.6	312.48	1	30
5	Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road	119.2	214.56	1	30
Total		**6170.2**	**11106.36**	**6**	**30**

Expectedly, it takes about 60 days for site clearance. From the above table, the demilition amount is 185,106 tons. It needs 6 trucks of 10 tons each day with frequency of 6 times/day (for outward and return journey). The average distance of 30km/truck = 540km/6trucks/day. Thus, the load of pollutants araising from the component 2 is follows:

Table 4.30. Concentration of emissions from the site clearance

No	Target	Pollutant load (kg/day)
1	Dust	0.486
2	SO_2	0.57915
3	NO_x	6.372
4	CO	3.24
5	VOC	1.404

Comments: In the phase, along routes/construction area, items in the component including demolition activities, load of emission from the waste material transportation is dispersed on both time and position. On the other hands, the activity is short-time (about 4-6 weeks for each route/location) and successive orders - move to another location after completed. Therefore, the impacts from emissions from the transportation of demolishing materials is LOW → MEDIUM. Besides, the Contractor shall use methods for regulating the density of traffics during the transportation to limit impacts on people in the project area and on main routes.

a6. Emissions from transportation of backfilling and excavated soild

On the basic of all calculation data that applied for all items that belongs to Component 2: Type of filled-up soil and backfill soil with the load of 15 m3 and specific consumption of fuel of 0.4 liter of oil/car.km (1 diesel oil liter = 0.832 kg), transportation distance with 15 km. All parameters for the transportation car quantity, consumed fuel quantity that presented in Table 4.31.

Table 4.31. Fuel consumption because of transportation of materials and excavated soils in the Component 2

Item	Expected time (day)	Number of transport vehicles (trip/day)	Consumables (kg/day)	Load of SO_2 generated (mg/m.s)	Load of NO_2 generated (mg/m.s)	Load of CO generated (mg/m.s)
Construction of embankment and park on Bao Dinh river sides	720	4	19.968	0.00023	0.00044	0.00043
Rehabilitation of Cau Tre canal	360	26	129.792	0.00150	0.00287	0.00279
Construction of ring road	720	10	49.92	0.00058	0.00110	0.00107
Construction of Luu Van Te road	540	9	44.928	0.00052	0.00099	0.00097
Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road	360	4	19.968	0.00023	0.00044	0.00043

Because the load of exhaust gases is relatively low; however, for assessing activities' impacts on ambient air, **Sutton** model is applied to calculate the content of pollutants in the exhaust gases according to the distance (x) and height (z) of the load of NOx which has the highest content in the item of Cau Tre canal rehabilitaiton. Calculation is shown in the table below:

Table 4.32. Concentration of NOx generated from the transportation of excavated soil of component 2

Item	L(m)=W (m)	NOx concentration (mg/m^3)				QCVN 05:2013/BTNMT (The average in 1h)
		H=1,5	H=5	H=10	H=23	(mg/m^3)
Rehabilitation of Cau Tre canal	5	0.00060	0.00046	0.00021	0.00013	**0,3**
	10	0.00046	0.00042	0.00031	0.00020	
	20	0.00031	0.00030	0.00026	0.00023	

Comments:

NOx concentration generated from the process of transporting excavated soil is much lower than the allowable limit of QCVN 05:2013/BTNMT - National Technical Regulation on ambient air quality. This result shows that the impact of exhaust gas from the transport vehicles of excavated soil of the component 2 items is negligible.

a7. Dust and exhaust gas generated from the operation of machinery and construction equipment

The construction phase of component 2 will require many equipment and construction machinery such as bulldozers, excavators, concrete mixers, air compressors, cranes, road rollers. The operation of these devices will generate exhaust gases due to fuel combustion. The calculation results and predicted load of exhaust gas in the period are shown in the following table:

- ***For demolition, clearance and cleaning of the site***

The project will conduct clearance and resinstatement of the ground of about 28.2 hectares, the total amount of oil for this activity is estimated at 76 l/ha, the time for clearance and cleaning of the site for each item of component 2 is about 30-60 days. The result below:

Table 4.33. Load of exhaust gas generated from the clearance of the site in component 2

Amount of oil usage (ton/day)	Pollutant load (mg/m3)		
	SO_2	NO_2	CO
1.71	0.43	1.87	0.01
QCVN05:2013 the average in 8h (mg/m^3)	**-**	**-**	**10**

Comments: Concentration of SO_2, NO_2,CO generated from operation of machines and equipment for site clearing are much lower than the allowable limit of QCVN 05:2013/BTNMT - National technical regulation on ambient air quality. The results show that impacts of exhaust gases from site clearing means in component 2 is inconsiderable

- ***For construction of work items***

According to the equation [6], dust and exhaust gas pollutant load from fuel combustion operation of the machines in one shift of component 2 is calculated in the table 4.43.

Table 4.34. Factor and pollutant load from burning diesel oil of vehicles, construction machinery in component 2

Load (g/s)	Exhaust gas	Pollutant load factor (g/kg DO)	Items				
			Embankment and construction of Park on Bao Dinh river sides	Rehabilitation of Cau Tre canal	Construction of ring road	Construction of Luu Van Te Road	Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road
	SO_2	20*S	0.0051	0.0071	0.0069	0.0083	0.0107
	NO_2	2.84	0.0029	0.004	0.0039	0.0047	0.0061
	CO	0.71	0.0007	0.001	0.001	0.0012	0.0015
	Dust	0.28	0.0003	0.0004	0.0004	0.0005	0.0006
	VOC	0.035	0.00004	0.00005	0.00005	0.00006	0.00007

In which: S is the concentration of sulfur in the fuel (0,25%).

The load with the highest concentration of SO_2 in the area of construction Tran Phong Sac road connecting to Nguyen Minh Duong road is selected. Impact is assessed by applying Screen View software with a wind speed of 3.5 m/s and a distance of 0 - 150 m from generating sources,

height of 1.5 m. Concentration of **SO_2** generated from operation of construction area vary between 0.05 – 0.2 mg/m^3 (compared with permissible standard limits of 0.35 mg/m^3).

Comments: According to results of the model, the concentration of pollutants are all within the allowable limit of the QCVN 05:2013/BTNMT - National technical regulation on ambient air quality (average 1 hour) highly increases but tends to decrease within the distance of 100m. Dust emissions and gases discomfort and affect people's health. Therefore, residential areas in the vinicities are sensitive to dust, exhaust gases and noise.

4.1.4.2.2. ***Impacts from noise and vibration***

b1. Impacts from noise

Noise generated during the construction phase of Component 2 comes mainly from 3 sources: (1) from the demolition of structures, relocation of technical infrastructure utilities; (ii) the transportation vehicles of materials and waste; (iii) from construction vehicles and machinery.

Noise level by the distance of machines in this period is calculated as in the table below:

Table 4.35. Noise level by the distance of construction means in component 2

Item	Machine	Quantity machine	Distance to noise source (m)								
			1	15	30	60	90	120	150	180	300
Embankment and construction of Park on Bao Dinh river sides	**Total noise level**	28	**100**	**76**	**70**	**64**	**61**	**58**	**56**	**54**	**50**
	Bulldozer	3	97	73	67	61	58	55	53	51	47
	Excavator	4	92	68	62	56	53	50	48	46	42
	Truck	5	94	70	64	58	55	52	50	48	44
	Concrete mixer	4	87	63	57	51	48	45	43	41	37
	Roller	3	77	53	47	41	38	35	33	31	27
	Excavator	2	81	57	51	45	42	39	37	35	31
	Paving machine	2	90	66	60	54	51	48	46	44	40
	Mobile crane	2	84	60	54	48	45	42	40	38	34
	Electric generator	2	80	56	50	44	41	38	36	34	30
	Air compressor	1	81	57	51	45	42	39	37	35	31
Rehabilitation of Cau Tre canal	**Total noise level**	24	**99**	**75**	**69**	**63**	**60**	**57**	**55**	**53**	**49**
	Bulldozer	3	97	73	67	61	58	55	53	51	47
	Excavator	3	91	67	61	55	52	49	47	45	41
	Truck	2	91	67	61	55	52	49	47	45	41
	Concrete mixer	3	86	62	56	50	47	44	42	40	36
	Roller	3	77	53	47	41	38	35	33	31	27
	Excavator	2	81	57	51	45	42	39	37	35	31
	Paving machine	2	90	66	60	54	51	48	46	44	40
	Mobile crane	2	84	60	54	48	45	42	40	38	34
	Electric generator	2	80	56	50	44	41	38	36	34	30
	Air compressor	2	84	60	54	48	45	42	40	38	34
Construction of ring road	**Total noise level**	35	**102**	**78**	**72**	**66**	**63**	**60**	**58**	**56**	**52**
	Bulldozer	4	99	75	69	63	60	57	55	53	49
	Excavator	5	93	69	63	57	54	51	49	47	43
	Truck	4	94	70	64	58	55	52	50	48	44
	Concrete mixer	3	86	62	56	50	47	44	42	40	36
	Roller	3	77	53	47	41	38	35	33	31	27
	Excavator	3	82	58	52	46	43	40	38	36	32
	Paving machine	4	93	69	63	57	54	51	49	47	43
	Mobile crane	3	86	62	56	50	47	44	42	40	36
	Electric generator	3	81	57	51	45	42	39	37	35	31
	Air compressor	3	85	61	55	49	46	43	41	39	35
	Total noise level	41	**102**	**78**	**72**	**66**	**63**	**60**	**58**	**56**	**52**

Item	Machine	Quantity machine	Distance to noise source (m)								
			1	15	30	60	90	120	150	180	300
Construction of Luu Van Te Road	Bulldozer	5	99	75	69	63	60	57	55	53	49
	Excavator	5	93	69	63	57	54	51	49	47	43
	Truck	7	96	72	66	60	57	54	52	50	46
	Concrete mixer	3	86	62	56	50	47	44	42	40	36
	Roller	4	79	55	49	43	40	37	35	33	29
	Excavator	4	84	60	54	48	45	42	40	38	34
	Paving machine	3	92	68	62	56	53	50	48	46	42
	Mobile crane	3	86	62	56	50	47	44	42	40	36
	Electric generator	3	81	57	51	45	42	39	37	35	31
	Air compressor	4	87	63	57	51	48	45	43	41	37
Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road	**Total noise level**	38	**100**	**76**	**70**	**64**	**61**	**58**	**56**	**54**	**50**
	Bulldozer	3	97	73	67	61	58	55	53	51	47
	Excavator	4	92	68	62	56	53	50	48	46	42
	Truck	5	94	70	64	58	55	52	50	48	44
	Concrete mixer	5	88	64	58	52	49	46	44	42	38
	Roller	5	79	55	49	43	40	37	35	33	29
	Excavator	4	84	60	54	48	45	42	40	38	34
	Paving machine	3	92	68	62	56	53	50	48	46	42
	Mobile crane	3	86	62	56	50	47	44	42	40	36
	Electric generator	3	81	57	51	45	42	39	37	35	31
	Air compressor	3	85	61	55	49	46	43	41	39	35
QCVN 26:2010/BTNMT (from 6h-21h) – normal area			**70**								
QCVN 26:2010/BTNMT (from 21h-6h) – Normal area			**55**								

The results show that:

The noise of the vehicles operating within distance of more than 15 m (daytime) and more than 120m (night) is within the allowable limits of QCVN 26:2010/BTNMT - National Technical Regulations on noise (70dBA for normal areas from 6 - 21h, 55dBA for normal area from 21h - 6h)

The resonant noise of the vehicles operating within the distance of more than 50m (daytime) and more than 150m (night) is within the allowable limit of QCVN 26:2010/BTNMT - National Technical Regulation on noise (70dBA for normal areas from 6 - 21h, 55dBA for normal area from 21h - 6h).

In general, households is 20-50m far from the construction site of the component 2 (exceptng for the construction site of bridge and ring road 2 with dispersed population and with the nearest distance from 50-100m), on the other hand, the construction of work items are insimultaneously in combination with clear site which is along roads or on canals sites and long-term construction time (average 18-24 months), the impacts from noise is at MEDIUM level.

b2. Impact due to vibration

The constructional activities may cause the impact, vibration of groud surface at the different levels that depend on all constructional method and equipments, however, the vibration strength will decrease under the propagation distance. Refer the vibration level of means, machine, equipment in the report: *Transit Noise And Vibration Impact Assessment, FTA, 2006*, that the vibration level of all means, machine, equipment that presented in the following table:

Table 4.36. The vibration level of all means, machine and equipment

No	Equipment	Vibration level of all sources 7,5m (dB)	QCVN 27:2010/BTNMT, (Từ 6h-21h) - Common area
1	Lorry	86	**75dB**
2	Bulldozer/earthmover	87	
3	Excavator	94	

***Source**: Transit Noise And Vibration Impact Assessment, FTA, 2006.*

Bảng 4.37. Vibration level under the distane of all means

No	Equipment	Vibration level of all sources D(m) (dB)											
		7,5	**10**	**12,5**	**15**	**17,5**	**20**	**22,5**	**25**	**27,5**	**30**	**32,5**	**35**
1	Lorry	**86**	**82**	**79**	**77**	**75**	73	72	70	69	68	67	66
2	Bulldozer/earthmover	**87**	**83**	**80**	**78**	**76**	74	73	71	70	69	68	67
3	Excavator	**94**	**90**	**87**	**85**	**83**	**81**	**80**	**78**	**77**	**76**	**75**	74
QCVN 27:2010/BTNMT, (6h-21h) - Common area		**75dB**											

From the results above, the following comments could be given:

At the distance of 7.5 - 17.5m from the vibration source, the vibration levels of all vehicles are outside the allowable limits of QCVN 27:2010/BTNMT - normal area from 6 - 21h.

At the distance of 20m - 32,5m from the vibration source, the vibration level of excavator is beyond the allowable limit of QCVN 27:2010/BTNMT - normal area from 6 - 21h. The vibration level of the remaining vehicles is within the allowable limit.

With the above vibration level, the vibration impacts on people around the construction site only take place within a radius of less than 35m from the source of vibration. Outside the 35m radius, the vibration impacts on local people are negligible.

In general, as evaluated above, the impact level of the dust is LOW and of noise is LOW → MEDIMUM.

4.1.4.2.3. ***Impacts on water environment***

During the construction phase of the items of component 2, there are three main sources of impact on the aquatic environment, including: (1) Stormwater runoff at construction site; (2) Wastewater discharged by construction workers; (3) construction wastewater.

c1. Stormwater runoff at the construction site

Total rainfall from the project area is estimated during the construction phase of the component 2 is shown in table below:

Table 4.38. Stormwater runoff in the project areas of component 2

Items	Stormwater dranage area (m^2)	The flow coefficient	The flow rate of stormwater (l/s)
Construction of embankment and park on Bao Dinh river sides	39650	0.2	10.31
Rehabilitation of Cau Tre canal	12400	0.2	3.22
Construction of ring road	138600	0.4	87.54
Construction of Luu Van Te road	59400	0.2	13.47
Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road	25900	0.4	1.56

Normally, the first stormwater will contain a large amount of of impuritiesaccumulated on the surface such as oil, grease, dust, soil.According to data of WHO (1993), content of pollutants

in stormwater runoff is approximately 0,5-1,5mgN/l, 0,004-0,03mg P/l, 10-20mg COD/l và 10-20mg TSS/l. The stormwater is considered to be clearer than domestic waste; and it takes about 01 month for demolition and site preparation for the component in each LIA, impacts from stormwater are insignificant.However, to minimize the impacts, the contractor will have to distribute appropriately the area for gathering machines, materials and solid waste in order to avoid leakage of pollutants.

c2. Wastewater discharged by workers

The flow rate of wastewater from domestic activities of workers based on the average water supply norm for each worker stated in QCXDVN 01:2008/BXD is 45/l/person/day including wastewater from washing, cooking and personal hygiene. Generated wastewater is calculated as 100% of daily using water volume. Therefore, wastewater from domestic activities ranges from 1,35 m^3/day đến 2,25 m^3/day. As Particulate emission factor in wastewater per capital for developing countries in accordance with WHO (1993) and the number of wokers and water flow rate in the table below, the concentration of pollutants in wastewater is calculated as follows:

The domestic wastewater mainly comprising residues, suspended solid (SS) organic compounds (BOD_5), nutrients (NO_3^-), bacteria, load and content of pollutants in wastewater which are primarily treated by septic tank are shown as follows

Table 4.39. Load and concentration of pollutants in domestic wastewater (before treated)

No.	Pollutants	Particulate emission factor (g/worker/day)	Construction of embankment and park on Bao Dinh river sides	Rehabilitation of Cau Tre canal	Construction of ring road	Construction of Luu Van Te road	Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road
			Load (kg/day)	Load (kg/day)	Load (kg/day)	Load (kg/day)	Load (kg/day)
1	Number of wokers		50	30	50	30	30
2	BOD5	45 – 54	2.25 – 2.7	1.35 - 1.62	2.25 – 2.7	1.35 - 1.62	1.35 - 1.62
3	COD	72 – 102	3.6 – 5.1	2.16 - 3.06	3.6 – 5.1	2.16 - 3.06	2.16 - 3.06
4	TSS	70 – 145	3.5 – 7.25	2.1 - 4.35	3.5 – 7.25	2.1 - 4.35	2.1 - 4.35
5	Grease	10 – 30	0.5 – 1.5	0.30 - 0.90	0.5 – 1.5	0.30 - 0.90	0.30 - 0.90
6	Total Nitrogen	6 – 12	0.3 – 0.6	0.18 - 0.36	0.3 – 0.6	0.18 - 0.36	0.18 - 0.36
7	N-NH4	2.4 – 4.8	0.12 – 0.24	0.07 - 0.14	0.12 – 0.24	0.07 - 0.14	0.07 - 0.14
8	Photphorous	0.8 – 4.0	0.04 – 0.2	0.02 - 0.12	0.04 – 0.2	0.02 - 0.12	0.02 - 0.12
9	Total Coliforms	10^6 - 10^9	$50x10^3$-$50x10^6$	$30x10^3$-$30x10^6$	$50x10^3$-$50x10^6$	$30x10^3$-$30x10^6$	$30x10^3$-$30x10^6$

(Source: WHO, 1993)

Concentration of pollutants in domestic wastewater after being treated by septic tanks are presented in the following table:

Table 4.40. Parameters and concentration of pollutants in domestic wastewater

Pollutants	Concentration of pollutants (mg/l)		QCVN 14:2008/BTNMT (collumn B)
	Untreated	Septic tank	
pH	5 – 9	5 – 7	5 - 9
BOD_5	450 – 540	100 – 200	50
TSS	700 – 1450	80 – 160	100
Nitrat (NO_3^-)	50 – 100	20 – 40	50
Total coliform	10^6 – 10^9	Reducible	5.000

(Source: Hoang Hue - Wastewater treatment, Construction Publisher)

According to the above results, after treated through septic tank, the quality of domestic wastewater from workers' activities still contains some parameters exceeding the allowable limit such as BOD (exceeding 2-4 times), TSS (may be exceeding 1,6 times). Unless there is a appropriate management plan, the domestic wastewater will deface the city beautiful landscape and pollute the soil, water, air environment as well as the pathogen proliferation. Consequently, people's and the community's health will be affected significantly. The impact level is MEDIUM and is under control

c3. Construction wastewater

During the construction phase, a small amount of wastewater from the operation and maintenance of equipment, trucks, ... or washing construction tools/instruments in which the main components are grease, suspended solids and a number of other substances. To prevent the construction waste water flowing into the water source, the maintenance and washing area should be shielded and collected for separate treatment.

4.1.4.2.4. ***Impacts from solid waste***

Solid waste generated in the construction phase of component 2 includes 3 main types: (1) construction solid waste (debris); (2) domestic solid waste; (3) hazardous solid waste. The volume is assessed as follows:

d1. Solid waste (debris) from construction activities

Waste from construction activities of component 2 mainly come from the demolition of existing structures and excavated soil/rock on the construction areas. Amount of construction solid waste is calculated and shown in table below:

Table 4.41. Volume of solid waste during the construction of component 2

No.	Item	Volume of demolition (m^3)	Volume of demolition (ton) *Specific weight 1,8 ton/m^3*	Volume of excavated soil (m3)	Volume of excavated soil (ton) *(specific weight 1.5 ton/m^3)*	Total (ton)
1	Construction of embankment and park on Bao Dinh river sides	4734.7	8522.46	10850	16275	24,797.46
2	Rehabilitation of Cau Tre canal	121.2	218.16	1250	1875	2,093.16
3	Construction of ring road	1021.5	1838.7	6240.8577	9361.28655	11,199.99
4	Construction of Luu Van Te road	173.6	312.48	33976.25	50964.375	51,276.86
5	Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road	119.2	214.56	6682.5	10023.75	10,238.31
	Total	**6170.2**	**11106.36**	**58999.61**	**88499.41**	**99605.77**

In addition, in the construction process, a small amount of debris is generated such as lime, mortar, iron and steel, soil, rock and cement packages, etc.

The volume of construction solid waste generated from the construction process of work items of the component 2 is relatively large in comparison with the construction of other urban infrastructure facilities. Overall, the impact of the construction solid waste in the construction phase of the component 2 is MEDIUM because the work items are located at different areas and

along the road routes. On the other hand, the "successive construction method" is used, therefore amount of solid waste generated daily will be smaller than that has been calculated above.

Beside that, under the soil quality analysis result at all project areas, it all has the content of heavy metal indices that lower than the allowable limit (as mentioned in Chapter 2) and under the soil observation result within 5 recent years in Tan An province. However, because the nature of the excavation soil at all existing alley lines in all Lias areas that all are the stable grounds that mixed with rock/pebble/garbage/,… it can not utilize this excavation soil for the agricultural purpose, but, it can use it to aggrade the hollow place, floor (if all households/units have the demand) or the sign the treatment and collection contract with Tan An city Urban Company.

d2. Solid waste discharged by construction workers

Domestic solid waste are mainly packages, plastic bags, bottles, cans of food, etc. The volume is assessed by rapid assessment method of the WHO, the volume of solid waste discharged every day is 0.5 kg/person/day. The estimated volume of the total solid waste generated daily in the construction process of the component 2 is shown in the table below:

Table 4.42. Volume of domestic solid waste generated during construction of component 2

No.	Item	Number of workers (person)	Construction duration (day)	Daily produced (kg/day)	Total (kg)
1	Construction of embankment and park on Bao Dinh river sides	50	720	25	18000
2	Rehabilitation of Cau Tre canal	30	360	15	5400
3	Construction of ring road	50	720	25	18000
4	Construction of Luu Van Te road	30	540	15	8100
5	Construction of Tran Phong Sac road connecting to Nguyen Minh Duong road	30	360	15	5400
	Total	**190**	**2700**	**95**	**54900**

The volume of domestic solid waste generated during construction of individual items of component 2 is small, which is about 15 - 25 kg/day. This is the main source of pollution due to the decomposition of organic matters that creates bad odor, leachate and pathogenic microorganisms. If this source is not collected reasonably, it will cause environmental pollution. Though the project areas are not centralized but scatered, on the other hand, and the successive construction method is used, but the construction duration is long. Therefore, the impact level is assessed as MEDIUM.

d3. Hazardous waste

Hazardous solid waste generated during construction process are mainly barrels/plastic containers containing motor oil, oil, gasoline, used fluorescent bulbs, greasy rags from the means of transportation etc. Hazardous waste generated during the construction process includes fluorescent bulbs, batteries, waste oil, greas, greasy equipment, etc. Amount of hazardous waste is estimated equal to 2% of total domestic solid waste, which is equivalent to 0,3 – 0,5 kg/day. Though volume of hazardous waste generated on site is not large but due to its hazardous nature, 100% of the volume must be collected, stored and handled in accordance with regulations on hazardous waste.

4.1.4.2.5. ***Impacts on existing technical infrastructure in the region***

As calculated in the assessment of impacts on the air environment, during the construction process of works under Component 2, the number of vehicles to transport wasteed materials from the construction site to the dump sites as well as the construction materials from the supplier to the work is not much. However, as they are heavy motor vehicles and have to pass through the

residential area to access to construction site so the effects to local transportation infrastructure is inevitable, which causes damage to the public utilities such as roads, water supply and drainage pipes, electrical wire/fiber cable/network, assets of the local residents, etc,.

The impact duration of these activities will take place throughout the construction process, and mainly concentrate in the area of construction work items. To minimize these impacts, the contractor must fully comply with the provisions set out in the ECOPs of the project and have to analyze and select the suitable transport route to limit the travel through the residential areas. In case of causing damage, the contractor must take measures to repair, remedy or compensate appropriately.

4.1.4.2.6. ***Impact on City Landscape***

The rehabilitation/construction activities would require excavation on 03 roads, 02 bridges, 01 canals (Cau Tre section 2) 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 these works 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.

4.1.4.2.7. ***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 Impact

4.1.4.2.8. ***Subcomponent 2.1 – Embankment of Bao Dinh river and construction of an extension road of Bao Dinh river embankment.***

Construction of the 1.3 km of Bao Dinh river embankment will require dredging of 10850 m^3 of soils and sediment. The construction will have impacts on the reiver water quality, aquatic and bentic communities and impacts associated with transportation and disposal of the dredged soils and sediment.

Impacts on water environment and aquatic communities of Bao Dinh river:

River dredging may give rise to the amount of suspended solids swept away toward the river downstream. The rainfall runoff around the subproject area will be accompanied with pollutants including construction material, soil, sand, grease and oil flowing into the river, affecting the water quality of Bao Dinh River.

In addition, during the construction, the flow cross-section can be reduced and thus leads to the increased the flow rate, especially at the time of heavy rain, which can lead to the erosion of the riverbank at the downstream.

Another factor bound to cause water source pollution is a small amount of domestic waste and wastewater (2.25 m^3/d) from workers' camps. This source of pollutants, if discharged directly into canals, would cause organic pollution (BOD, COD) and nutrient pollution (N, P) to the receiving waters.

The biome structure and variations of the related aquatic species show that the water environment in Bao Dinh river has been affected by organic pollution. Some aquatic plant species in the river include water hyacinth, water cabbage, water moss, water spinach, nipa palm, water ginger grass, etc. In this river section, there are no endemic or rare species listed in the Red Book which require protection, and there are no natural vegetation and no rare or typical fauna and flora.

The impacts only happen during construction period which last about 03 months and would stop by operation. The level of the impacts, therefore, is moderate temporary and could be mitigated by good construction practices.

Impact on waterway traffic activities on the Bao Dinh river

The method of Bao Dinh river embankment is to place sheet piles for each construction segment with a length of 50m to prevent water from flowing into the site causing construction obstruction and to limit the disturbances to the river flow. In general, the sheet pile area is small and only within 5m wide for each embankment segment.

During 24 month of construction, although work items are implemented in a sequencing manner, there will be certain impact to waterway transportation. However, on Bao Dinh goods transportation by boat and barges is not high thus the impacts on waterway can be ranked as moderate. The mitigation can be made through the collaboration with the local waterway management company to provide necessitate information on alternative traffic routes for boats.

Risk of embankment subsidence and bank erosion during construction process

The current status Bao Dinh river banks is natural earth banks. Therefore, similar to Rot canal under component 1, during the embankment process of Bao Dinh River, there will be risks on shore erosion and subsidence as discussed above. Moreover, the flow of Bao Dinh river along the embankment is affected by tide, especially in the wet season. The combination of heavy rain and high river tides can cause big flood although the likelihood of occurrence might be low. It

however can pose a severe risk on land subsidence and river bank erosion. For convenience and safety, the contractor should focus the construction in dry season because there will be much less rainfall during dry months. In addition, geological, hydrological and hydraulic conditions in the surrounding area of the embankment work need to be surveyed thoroughly during the work design and preparation. These impacts are localized, short term and avoidable via appropriate design and good construction practices

The embankment process of Bao Dinh river involves the pile jacking of concrete piles to the depth of 12 m. It is calculated that the risks on infrastructure cracking and collapse are within the radius of 5-8 m from the embankment. However, the land acquisition for the construction of the embankment and adjacent operational roads will be carried out beyond the area of influence (10 m distant from the embankment). Thus the risk on cracking and collapse of infrastructure along the river is not likely to occur.

Impact on irrigation scheme along the Bao Dinh embankment's extended/or connecting road:

There is one irrigation canal that run across the road (see section 2.5) . The construction of the might affect an irrigation canal that runs across the road in a number of ways (i) temporarily block the canal and water flow; (ii) contaminate irrigation water due to the spill of construction materials into the canal; (iii) physically damage to the irrigation canal. The execution work of the road may block the canal, spread soil to the irrigation canal and the vegetable fields causing sedimentation in the canal and arable agricultural land if there is no strict erosion and sedimentation management measures. However, construction activities through the canal intersection will be done in a short-time and appropriate mitigation measures will be adopted. The impact thus is assessed as moderate and temporary.

Impacts on Thien Chau Pagoda (50 m from Bao Dinh Embankment); Binh Yen Dong Temple (30 m from Bao Dinh Embankment) and Long Chau pagoda (20 m from extension road of Bao Dinh river embankment)

Construction activities of the embankment including dredging the transportation of the dredged sediments would have the potential adverse impacts on the temple/pagodas due to: (i) hindrance to access to the temple; (ii) increase in dust, exhaust gases, and noise affecting religious practices and visitors to the temple/pagoda; (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 temple/pagodas.

Impact on vibration to PCRs during the construction of the embankment and operation road.

As indicated above, the embankment process of Bao Dinh river involves the pile jacking of concrete piles to the depth of 12 m. It is calculated that the risks on infrastructure cracking and collapse are within the radius of 5-8 m from the embankment.

All the PCRs within the project areas are at least 20 m distant from the embankment construction site which are beyond the area of influence (5-8 m). Therefore, the risk on PCRs collapse is not likely to occur.

Thien Chau Pagoda (50m away from bank side of Bao Dinh River)

Binh Yen Dong Temple (30 m from Bao Dinh Embankment)

Long Chau pagoda's entrance is 20 m from Bao Dinh Embankment

Disruption of business activities

There are remaining 11 temporary affected household-businesses by Bao Dinh embankment which sell foods, vegetables or convenient good stuff near the road. Besides being a safety risk, noise and dust from road construction activities and equipment might temporarily disrupt business activities. The contractor should take caution on this matter to avoid accidents and dust impacts to the shop.

4.1.4.2.9. ***Subcomponent 2.2 – Rehabilitation of Cau Tre canal***

Cau Tre canal has two sections to be rehabilitated of which section 1 is upgraded under component 1 and section 2 is an investment under subproject's component 2. The status of the canal is highly polluted due to the direct discharge of domestic wastes and wastewater into the canal and the fact that the canal has not been dredged regularly.

Activities for rehabilitation of the canal includes (i) canal dredging (ii) soft embanking of 1.24 km long; (iii) construction of operational road along two sides of the canal; and (iv) provision of drainage pipes and other associated lighting and tree landscaping.

The following issues are of concerns as their impacts are negative to construction workers and local people.

- Local flooding
- Social disturbance and traffic disruption
- Management of dredging materials and leachate
- Bad dredging odors
- Soil subsidence and erosion
- Damages to the local houses' structures

Local flooding

During the construction, material gathering/ aggregating or spill of materials into the canal can block the water flow. In addition, the existing under capacity of drainage functions poorly, thus localized floods can happen. The impact is however low due to the construction work is carried out in a short time (2 months on average). The canal embankment is done in sequencing segment of 50-100 m. The impact can be mitigated by adopting measures specified in the ESMP.

Social disturbance and traffic safety concerns

At the two ends of the canal section, traffic congestion can be an issue as high densely population resides at these areas. Traffic pressure is highly sensitive to the local people however

the impacts can be controllable. The contractor should apply appropriate measures to address the traffic flow and accident risks, having clear signs and instruction for detour as necessary.

Bad odor and management of dredged materials

Upgrading this section of Cau Tre canal would generate about 7,400 m^3 of dredged soils and sediments. Analytical results of the sediment samples of the canal reveals that toxic heavy metals are lower than allowable limits However, the canal sediment are contaminated with high level of organic substances and pathogens affecting public health.

Similar to section 1, dredging and transportation of sediment from Cau Tre canal, section 2 could cause bad odor, nuisance, leakage and unsanitary conditions to the local residents along canals, at the transfer sites and along the transportation routes. Local residents and workers are exposed to the bad smell for a short period of dredging at each 50-100 m canal's segment. However, this impact can be assessed as medium, localized and short term intermittent. The route of concern is Nguyen Van Tao Road →provincial road 62→landfill site in Tan Dong commune.

Risks on bank erosion, soil subsidence and house cracking during piling operation for embankment foot protection

The canal bank erosion and embankment subsidence could pose safety risks to human life and loss of assets in the subproject areas.

These impacts are localized, short term during construction period, and avoidable if geology survey are carefully considered during the detailed design, and via the application of good construction method. More importantly, the likely affected households are often those will be relocated to the resettlement site. Thus, the risk on house cracking during the construction process is not likely to occur if land acquisition is completed prior to construction.

4.1.4.2.10. ***Subcomponent 2.3 – Construction of Ring Road***

Impact during the construction phase

Construction of the ring road is based on the existing road base and agriculture land of Khanh Hau and Loi Binh Nhon communes. Residential houses are scattered and at distance from 50-150m from construction site. Sensitive receptors are the low voltage power line and the irrigation canals (Khanh Hau Tay and Chinh Nam) serving irrigation for agriculture activities of the 2 mentioned communes. On the road alignment, there are two bridges will be constructed: (i) one at the intersection with Mang canal at km4+562; (ii) and one overpass at the junction with the Ho Chi Minh City – Trung Luong Expressway (overpass No. 7) at Km4+562.

Construction work includes: (i) traffic safety during the construction of bridge across Trung Luong highway; (ii) relocation of power poles on the road alignment; (iii) impacts on irrigation canals and agriculture activities; (iv) impacts on quality of surface water on Can Dot canal; (v) subsidence and damages of houses' structures during construction of Mang bridge. Construction period will be within 24 months and the impact are the following:

Traffic safety concerns during the construction of overpassing bridges across

Traffic obstruction can happen during the construction period at the traffic nodes/ intersections/ at overpassing bridges on National Highway Ho Chi Minh – Trung Luong at Km4+562 and Mang bridge at Km6+023 in a number of ways: (i) placing of materials, machineries and construction work could cause limit traffic access of people; (ii) increase traffic flow due to vehicle transportation of materials and waste; (iii) unwanted accidents can happen. Likelihood of this impact is high however it will be short term and ceasing upon the completion of the construction, thus the impact can be considered moderate to local people.

Impact on the relocation of power poles and other current technical infrastructures

The construction of ring road will cause relocation of power poles and line along the road. As description provided in section 2.5, there are 20 lower voltage power poles at 5 m distance from the road center line and 2 high voltage power poles at Km 6+828 and Km8+900 at a distance of 23 m from the road centerline.

During the construction phase, these impacts will cause some temporary disruption to local people and safety risks to workers and local residents nearby if the electric poles and line relocation are not conducted appropriately. The impacts are short term and avoidable by application of good construction management practices.

Impacts on irrigation canals and agriculture activities

The construction process might cause effects on 2 irrigation canals that run consecutively along section 1 of the road (Km00 to Km 4+200). These canals provide irrigation water to the rice field of the two communes in the subproject area. The impacts are: (i) temporarily block the canal and water flow; (ii) contaminate irrigation water due to the spill of construction materials into the canal; and (iii) physically damage to the irrigation canal. The execution work of the road may block the canal, spread soil to the irrigation canal and the rice fields if there are no strict erosion and sedimentation management measures. However, construction activities along the irrigation canal will be done in a short-time and appropriate mitigation measures will be adopted. The impact thus is assessed as moderate and temporary.

Impacts on water quality of Can Dot canal during the construction of Mang bridge

Cast-in-place pile will be used for construction of piers and abutments at the depth of 60m. Boring will impact on surface flow and increase the turbidity of Can Dot canal. Construction materials can fall into the river.

At the boring locations, there may be local piled-up boring materials. Besides, construction materials at the river banks (concrete, cement, paint, steel) and other substances can get into and degrade quality of water and affect aquatic species. Some aquatic plant species in the river include water hyacinth, water cabbage, water moss, water spinach, nipa palm, water ginger grass, etc. In this river section, there are no endemic or rare species listed in the Red Book, which required protection, and there is no natural vegetation and no rare or typical fauna and flora.

However, bridge pier construction period is about 6 months (dry season). Flow rate is good (due to the semi-diurnal regime with two times of tide rise and tide fall per day averagely), and with application of suitable construction methods. Therefore, this impact is at low level and can be mitigated.

Subsidence and Risks on pier collapse and damages to adjacent local houses during construction of two bridges on the road alignment

For two bridges construction item on Ring road, there're risks of on-the-spot subsidence and especially during construction of bridge piers there're risks of surface cracking because of the project area's particular geologic, topographic conditions, especially affecting structures of residential houses nearby the two ends of the bridge unless carrying out careful surveying of the area's geologic and topographic conditions.

For the bridge across Trung Luong highway, around construction bridge's sites is mostly agricultural land. Thus, there is no impact on residential house structure of this bridge construction item.

For the bridge across Can Dot canal, about 2-3 houses with a distance of 20-30m away from bridge piers are in the risk of subsidence due to improper methods of piers construction.

4.1.4.2.11. ***Upgrading of Luu Van Te road (subcomponent 2.4) and Construction of the road connecting Tran Phong Sac road and Nguyen Minh Duong road (subcomponent 2.5)***

Luu Van Te road is located in ward 4. Currently it is degraded largely, affecting the commuting of local people. Population resides at a moderate density along the road at a distance of 10-200 m from the the road. There are Thien Khanh pagoda ar a distance of 30 m from the construction site. Other sensitive receptors include Phuong Hong kindergarten and power facilities. Construction duration would be about 12 months. Site-specific impacts during the construction of these investment include: (i) traffic safety and local disturbance; (ii) impacts to PCRs and sensitive points; (iii) impacts on the relocation of power poles on Luu Van Te road. The detailed impacts assessment are presented below:

Social disturbance and traffic safety concerns

Construction of Luu Van Te will require about 10 vehicle trips per day and construction of link road between Tran Phong Sac road and Nguyen Minh Duong road will require about 4 vehicle trips per day to transport excavation soil and demolition materials, which will last for one year of construction period. These vehicles will travel through many key roads of Tan An City such as Nguyen Van Tao road, NH No.1A, Hung Vuong road, NH No.62, Nguyen Minh Duong road and Tran Phong Sac road.

The construction and upgrading of roads includes mobilization of materials and machineries, excavation, installation of drainage pipes, concreting surface of the roads. Without project implementation, the commuting of local residents in the subproject area is already difficult as the existing roads are small and degraded. Road construction activities will lead to the increased traffic congestion and cause disturbance to the daily activities of the local people. For Luu Van Te road, the receptors would be the households living nearby and along the transportation rout and along road alignment, especially at the section of 100 m from NH No.1A

For link road between Tran Phong Sac road and Nguyen Minh Duong road, the receptors would be the households living nearby and along the transportation route and road alignment, especially at two connecting points with Tran Phong Sac road and Nguyen Minh Duong. In general, these impacts are assessed as moderate, temporary during construction period and could be mitigated via the application of good management practices.

Impact on PCRs and sensitive receptors on Luu Van Te road

Phuong Hong Kindergarten and Thien Khanh Pagoda will be sensitive receptors. These facilities are also under impacts of alley upgrading in LIA 3. Thus assessment of potential impacts can be referred to the above section.

Vibration impact on PCRs and sensitive points during the construction of Luu Van Te road

Thien Khanh Pagoda and Phuong Hong Kindergarten is in the immediate vicinity of the construction site of Luu Van Te road, about 7 m and 0.5 m respectively. The construction of Luu Van Te road will involve the excavation process for the installation of box culvert along the road. The excavation process may encounter the foundation of the gate and fence of the kindergarten and pagoda and cause a risk on infrastructure collapse. These impacts could be manageable by application of appropriate construction method, for example using supporting pillars or steel frame to protect the fence foundation.

Thien Khanh pagoda's entrance is 5 m from Luu Van te road.

Thien Khanh pagoda's entrance is on the side of Luu Van Te road

Impact on the relocation of power poles on Luu Van Te road

Upgrading alleys will cause relocation of some existing infrastructure such as water pipeline or power lines. According to the RP, there will be a need for relocating 10 electrical poles and replacing 500 m electrical line. This must be well discussed with the Electricity Company in Tan An province before relocation and will cut electricity temporarily for households who directly connect to the power system, affecting on their living activities and may threaten the electricity safety of workers for implementing the relocation.

In addition, the mobilization of construction machineries and equipment to the site and the increase of traffic due to vehicle transportation of materials and waste could damage roads and other public facilities. During the construction phase, these impacts will cause some temporary disruption to local people's daily routine however the impact is reversible and considered low to moderate.

4.1.4.3. ***Component 2 – Impacts during the operation phase***

4.1.4.3.1. ***Subcomponent 2.1 – Embankment of Bao Dinh river and construction of an extension road of Bao Dinh river embankment.***

Risk of embankment collapse

The Bao Dinh river embankment has the reinforced concrete structure, thus it is quite stable compared to those of soft structure or combined hard and soft structure. The risk of collapse to the newly embankment work can happen although its occurrence is very low due t:o (i) extreme weather events that cause heavy rain, flooding and strong water current; (ii) induce impact from future construction work in the area (iii) waterway accidents among others. The collapse of embankment if occurred can cause severe loss of properties and life of local people and damage to the soil structure. Preventive measures should be put in place through the design, construction as well as operation phase.

Air emission, dust emission from the connecting road:

Improvement of the road makes traffic flow much higher, increasing of exhaust gas emission and dust generation is unavoidable.

Risk on traffic accidents from the connecting road

The road, on one hand facilitate traffic convenience, yet on the other hand will also increase traffic accident risks compared with present time if travelling vehicles are not good enough and the traffic participants' traffic regulation compliance is poor.

The connecting road, after completed must have proper traffic safety guidance items such as guiding signs, traffic lights, because the existing traffic lights at intersections are inefficient.

4.1.4.3.2. ***Subcomponent 2.2 – Rehabilitation of Cau Tre canal (section 2)***

Risk of bank collapse during operation

Cau Tre canal will be constructed as a soft and green revetment. Grass and landscaping trees will be planted on the bank slope. Therefore, similar to Rot Canal investment under subcomponents 1.2, there is a risk on embankment subsidence for Cau Tre Canal section 2 due to: (i) heavy rain, great flood, weak foundation causing embankment erosion; (ii) construction of adjacent infrastructures could cause damage to the embankment; (iii) failure to maintain trees and/or vegetation on the soft embankments. The likelihood of occurrence is very low however if happen, the collapse will directly affect the life of local people, environment landscape and quality of infrastructure located in the area protected by the embankment system.

Disposal of waste into the canal

During the operation, there might be some risks of pollution and flow stagnation due to disposal of waste from households living along the canal if their behaviors are not change and there is lack of enforcement from local authority. The level of impact can be from low to moderate. The impact however can be mitigated if proper O&M practices adopted and enforcement enhanced. Besides, behavior changes can happen as local people can be proud of new green design of the canal and want to collaborate to maintain the canal's clean and beauty.

4.1.4.3.3. ***Subcomponent 2.3 – Construction of Ring Rroad***

Road Safety, Air, Noise

Road safety is likely to be the key impacts during operation of Ring road during the first few years when transportation of rural population (bicycles, carts, etc.) are mixed with motor vehicle operations (cars, motorcycles, trucks, etc.) and level of traffic accident would be increased. Experience in the country suggested that this condition can be managed however improving knowledge of local people on road use regulations and practices as well as monitoring and enforcement of driver speed and behavior can help mitigating the impacts.

In a longer term when traffic volume is high, generation of dust, exhausted gases, noise, and vibration could be an additional issue but this could be mitigated through a long term planning.

Risk of local flooding due to the poor operation and maintenance

During operation, newly installed drainage systems along the road if not well maintained could potentially affect the drainage capacity, especially in rainy days, causing local flooding to the area. However, the impact can be low if proper O&M practices are adopted.

4.1.4.3.4. ***Upgrading of Luu Van Te road (subcomponent 2.4) and Construction of the road connecting Tran Phong Sac road and Nguyen Minh Duong road (subcomponent 2.5)***

Road Safety, Air, Noise

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

Local flooding on the roads due to inadequate maintenance

During operation, newly installed drainage systems along the road if not well maintained could potentially affect the drainage capacity, especially in rainy days, causing local flooding to the area. However, the impact can be low if proper O&M practices are adopted.

4.1.5. Environmental impact assessment for Component 3 - Resettlement

Construction of 2-hectar resettlement site includes the construction of water drainage and supply, power transmission line and social infrastructures. Detailed assessment on the potential adverse impacts during preparation, construction and operation of investments under component 3 are described below.

4.1.5.1. *Component 3 – Impacts during the preparation phase*

4.1.5.1.1. *Impacts from land acquisition for project*

Land acquisition, relocation and resettlement will affect physical and spiritual life of the affected For the Component 3 – Resettlement area, as constructed on the land of the former prision, the households are displaced by Tan An city People's Committee. As the project focuses on constructing infrastructure of resettlement area (transportation, drainage supply and lighting system, etc), the environmental impacts are mainly occurred in the construction and operation phases.

4.1.5.1.2. *Safety risk of Unexploded Ordnances (UXO)*

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

4.1.5.2. *Component 3 - Impacts during construction period*

A. General environmental impacts

4.1.5.2.1. *Impacts on air environment*

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 generated from the demolition of existing structures for site clearance

As mentioned in the impact assessment during the preparation for the Component, because the resettlement area is built in the former prision zone which has been cleared by Tan An CPC, there is no demolition volume.

a2. Dust generated from excavation and backfill of works

Based on all above-mentioned algorithms to define the generated dust volume for each item. Summarize all calculation results for this parameter that presented in table below.

Table 4.43. Forecast amount of dust generated from excavation backfill and ground leveling in the resettlement area

No.	Item	Volume of excavation, backfilling and ground leveling (m3)	Expected time for excavation and backfill (day)	Load of dust (kg/day)	Load of dust (mg/m3)	QCVN 05:2013 (mg/m3) *(average value in 1h)*
1	Resettlement	140000	540	10.663	**4.44**	**0.3**

Comments:

The results show that the concentration generated from the excavation is as 14.8 times as allowable limit of QCVN 05:2013/BTNMT but fast deposit and exist in the short time. With the distance of about 100m, the dust concentration meets allowable limit. The period of dust generation is long (about 4 weeks). Because the resettlement area is clear and there are some

households dispersedly living from 100-150m distance. Thus, the impact level is at MEDIUM and under control.

a3. Dust generated from the transportation

Load of dust from the transport process for the construction of resettlement area is determined in the table 4.44.

Besides, applying the models of road -source pollution diffusion according to the modified model of Sutton. The calculation results of dust concentration generated from the transportation process at the distance (x) and the height (z) are shown in Table 4.45:

Table 4.44. Load of emission from the transportation of materials and excavated soil for construction of resettlement area

Volume of materials (ton)	Volume of excavated soil (ton)	Transport duration (day)	Total of trips (trip/day)	Emission load (*) (mg/m/s)
243208.4	140000	540	49	21.54

Table 4.45. Dust concentration generated from transportation of materials and excavated soil for construction of resettlement area

Item	L(m)= W(m)	Dust concentration (mg/m^3)				QCVN 05:2013/BTNMT (The average 1h)
		H=1,5	H=2	H=3	H=3.5	(mg/m^3)
Construct resettlement site	50	1.228	1.215	1.180	1.133	**0.3**
	150	0.557	0.556	0.553	0.548	
	360	0.295	0.295	0.294	0.293	

Comment:

For the construction of resettlement site, the concentration of dust generated from the material transportation and excavated soil exceeds 4 times the allowable limits at the distance of 50m; 2 times as much as the level at the distance of 150m; and meet the allowable limit at 360m (over the QCVN 05:2013/BTNMT – National technical regulation on quality of ambient air);

In general, because the period of construction of the resettlement area lasts long (8 months), and that the site is clear and far from the residential area, the concentration of dust generated from the transportation of matertials and excavated soil in the omponent 3 is MEDIUM and mitigable.

a4. Dust from the gathering, loading and unloading of materials

Dust concentration and emission is calculated in the same way as components 1 and calculate from the loading/unloading of materials according to the method of *Trần Ngọc Chấn, 1999, air pollution and exhaust gas treatment (volume 1),*

The results show that: Concentrations of dust from the material loading and unloading for the resettlement area at a distance of 10m and height of 1.5 - 5m are 1.006 – 2.3 times over the allowable limit **QCVN 05:2013/BTNMT** upon each position; at the distance of over 50m, the dust concentration satifies the allowable limit. However, because of short period of construction time (8 months) along with the clear site and successive construction method and uncontinuous activities, the impacts of dust from the material loading and unloading in component 3 are at LOW level and under control.

a5. Exhaust gas and dust generated from the operation of transportation vehicles

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

Total amount of materials for construction of the resettlement area is approximately 243,208 tons. The material will be transported from material mines to the construction area by 31 trips per day within 18 months. Dust concentration and emission is calculated in the same way as components 1 and 2. The results show that:

CO contents 0.0007 mg/m^3 (compared with 30 mg/m^3); SO_2 contents 0.0004 mg/m^3 (compared with 0.35 mg/m^3); and NO_x contents 0.0007 mg/m^3 (compared with 5 mg/m^3). The dust and emission concentration would not exceed the national standards on ambient air quality (QCVN 05: 2013/BTNMT).

In general, the exhaust gas load generated by the operation of the vehicles and construction machines in the resettlement area is relatively small. On the other hand, the construction site is convenient but construction implementation period lasts 18 months, so this impact is LOW and can be minimized.

4.1.5.2.2. ***Impacts from noise and vibration***

b1. Impacts from vibration

Noise generated during the construction phase - Component 3 mainly comes from transportation of waste materials and the waste. calculate noise level as shown in table below.

Table 4.46. Noise level by distance of construction vehicles and machinery in component 3

Item	Types of machine	Quantity	Distance to the noisy sources (m)								
		machine	1	15	30	60	90	120	150	180	300
Resettlement	**Total noise level**	40	**101**	**77**	**71**	**65**	**62**	**59**	**57**	**55**	**51**
	Bulldozer	5	99	75	69	63	60	57	55	53	49
	Excavator	4	92	68	62	56	53	50	48	46	42
	Truck	4	94	70	64	58	55	52	50	48	44
	Concrete mixer	5	88	64	58	52	49	46	44	42	38
	Roller	4	79	55	49	43	40	37	35	33	29
	Excavator	5	84	60	54	48	45	42	40	38	34
	Paving machine	3	92	68	62	56	53	50	48	46	42
	Electric generator	3	86	62	56	50	47	44	42	40	36
	Air compressor	4	83	59	53	47	44	41	39	37	33
	Total noise level	3	85	61	55	49	46	43	41	39	35
QCVN 26:2010/BTNMT (6h-21h) – normal area		**70**									
QCVN 26:2010/BTNMT (21h-6h) – normal area		**55**									

The results show that:

- The noise of the vehicles operating within distance of more than 15 m (daytime) and more than 150m (night) is within the allowable limits of QCVN 26:2010/BTNMT - National Technical Regulations on noise (70dBA for normal areas from 6 - 21h, 55dBA for normal area from 21h - 6h)
- The resonant noise of the vehicles operating within the distance of more than 30m (daytime) and more than 180m (night) is within the allowable limit of QCVN 26:2010/BTNMT - National Technical Regulation on noise (70dBA for normal areas from 6 - 21h, 55dBA for normal area from 21h - 6h).

In general, the resettlement area has the sparse residential density, only several households are living at about 100-500 m away from the construction area. Therefore, the noise impacts are evaluated at LOW level and can be minimized.

b2. Impacts from vibration

Construction activities can cause tremors, shaking of the ground at different levels depending on the devices and construction methods. However, the vibration intensity will reduce by the transmission distance. The buildings, residential areas near the project area will be affected by the vibration during the construction phase of the project. Vibration levels are classified into the following levels: from no perceptible effect at the lowest level, a low rumbling sound and perceptible vibration at the moderate level, and slight damage at the highest level.

As stated in the impact assessment content due to noise, the resettlement site has low population density with only a scattered number of households who are living at 50 - 200 m away from the construction area, the scale of technical utilities is small -> medium so the vibration impacts should be assessed at a low level and can be mitigated.

4.1.5.2.3. ***Impacts on water environment***

During the period of construction of technical infrastructure for the resettlement site of the project, there are three main sources of impact on the aquatic environment, including: (1) Stormwater runoff at construction site; (2) Wastewater discharged by construction workers; (3) construction waste water.

c1. Stormwater runoff at construction site

Total rainfall arising from the resettlement area during the construction process is estimated by the equation [9]. The calculated rainfall of the resettlement area during the construction phase is 5.2 l/s.

Generally, the flow rate of stormwater runoff in the are is quite large. Stormwater runoff will run to canals/rivers in the project area. However, because the concentration of pollutants in stormwater is small along with the control of emission sources, impacts from the stormwater runoff for the component 3 is LOW and under control.

c2. Wastewater discharged by construction workers:

Similar to the calculation for component 1 and 2 in the construction period, the total amount of domestic wastewater generated from the construction of the resettlement area is1.35 m3/day, the total amount of waste water generated in this period is 729 m3.

Domestic wastewater contains many suspended solids, organic matters, nutrients and microorganisms. The composition of waste water includes suspended solids, oil, grease, high organic concentration, precipitated substances, insoluble organic matters (through the indicators of BOD5, COD), nutrients (nitrogen, phosphorus) and microorganisms. Based on the emission factors of pollutants of the World Health Organization for developing countries, the load of pollutants in domestic waste water for construction of the component 3 (averaged for over 30 workers, the same as the average calculation for each item of component 2).

In general, the quality of domestic waste water discharged by construction workers after being treated by septic tank still remains some indicators exceeding the allowable limits of BOD (2-4 times), TSS (1.6 times). Although the volume is not large(1.35 m3/ngày) if there is no appropriate measures to handle, the quality of wastewater discharged by workers in this period will be a local source of pollution for the construction sector, especially in the camp area. This impact is considered MEDIUM and can be minimized.

c3. Construction wastewater

During the construction phase, a small amount of wastewater from the operation and maintenance of equipment, trucks, ... or washing construction tools/instruments in which the main components are grease, suspended solids and a number of other substances. To prevent the

construction waste water flowing into the water source, the maintenance and washing area should be shielded and collected for separate treatment.

4.1.5.2.4. ***Impacts from solid waste***

Solid waste generated in the construction phase of component 3 includes 3 main types: (1) construction solid waste (debris); (2) domestic solid waste; (3) hazardous solid waste. The volume is assessed as follows:

d1. Solid waste (debris) from construction activities

Wastes from the construction of component 3 mainly from the amount of excavated soil/stone and debris during the construction phase.

Application of calculation methods as implemented during the construction phase of Component 1 and 2, the volume of excavated soil estimated about 20000 m3 (equivalent to 30000 tons, the proportion of soil is 1.5). The volume of excavated soil is quite huge. The the resettlement area is agricultural land (former prision). The analysis shows that the content of heavy metals is lower than allowable limit (stated in Chapter 2). The excavated soil can be used for leveling the low land, floor (for households/unit in need) or contract with Tan An city Urban Company for collection and treatment.

d2. Solid waste from domestic activities of workers

Solid wastes comprise of plastic bags, bottles, cans of food, etc. The arising volume is assessed according to the rapid assessment method of the World Health Organization, with 0,5kg/person/day of solid waste every day. The solid waste generated during the construction site is estimated about 15kg/day, total arising amount is 8100 kg (construction time: 18months)

This is the main polluting source because of organic substance decomposition creating mal odors, leachate and pathogenic microorganisms. If the sourceis not reasonablytreated, the environment will be seriously polluted. The volume of domestic solid waste generated in construction of each item in the component is small and because the site is clear, the impact is at low level and under control.

d3. Hazardous solid waste

Hazardous solid waste generated during construction process are mainly barrels/plastic containers containing motor oil, oil, gasoline, used fluorescent bulbs, greasy rags from the means of transportation etc. Hazardous waste generated during the construction process includes fluorescent bulbs, batteries, waste oil, greas, greasy equipment, etc..

Amount of hazardous waste is estimated equal to 2% of total domestic solid waste, which is equivalent to 0,3 kg/day. Although volume of hazardous waste generated on site is not much, due to its hazardous nature, 100% of the volume must be collected, stored and handled in accordance with regulations on hazardous waste.

4.1.5.2.5. ***Impacts on traffic infrastructure***

In the construction of items in component 3, the number of vehicles transporting waste and raw material is medium (25 trips/day). However, most of them are heavy vehicles and the project areas occupy several residential routes, impacts on traffic infrastructure are possible.

The increasing number of vehicle may affect the traffic safety and traffic jam on route. The transportation route includes Nguyen Dinh Chieu, Chau Thi Kim, Hung Vuong roads. The resident along roads will be affected by dust, noise, gases, etc. These impacts will take places all the construction. However, the construction will be divided into several bidding packages and implemented successively so the quantity of vehicles is much fewer than calculation. The impact is temporary, interrupted but extended (9 months) so it should be assessed at a medium level.

B. Site-Specific Impact

The impacts during construction period are generic and not beyond those as described in the ECOPs.

4.1.5.3. ***Component 3 - Impacts during operational phase***

4.1.5.3.1. ***Domestic waste***

If we assume that each person generates about 0.5 kg of domestic waste per day, with average total number of members of a HH being 4.0 people/household (according to the result of RP survey), 75 relocated HHs will totally have 300 HH members there will be an increase of 150 kg/day for the resettlement area. This volume of waste, if not well managed and collected, will affect surface water, groundwater and cause uncomfortable odors at the resettlement area. Persistent inorganic waste such as bottles, plastic bags and other items present in the water will affect the area's landscape.

4.1.5.3.2. ***Wastewater***

With average total number of relocated members are 300 people above. Total daily needed water volume as per QCXDVN 01:2008/BXD is 80 liters/person/day (washing, cooking, and drinking water). Generated domestic water volume is taken as 100% of daily used water volume. So, total generated domestic WW volume is about 24 m3/day.

Pollutants in the WW include suspended sediment, oil, grease, dissolved organic substances (BOD, COD), nutrients (N, P) and micro-organisms. The untreated wastewater has pollutant contents much higher than the allowable standard (QCVN 14: 2008/BTNMT (Column B). If there's no collection and treatment system developed, everyday there will be an amount of pollutant emitted to the environment. This is pollution source directly affecting living environment of and people in the project area, causing water-related diseases and directly affecting surface water and groundwater environments. As the amount of generated wastewater is small, thus the magnitude of impact is assessed as low.

4.2. SOCIAL IMPACT ASSESSMENT

4.2.1. Socioeconomic Situation for each Component

The Table below summarized the socioeconomic situation in each project component based on the SES conducted.

Table 4.47. Socioeconomic Situation of HH in Each Component

Component	Socioeconomic Situation of the population
Component 1: LIAs 1, 2, 3, 4	*Poverty:* - According to the survey on poor households of the city in 2015, the poverty rate is very low with only 1.72%. However, the SA survey data shows (see below) that the poverty of income rate is very high (accounting for 52-65% of the total HHs). - The evaluation is based on multidimensional poverty standard applied in 2016 -2020 (urban poverty level is under 900.000 VND / month / person). Poverty of income rate in LIAs remains high, accounting for 54-67% of the total HH. The highest rate is found in LIA 3 (64.7%), followedby LIA 1 (62.2%). *Sanitation conditions:* - The vast majority of households in the LIAs has no access to drainage and waste collection. Survey shows that only 67.1% households of the total survey samples have access to these services. Other HH, are directly discharging waste water, garbagesinto rivers /streams/canals (12,5 %), releasing into a ponds/gardens (3.3%) and other forms *Income:* - The main income sources are business/servicefor a high proportion (42,4%). However, theseare unstable sources because of theirseasonal characteristics. The stable revenues is

Component	Socioeconomic Situation of the population
	from state salary employment (workers and employees) with only 39.5%. *Housing conditions:* - In the area there are no temporary houses, 74,8% have one-floor permanent house, the rest is storey houses or two to four storey houses. *Land tenure* Most of HH in LIAs have LURC or are eligible to get the LURC *Poor sanitation conditions, high poverty rate and unstable livelihoods remain the main socioeconomic features in LIAs.*
Component 2 Canals	Similar to LIAs, the poverty rate as reported by the City People's Committee is much lower than the data of SA survey, namely as: - *Poverty according to each investment:* - The poverty rate in Embankment of Bao Dinh River and Cau Tre canal is 14.7% and 24.1% respectively. *Sanitation conditions:* - The survey shows that 69.2% households have access to the drainage and waste collection and treatment services, the rest: discharges into canals/creeks (18.9%), release to ponds/garden (4.1%) and other forms. *Income:* - Income of households living along the canals are unstable, the main income sources business/servicefor a high proportion (42.3%), trade and officers with 30.7 %, the rest works in other fields. *Housing conditions:* - The percentage of one-storey permanent house makes up 83.5%, the rest is one-storey houses or two to four storey houses. *Land Tenure* An important number of HH with no recognizable legal right or claim to are encroachers living along canals (Bao Dinh, Cau Tre canal in Ward 3, 4 and Ward 7), *Important number of encroachers lacking security of tenure and unstable sources of income are the main socioeconomic features along canals.*
Component 2 Roads	According to the survey: *Poverty rate according each region:* - The poverty rate in Ring roadis about 21.6%, Luu Van Te road is 28.6%,Tran Phong Sac road is 14.0%, following Connecting road of the embankment of Bao Dinh Riverwith 20.0%. *Sanitation conditions:* - The households in the area enjoy better sanitation conditions than for other components; thanks to the position which is easy to access to sanitation network. The surveys reveals that 94.7% of households have access to sewage, while the rest have no access because of their poverty. *Income sources:* - The main income sources business/servicefor a high proportion (52.8%), trade and officers with 41.4 %, the rest works in other fields. *Housing conditions:* - There is no temporary house, 78.6% one-storey permanent house, the rest is one-storey houses or two to four storey houses in the area. *Land tenure* Almost all HH along roads have LURC or are eligible to get the LURC *Good sanitation conditions, better security of tenure and more stable jobs are the main socioeconomic features along the project roads.*

4.2.2. **Possitive social impacts**

4.2.2.1. ***Possitive social impacs in construction phase***

Positive impacts of the project in construction phase are:

- Creating jobs for the local people
- Contributing to the development of relevant local services, helping to improve income and economic conditions of HHs.

The project will create temporaty/long-term jobs for people in the project area. Site clearance and construction will neet a great number of workers. This will create jobs for people in the area, especially those not having a stable job. Some HHs near construction sites can develop services such as house renting, food/commodity selling, road-side tea shop, etc. which will help improve their income. Although these postitive impacts are considered to be short-term and not sustainable compared with macro-impacts brought about for local and regional economy as mentioned above, they are still instant benefit for the local economic development brought about by the project.

4.2.2.2. ***Positive impacts of overall project***

The project's infrastructure upgrading investmentswill bring substantial benefits for people in the cityin general and people in low-income areas in particular. Significant infrastructure changes, especially in LIA areas as mentioned above, will help improve living conditions for more than 30 thousand people. These benefits include:

- ✓ Living condition improvement: mitigation of waste, dust and odor pollution
- ✓ Transport condition improvement: road quality, connection quality improvement will make travelling more convenient, easier and safer
- ✓ Working condition improvement: people have chance to work in a cleaner environment
- ✓ Social security improvement: drug use, stealing will be mitigated thanks to clean, clear roads with sufficient lighting system
- ✓ Real estate value improvement: real estate value is forecasted to increase 1,5 – 2 times thanks to infrastructure upgrading/rehabilitation
- ✓ Job creation: thanks to wider roads, especially services such as car, motorbyke washing, junk food, tea, etc

Besides, the community relationship will be closer. "*in rainy season, we couldn't go any where. I and my neighbor even did not meet each others about a couple of days in rainy days. When the rain stopped, the alleys were under water while there were a los of mosquitoes*" "said a resident in alley 20 Le Van Kiet in the depth-interview with households)

Specifically: Rehabilitation of infrastrucures in LIA 1 (Ao Quan - ward 1), Lia 2 (Mui Tau canal), Lia 3, (Cau Tre canal), Lia 4 (Rot canal) upgrading alleys/lanes ; water drainage/supply and lighting system. Alleys in LIAs are about 1,5-2 m wide, or narrower; run down asphalt road or earth/stone road; the roads is under flooding in heavy rain. Alleys with 10cm flooding comprise of alley 23 Nguyen Cong Trung, 148 Thu Khoa Huan, alley 115 Hoang Hoa Tham road; serious flooded alleys include 144 Thu Khoa Huân, alley 20 Le Van Kiet. The LIAs almost all have no drainage capacity. Therefore, living conditions of people are seriously affected, for example: obstruction of travel and trade exchange; environmental pollution which is a key factor for the development of mushroom, mosquitoes and harmous insects, threatening the community's health. The upgrading of infrastructure in 4 LIAs will basically overcome the current situation in quite large scale: LIA 1 - Ao Quan with an area of 7,8 ha, LIA 2 –Mui Tau with an area of 2,7ha , LIA 3- with an area of 20,1ha, Lia 4 with an area of 21,4ha.

With the upgrading of secondary infrastructures for the investmentsof embankment of Bao Dinh river in ward 3 and 4 ; consttruction of ring road ; upgrading of Luu Van Te road ; rehabilitation of Cau Tre canal and construction of Tran Phong Sac road connecting to Nguyen Minh Duong road to ensure the consistency, synchronousness and connection to the transport network of the province/region.

Table 4.48. Positive Social Impacts in the Project Area

Component	Description of Impacts	Beneficiaries	Measures to maximize project benefits
General Impacts for all Components			
All components	Employment opportunities during the construction phase for unskilled workers	For all unskilled workers in the project area	- Agreement with local authorities (ward level) to ensure benefits for job opportunities during the project period for unskilled workers in the project area (i.e. prepare list of workers to give to contractors). - Opportunity to be employed for both men and women.
Specific impacts for each Component			
Component 1 Upgrading tertiary infrastructure in LIAs 1, 2, 3, 4	Infrastructure upgrading in LIAs will improve living conditions for all HH in LIAs. Especially: (1) wastewater will be treated, (2) Flooding will be significantly improved, the environment and people health therefore enhanced.	1.418 Households (5.247 persons)	- Design and implementation of the subproject with participation of the whole community; proposedchanges by the community integrated into implementation plan. - Civil works in component 1 shall prioritize job opportunities for poor people in LIAs to increase their income.
	Alleys and lanes are expanded and equipped with lightning system; With the widening of alleys, 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	1.418 Households (5.247 persons)	- Raising people's awareness on the problems causedof encroaching on public land and streets through development of awareness programs
	By improving infrastructure and access in the LIAs, value of land and house will increase accordingly.	People living in LIAs, particularly people living along street/lane front houses.	- Regularize HH without LURC after the civil works.
Component 2	Canal: - Bao Dinh river embankment with a total	2.261 Households (8.366 persons)	- Design and implementation of the subproject with participation of the whole community;

Component	Description of Impacts	Beneficiaries	Measures to maximize project benefits
	length of 1,300 m is built with the eco-soft embankment system and parks on both sides to create landscape and protection of the embankment. - Cau Tre canal (from Bao Dinh river to National Road 1) combining with investment in the connecting road from Tran Phong Sac to Nguyen Minh Duong street is renovated.		proposedchanges integrated into implementation plan.
Road	Road: - The connection of Phan Van Tuan Street and Nguyen Tan Chinh Street with a total length of 6,000 m favors the transportation of goods among locals in the region more effective. - 1,850 m of Luu Van Tue Street is upgraded to create the convenient transportation among localities. Rehabilitate and upgrade Tran Phong Sac road Consruct a connecting road of the embankment in ward 7.	4.135 Households (15.299 persons)	- Design and implementation of the subproject with participation of the whole community; proposedchanges integrated into implementation plan.

4.2.3. **Negative impacts**

4.2.3.1. ***Negative impacts from site clearance and related assets***

Land acquisition is the main negative social impact. Area of land acquisition for the project is divided into 02 types: (i) temporary acquisition for construction of subsidiary works such as material gathering yards, camps for workers, dumping site, etc; (ii) permanent land acquistion for work items. For farming households, land is the most important asset; land lost means the source of incomelost and therefore they encouter into a very difficult situtation. In addition, their life will be significanly changed after receiving a large amount of compensation., This will also athe chance for people forraising up their financial capacity an invest for example in buying new productive land. For small-scale traders, hairdressers, naildressers or farmers (small proportion) who have to be relocated there is a risk to lose their customers due to the distance of their new house to their former placeAthough households who land acquired will be compensated and supported by the project, land acquisiion is the major factor causing social and economic disruption..

For mitigating the impacts from land acquistion, the design consultant must consult with the local residents to find out mitigation measures for impacts from land acquistion and other adverse impacts on people. On the other hand, a resettlement policy framework and a resettlement

plan for Tan An city have been prepared to ensure that people are proper compensated for all damages caused by the subproject implementation. Level of impacts on assets is as follows:

Table 4.49. Number of households affected by the project

No.	Affected households	Unit	Total	
			Quantity	Affected households /organizations
1	**Total number of AHs**	**Household**	**899**	
2	Resettled households	household	198	
3	Seriously affected households because of land loss	household	172	
4	Households have business activities affected	household	80	
5	Residential land	m2	81,342	676
6	Agricultural land			
	Annual land	*m2*	*151,758*	*225*
	Perennial land	*m2*	*1,250*	*2*
7	Structures			
	Grade 3 houses	*m2*	*170*	*2*
	Grade 4 houses	*m2*	*10,870*	*249*
	Temporary houses	*m2*	*629*	*17*
	Level of impacts on structures			
	Totally affected houses	*m2*	*10,539*	*198*
	Partially affected houses	*m2*	*1,130*	*70*
8	Cash crops and pants/trees			
	Cash crops	m2	128175	188
	Fruit trees	tree	4821	320
	Wood trees	tree	1033	143

Thus, with such affected scope, about 200 households should be thoroughly consulted with about livelihood for life restoration after displacement.

4.2.3.2. ***Impacts on the community's health and safety***

During the construction, a large amount of soil, stones, sand and construction materials as well as equipment will be transported to the site, increasing the number of vehicles circulated on roads as a result of congestion at rush hours and high risks of traffic accidents. During the construction period, households at the site will be suffered from dust, emissions, noise and badodor affecting the community's health.

4.2.3.3. ***Generation of social problems***

The important number of outsideworkers of whom male dominate at the site together with irregular residents and business and entertainment activities can cause serioussocial problems such as violence, drug use and prostitution. Some social diseases as HIV/AIDS, hepatitis B and C may appear and widely spread; Social problems-related issues shall be consulted in the depth-interview with the local leaders and consultation with local people in the project area as well as affected households. Mitigation measures will be revealed in the following part.

4.2.3.4. ***Gender-related issues***

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 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 and may be particularly affected by relocation.

Specific consultation with women needs to be conducted during project implementation.

A Gender Action Plan will be prepared to assess and reduce impacts.

4.3. ASSESSMENT OF CUMULATIVE IMPACTS

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

Geographic Scope

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

Project Timing

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

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

4.4. INDUCED IMPACTS

Induced development can be a positive as well as negative cumulative impact. If not planned to conform to local physical plans, it can lead to urban sprawl along the new roads and improved canals. However, this impact can be manageable if proper planning adopted. The positive induced impacts however will outweigh the negative ones. It is foreseeable that the land value will increase along the new road and improved areas therefore land-use will significantly changed in the surrounding areas. Specifically, current agriculture land along (Construction of Ring road; Luu Van Te street; Connecting road between Tran Phong Sac and Nguyen Minh street; Cau Tre and Rot canal) will be subjected to residential land as according to the City Master Plan. Undoubtedly, the local government and the community will be benefited from the land value capture financing. This is one among many other benefits that the urban upgrading project will bring.

CHAPTER 5. ENVIRONMENTAL AND SOCIAL MITIGATION MEASURES

5.1. ENVIRONMENTAL MITIGATION MEASUARES

5.1.1. General principles

In order to minimize adverse environmental impacts, many measures haven been proposed since the preparation stage of the subproject. Surveys and design activities have been prepared with many alternatives to minimize the subproject's impacts during construction and operation processes. During the preparation of the subproject, effort has been made to avoid potential adverse impacts on resettlement and land acquisition by reducing scope and/or modification of the basic design of the subproject investment. In developing the mitigation measures the strategies to minimize and/or rectify the impacts have been applied and where appropriate compensation has been incorporated. The proposed mitigation measures to reduce the impacts due to land acquisition and resettlement are described in the RP. The following principles have been adopted in devising the mitigation measures:

- Disturbance to the life and transportation of the local people must be minimized.
- The proposed measures must be environmentally and socio-economically feasible.
- Technical standards and regulations must be abided by.
- Construction equipment and methods must be environment-friendly.
- Monitoring activities must be conducted on a regular basis.

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

5.1.2. Measures to be integrated into the detailed technical design

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

5.1.2.1. *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.

5.1.2.2. *Component 2: Upgrading primary and secondary infrastructure priorities*

5.1.2.2.1. *Embankment of Bao Dinh River and Rehabilitating Cau Tre canals (Subcomponent 2.1 and 2.2)*

- 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 dredged sediment. This position must be well distant from residential areas and to the tail end of the wind.
- Positions of placing public waste bins along the embankments are to be included in the design so that residents could dispose of garbage properly.
- Trees would be planted along Cau Tre canals to improve the landscape.

5.1.2.2.2. ***Upgrading/Constructing 3 routes (Ring road, Luu Van Te road, Construction of link between Tran Phong Sac and Nguyen Minh Duong roads)***

- 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 it elevation to avoid possible water run off to the households along the two sides of the roads.
- 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.

5.1.2.3. ***Component 3: Resetlement Area***

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

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

5.1.3. **Mitigation measures during preparation phase**

5.1.3.1. ***Mitigation Measures for Land Acquisition***

During the project preparation, the Resettlement Consultant, Technical Consultant and PMU have worked together, considering technical requirements and construction method, to reduce resettlement on the principle of (i) mitigating impacts from land acquisition for households in the project area; and (ii) prioritizing the construction option which requires the smallest land

acquisition area.

On this basis, there are 899 project affected households and 02 affected organizations located in 08 wards/communes of Tan An City. Of 899 PAHs, 172 PAHs are severely affected, in which 170 PAHs have more than 20% and 02 PAHs have more 10% (for the vulnerable) of their agricultural land including garden land that is affected.

As presented in Chapter 4, the total land acquired by the project is 288,658 m2, of which: Residential land: 81,342 m^2 (28.2%); Agricultural land: 153,009m^2 (53%), of which perennial tree land is 1,250 m^2 (0.4%) and annual crop land is 151,758m^2 (52.6%); Public land (Land managed by ward 3, ward 4 of Tan An City): 50,416 m^2 (17.5%); Other lands (transportation, rivers, canals, cemeteries): 3,846 m^2 (1.33%).

92 PAHs whose business is being affected, of which 52 PAHs have their business licenses and the remaining 29 PAHs are not registered. Of the 92 affected businesses, 81 units have to relocate. Most of the business are managed by women accounting for 64.7% (60/92 PAHs), the remaining shops/business establishments are managed by men. There are 22 vulnerable households out of 899 PAHs, of which 12 are female headed households with dependents and economic disadvantages, accounting for 1.3%. The remaining 1% include 01 disabled headed HH, 01 elderly HH, 04 poor HHs and 04 HHs covered under other social policies.

Total cost for compensation, support and resettlement of the 3 components is **217,140,627,790 VND**, equivalent to **9,637,844** USD. Of which:

Table 5.1. The estimated cost for the RAP of Tan An subproject

No.	Component	Total	
		VND	USD
1	Component 1	**22,254,682,329**	**987,780**
2	Component 2	**194,885,945,460**	**8,650,064**
3	Component 3	0	0
	Total for subject	**217,140,627,790**	**9,637,844**

(Source: RP report. Dec 2016)

The estimated cost for land clearance and resettlement is calculated based on provisions set by People Committee of Long An 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 40 graves

There are 40 household graves which will need to be relocated for construction of Ring road. Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation and other related costs which are necessary to satisfy customary religious requirements. Compensation in cash will be paid to each affected family or to the affected group as a whole as is determined through a process of consultation with the affected community. The level of compensation will be decided in consultation with the affected families/communities. All costs of excavation, relocation and reburial (5,000,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways.

During implementation the PMU will make early announcements to the households whose graves are affected so that they can make arrangement consistent with the spiritual practices of the people and compensate the affected household as required in the subproject RP and ESMP.

5.1.3.2. ***Mitigation of UXO Risks***

The subproject owner (the subproject PMU) will sign a contract with the military civil engineering agency or Long An Provincial Military Base for UXO detection and clearance at the construction sites. UXO clearance will be executed right after the completion of site compensation

and before the implementation of demolition and ground leveling. The estimated cost is approximately 50 million VND/ha. No construction activity will be allowed until the UXO clearance is completed.

5.1.4. **Mitigation measures during construction phase**

5.1.4.1. ***General mitigation measures***

Environmental Codes of Practice (ECOPs) describe the general, typical requirements which will be obliged to the contractors and supervised by the construction supervision consultants during the construction period. ECOPs will be attached to the Appendices of the bidding documents and contracts documents. The scope and contents of ECOPs are as follows:

Scope: General environmental impacts mitigation measures stipulated in ECOPs are the activities minimizing the social impacts at a limited extent, which are temporary and recoverable and readily managed by good construction practices.

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

ECOPs are presented in deails in **Section 6.1.1.**

5.1.4.2. ***Site-specific Mitigation Measures***

The impact assessments on the construction of bridge and roads, and embankment rehabilitation are discussed in Chapter 4, Section 4.1, which indicated the medium level of most of the environmental impacts. The Contractors will have to take mitigation measures under ECOPs to control these impacts. In order to mitigate the site - specific impacts arising from the dredging and embankment construction as well as those generated from construction of roads and bridges, the Contractors shall take the following measures:

Table 5.2. Site-specific mitigation measures during construction phase

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
I	**Component 1: Tertiary Infrastructure Upgrading in LIAs**	
I.1	***Subcomponent 1.1 – Tertiary Infrastructure Upgrading in LIAs***	
	Local flooding - Local residents within LIAs 1,2,3,4	- PMU will ensure that the detailed design will consider adequate temporary drainage to avoid potential flooding during construction - The Contractors must apply the specific construction methods, incorporating flood prevention and control alternatives during construction divert flow accordingly to ensure effective drainage at work locations. - The contractors must set up temporary drainage if necessary and ensure they are cleared of mud and other obstructions

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
		- Arranging standby pumps for rapid drainage in case of heavy rain or extreme weather events.
	Social disturbance and traffic safety concerns - Local residents within LIAs 1,2,3,4	- Ensure that the contract requires the contractor, before commencing work, to provide a construction plan with a detailed health, safety, environment and traffic management plan - Inform local residents in advanced (at least 07 days) about construction and work schedules, interruption of services, traffic routes etc. - Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work. - Construction in a successive manner, section by section in a short a period as feasible. Avoid simultaneous construction and delays that may affect large sections of the LIAs. - Contractors should provide lighting at all construction sites at night; security guard staff at construction sites to moderate vehicles entering and exiting the construction site; - Put road construction warning signs at the site and maintain them for the duration of the work. - Avoiding transporting waste and bulk materials during rush hours; Construction by night time is not allowed - Limit the construction area to be within the site boundary - Assign staff to control traffic during transportation, loading and unloading.
	Impact on current technical infrastructures (relocated 75 power poles and electric lines in 4 LIAs) - Local residents within LIAs 1,2,3,4	- Prepare plans for dismantling and notify the people and production facilities around the area of the dismantling time and electricity supply suspension at least 07 days prior to the dismantling work. - Prior to construction, contractors and Project Management Unit shall coordinate with the relevant authorities Tan An EVN in the dismantling, proper use of specialized workers for the dismantling to avoid safety risks.
	Impact on PCRs and sensitive receptors *Impacts on the Thien Khanh Pagoda (at a 30m distance from the construction site in LIA 3)* *Impacts on Phuong Hong Kindergarten (at a 50m distance from the construction site in LIA 3)*	*For Thien Khanh pagoda:* - Inform the pagoda of the construction activities and their potential impacts such as, waste, dust, 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

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
		sensitive times (e.g., religious festival days). Avoid construction activities during religious events every first and 15th day of the lunar month and during festival days if possible. - Prohibit storage of construction materials within 100m in front of the pagoda. - 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 including installation of fences, barriers warning signs, lighting system to prevent traffic accidents as well as other risk to local people and pagoda visitors. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas, or as required. - Truck drivers shall restrict the use of horns close to the pagoda location - Immediately address any issue/problem caused by the construction activities and any raised by the pagoda. *For Phuong Hong Kindergarten:* - Inform the school management of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction - Construction area to be fenced and marked with warning signs to prevent pupils and unauthorized people from entering. - Teachers to be informed of construction operations to keep pupils off the site during their break time. - Prohibit use of construction methods that cause noise during school learning hours. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Immediately collect any domestic wastes and construction spoils around the school and dispose in a designated site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes when children go to and leave the school. - Do not load construction materials within 20m from school and tidy construction materials and stockpiles every working session.

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
		- Cover the incomplete trenches under construction at end of the working day. - Immediately address any issue/problem caused by the construction activities and raised by the schools
I.2	***Subcomponent 1.2 – Rehabilitation of polluted canals and pond in LIAs***	
	Odors from dredging process and management of dredged materials (Mui Tau, Cau Tre – section 1 and Rot Canals) - Local residents at the dredging sites and transfer site - Workers - People commuting along transportation routes	*To control impacts by dredged sediment:* - The Dredged Materials Management Plans (DMMPs) for the Mui Tau, Cau Tre and Rot canals have been prepared and included in Annex 1. Overall, sediment will be disposed at Long An solid waste treatment and recycle Plant at Tan Dong commune (landfill site) or used for agricultural or tree planting purpose based on actual need of the local people. - Ensure that detailed design scope for the canals dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor's dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts - Prior to construction, the contractors shall develop a specific DMMP based on the updated DMMP. The contractor's DMMPs shall be submit to the Construction Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary storage of dredged materials, and control of polluting material during temporary handling and transportation, pollution control, and risks at disposal sites. - Manage to ensure sediment will be disposed appropriately according to the approved DMMP. *To control impacts by odors from dredging process:* - Sludge is to be deposited along the work sites on suitable sheeting to limit leachate entering the soil. and is to be transported for disposal within the day. The management plan on dredged materials will be prepared to instruct the contractors to manage the waste source. - Uncontrolled disposal of the dredged dredged material is prohibited and must be managed effectively under the supervision of the PMU. - In order to limit the effects of odor or contamination from the dredged material. the

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
		workers shall be equipped with the minimum personal protective equipment (PPE). including masks. boots and gloves when working in/exposed to this waste. - Spraying EM (Effective Microorganisms) every day. to limit odors from H_2S. CH_4. etc. - Dredged sediment will be collected. transported and treated under contract in the Long An solid waste treatment and recycle Plant at Tan Dong commune (landfill site). Transportation of the dredged material must meet the environmental protection requirements and avoid dredged material leakage; the dredged material carrying trunks must be covered and not overloaded.
	Local flooding (Mui Tau. Cau Tre – section 1 and Rot Canals) - Local residents within LIA 2 and LIA 3	- Apply similar mitigation measures as those for investments under subcomponent 1.1
	Risks on shore erosion and subsidence; infrastructures collapse and cracking during the embankment process of Quan Pond (in Lia 1) and Rot canal (in Lia 4) - Local residents within LIA1 and LIA 4 - Workers	- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure sustainable and stable of the embankment; - Ensure that the detailed design and contractor's construction method take into account the risk of potential damage to nearby houses or other structures. - Before dredging, reinforcement of banks will be conducted if considered nececssary. The construction method proposed must be submitted to the relevant authorities for approval by the contractors. - Maximise the use of high-tech equipment to reduce vibration during embankment work and closely monitor the vibration levels; - Construction of side slope in accordance with the design - Limiting dredging works during the rainy season. - Do not place heavy macheryor loaded vehicles near the canals ban edges. - Inspection and supervision to prevent landslide risks must be done regularly to prepare the appropriate reinforcement plans. - Inform the potential affected people of the nature of work and get their agreement; - In the case that property damage is likely to occur ,the affected households shall be temporarily relocated prior to construction. This temporary relocation shall be carried out with

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
		appropriate consultation and and adequate compensation.
	Social disturbances and traffic safety concerns (Mui Tau, Cau Tre – section 1, Rot Canals) - Local residents within LIAs 1,2,3,4	- Apply similar mitigation mesures as those for investment under subcomponent 1.1
I.3	***Subcomponent 1.3 – Construction of a green park in LIA 2*** Applied the ECOPs	
II	**Component 2: Priority Primary and Secondary Infrastructures**	
II.1	***Subcomponent 2.1 – Embankment of Bao Dinh river and construction of an extension road of Bao Dinh river embankment.***	
	Management of dredged soils and sediments: - Local resident in ward 7 - People commuting on the transportation route.	- Only conduct dredging work during the dry seasons - Upon forecasted stormy weather, suspend all the construction activities, tidy up the sites, stabilize and protect any loose materials and construction machinery. - In case construction needs to be executed at night time or early morning, inform the community at least 2 days in advance, and only carry out the activities that will not generate excessive noise and vibration. - Place warning signs along the construction route, both on land and water surface (arrange the road and waterway traffic guide). - The dredged materials will be used to backfill at low areas in the Tan An city (as per organizations / household needs) or used to level landfill cells at Long An solid waste treatment and recycle Plant at Tan Dong commune (landfill site).
	Impacts on water environment and aquatic communities of Bao Dinh river	- The dredging operation is conducted only during the dry season; - Create sedimentation traps and maintain them periodically to ensure that most solids in surface runoff are retained in the traps before entering the existing drains or water sources surrounding the sites; - Leachate from sediments must be first deposited in sedimentation hole/trap before entering the river. - Strictly prohibit contractors to discharge waste into river - Upon forecasted stormy weather, suspend all the construction activities, tidy up the sites, brace and protect the materials and construction machines.

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
		- Do not gather construction materials as well as machinery and equipment near the river. Gathering small quantities of materials, fit with the schedule. Materials must be covered with tarpaulin, avoiding the upwind location, near the canal. - Strictly prevent hazardous waste, waste oils or particularly greasy rags from entering the flow.
	Impact on waterway traffic activities on the Bao Dinh river	- The works design should evaluate the effects of restricting river flow - Coordinate with the local authority to inform local people of the construction plan prior to construction; - Coordinate with the Department of Inland Waterway to flag the signal system on the inland waterway the transport will travel through; - Provide the workers with all appropriate PPE and ensure that life jackets are used in proximity to water. Safety staff must be available at all times for timely rescue in case of incidents. - Place warning boards along the construction route, both on land and water surface (arrange the road and waterway traffic guide).
	Risk of embankment subsidence and bank erosion during construction process - Local residents nearby construction site in Ward 7 - Workers	- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure sustainability and stability of the embankment; - Ensure that the detailed design and contractor's construction method take into account the risks on collapse and cracking of local house and nearby structure - Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to the authorities concerned for approval by the construction contractors. - Ensure that land acquisition and house relocation at the site boundary is completed piror to commencing construction work - Use construction method to reduce vibration for construction activities of embankment i.e. pipe jacking instead of pile driving; closely monitoring the vibration level; - Construction of side slope is made in accordance with the design - Do not carry out dredging works in rainy season. - Do not place heavy machineries and transportation vehicles near the canals banks. Inspection and supervision on land subsidence

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
		risks must be taken regularly in order to prepare the appropriate reinforcement plans.
	Impact on irrigation scheme across the new construction road starting from the Bao Dinh embankment	- Informing the community of the construction schedule at least one week before the construction. - Arrange drainage around the construction sites to prevent soil erosion and sedimentation into the rice fields and irrigation canals. - Regularly check the affected on-field irrigation canals to ensure they are not blocked by construction spoil or waste and if they are affected, provide alternative irrigation water from canals to the locations the local people request. - Immediately rehabilitate irrigation canals if they are damaged by construction activities to ensure that water supply for the rice fields is maintained. - Closely consult with the local community to ensure that suitable solutions to problems are taken and communities' concerns related to construction activities are addressed.
	Impacts on Thien Chau Pagoda (50 m from Bao Dinh Embankment); Binh Yen Dong Temple (30 m from Bao Dinh Embankment) and Long Chau pagoda (20m from extension road of Bao Dinh river embankment)	- 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. - Inform the pagodas of the construction activities and their potential impacts such as, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction. - Prohibit storage of construction materials within 100m in front of the pagodas. - Pile driving activities will not be carried out before 7 am or after 6 pm, or at days and hours advised by the local authority. - Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagodas. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas, or as required. - The contractor shall provide safety measures including installation of fences, barriers warning signs, lighting system to prevent traffic accidents as well as other risk to local people and pagoda visitors.

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
		- Truck drivers shall restrict the use of horns close to the pagoda areas - Immediately address any issue/problem caused by the construction activities and raised by the pagodas.
	Disruption of business activities - Business on the two sides of road along Bao Dinh embankment	- Inform the street household businesses of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 02 weeks before start of the construction. - Set up construction and traffic warning signs at the construction site. - Provide safe and easy access to the household businesses putting clean and strong thick wood panels or steel plates over the open ditches. - Do not gather materials and wastes within 20m from household businesses and shops. - Do not use machines generating loud noise and high vibration levels near the businesses. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes, and to guard high risk operations. - Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session. - Cleaning up construction areas at the end of the day, especially construction areas in front of business shops. - Providing night lighting system with luminously painted fence and night lamp. - Manage the worker force to any avoid the conflict with the local people and traders. - Compensate goods, products damaged by construction activities of the subproject. - Immediately address any issue/problem caused by the construction activities and raised by the local household traders.
II.2	***Subcomponent 2.2 – Rehabilitation of Cau Tre canal (section 2)***	
	Local flooding - Local residents living along section 2 of Cau Tre canal, in Ward 4	- Ensure that the detailed design includes adequate geotechnical survey, taking into account the possibility of encountering groundwater. - Ensure the detailed design includes temporary drainage to prevent potential flooding during construction

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
		- The Contractors must apply the specific construction methods, incorporating flood prevention and control alternatives during construction divert flow accordingly to ensure effective drainage at work locations. - Contractor shall et up temporary drains as required to ensure drainage at the construction site. - Arranging standby pumps for rapid drainage in case of heavy rain or extreme weather events.
	Social disturbance and traffic safety concerns - Local residents living along section 2 of Cau Tre canal, in Ward 4	- Apply similar mitigation measures as those under subcomponent 1.1
	Odors from dredging process, and management of dredged sediments - Local residents living along section 2 of Cau Tre canal, in Ward 4 - Workers - People commuting on the transportation routes	- Apply similar mitigation measures as those for the Rot and Cau Tre Canals, section 1 under subcomponent 1.2
	Risks on bank erosion, soil subsidence and house cracking during piling operation for embankment foot protection. - Distance of 1-3 from construction site of Cau Tre embankment. - Local residents along the Cau Tre Canal, especially those from 50-100 m at the two ends intersected with 1A National Highway and Nguyen Cuu Van Street	- Apply similar mitigation measures as those for the Rot Canal under subcomponent 1.2
II.3	***Subcomponent 2.3 – Construction of Ring Road***	
	Traffic safety concerns during the construction of overpassing bridges across Can Dot Canal and Trung Luong Highway- - Local resident in Binh Nhon Commune and Khanh Hau ward. - People commuting on Trung Luong highway - Workers	- Prior to construction, the contractor shall prepare a Traffic Management Plan maintain safety, to minimize disturbance to local traffic and pedestrians and to maintain public and private access throughout the works areas. The Plan will show routes provided to maintain access, e.g., a passing lane retained along the road during construction or temporary bypasses, or scheduled access times. The Plan will be presented to communities and officials before finalization and approval by the CSC/PCC and subsequent implementation by the Contractor; - During the prepartion, the contractor shall carry out consultation and coordination with O&M unit of Trung Luong Highway (under Department of Transport) to propose proper construction measure and detailed plan

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
		- Prior annoucement of the construction schedule and method to the O&M unit at least 2 weeks in advance. - Contractors should provide lighting at a construction site at night; security guard staff at construction sites to moderate vehicles go out and in the construction site; - Ensure that traffic safety provisions, including signs, lights, and pavement markings, that were installed during construction is permanently and effectively maintained, and renewed as necessary.
	Impact on the relocation of power poles and electric lines along the road - Local resident in Binh Nhon Commune and Khanh Hau ward. - Workers	- Prepare plans for dismantling and notify the people, production facilities around the area of the dismantling time and electricity supply suspension. - Contractors, Project Management Unit coordinate with the relevant authorities Tan An EVN in the dismantling, proper use of specialized workers for the dismantling to avoid risks.
	Impacts on irrigation canals and agriculture activities	- Informing the community of the construction schedule at least one week before the construction. - Arrange drainage around the construction sites to prevent soil erosion and sedimentation into the rice fields and irrigation canals. - Regularly check the affected on-field irrigation canals to ensure they are not blocked by construction spoil or waste and if they are affected, provide alternative irrigation water from canals to the locations the local people request. . - Immediately rehabilitate irrigation canals if they are damaged by construction activities to ensure that water supply for the rice fields is maintained. - Closely consult with the local community to ensure that suitable solutions to problems are taken and communities' concerns related to construction activities are addressed.
	Impacts on water quality of Can Dot canal during the construction of Mang Bridge	- In case of material leakage from the dredged materials, the contractors will have to take all necessary measures to tidy up the areas to prevent the spread of pollution. - The construction of the bridge and as well as structures at both sides should only take place in the dry season to minimize the possibility of wash out of material into the canal

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
		- Upon forecasted stormy weather, suspend all the construction activities, tidy up the sites, stabilize and protect any loose materials and construction machinery. - Strictly prohibit contractors from disposing of water pumped out from excavations into the canal to avoid water quality issues. - Do not store construction materials or heavy machinery and equipment near the canal (at least 50m away). - Prevent hazardous waste, waste oils or particularly oily rags from entering the canal. - Limit the use of construction vehicles working in-stream, as there is a risk of oil or lubricating fluids contaminating the water and also causing vibration and noise that can affect the aquatic ecosystem. - If works require restrictions to canal flow, they must be evaluated for their effect on aquatic species and allowances should be made.
	Risks on piers collapse and damages to adjacent local houses during construction of two bridges across Trung Luong highway and Can Dot canal - Local residents near the two ends of bridge across Can Do Canal - People commuting on Trung Luong Highway - Workers	- Ensure that the detailed design for the bridge includes hydrological and geological surveys to ensure sustainability; - Ensure that the detailed design and contractor's construction method take into account the risk on local house cracking - Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to the authorities concerned for approval by the construction contractors. - Ensure that land acquisition and house relocation at the site boundary is completed piror to commencing construction work - Construction of side slope is made in accordance with the design - Do not place heavy machineries and transportation vehicles near the canals banks. Inspection and supervision on land subsidence risks must be taken regularly in order to prepare the appropriate reinforcement plans.
II.4	***Upgrading of Luu Van Te road (subcomponent 2.4) and Construction of a link between Tran Phong Sac road and Nguyen Minh Duong road (subcomponent 2.5)***	
	Social disturbance and traffic safety concerns - Local residents along the Luu Van Te road alignment - Local residents along road connecting Tran Phong Sac and Nguyen Minh Duong Roads.	- Apply similar mitigation measures as those for the road under subcomponent 1.1

No	Site-Specific impacts and Sensitive Receptors	Site-specific mitigation measures
	Increased dust, noise, traffic, waste and social disturbance to daily activities of Thien Khanh Pagoda (7 m distant) and Phuong Hong Kindergarten (0.5 m distant) on Luu Van Te road. - Risk on collapse of gate/fence of the pagoda and Phuong Hong kindergarten	- See in the subcomponent 1.1 above. - The construction method shall include the measures to protect the foundation of the fence/gate of the school and pagodas, such as using supporting pillars or steel frame. - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the pagoda or the school
	Impact on the relocation of power poles on Luu Van Te road - Local residents	- Prepare plans for dismantling and notify the people, production facilities around the area of the dismantling time and electricity supply suspension. - Contractors, Project Management Unit coordinate with the relevant authorities Tan An EVN in the dismantling, proper use of specialized workers for the dismantling to avoid risks.

Mitigation measures for impacts on traffic and traffic safety due to transportation of construction materials and wastes for Tan An subproject

During construction, under component 1,2,3, a number of streets and roads will be affected by transportatin of construction materials and waste as indicated in Table 5.3 below.

Table 5.3. Material and waste transport routes for Tan An subproject

Construction site	Estimated length (km)	Roads for transportation of material and wastes
Component 1:		
LIA 1	15	Nguyen Dinh Chieu→ Chau Thi Kim → Hung Vuong → National Highway (NH) 62→ Landfill in Tan Dong commune
LIA 2	15	NH 1→ Hung Vuong→ NH 62→ Landfill of Tan Dong commune
LIA 3	15	Nguyen Van Tao→ NH 62→ Landfill of Tan Dong commune
LIA 4	15	NH 62 → Landfill of Tan Dong commune
Component 2 :		
Embankment of Bao Dinh Rive	15	Huynh Van Nhat and Nguyen Cuu Van →Hung Vuong→ NH 62→ Landfill of Tan Dong commune
Construction of Ring road	12	Phan Van Tuan→ Trung Luong Highway→ NH 62→ Landfill of Tan Dong commune
Upgrading of Luu Van Te street	13	NH 1→ Hung Vuong→ NH 62→ Landfill of Tan Dong commune
Rehabilitation of Cau Tre canal	13	NH 1→ Hung Vuong→ NH 62→ Landfill of Tan Dong commune

Construction site	Estimated length (km)	Roads for transportation of material and wastes
Construction of connecting road between Tran Phong Sac and Nguyen Minh street	12	Hung Vuong→ NH 62→ Landfill of Tan Dong commune
Component 3:		
Resettlement site	15	Nguyen Dinh Chieu→ Chau Thi Kim → Hung Vuong → National Highway (NH) 62→ Landfill in Tan Dong commune

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. **Mitigation measures during operation phase**

5.1.5.1. ***Component 1: Tertiary Infrastructure Upgrading***

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:

Operation: Subcomponent 1.1- Tertiary Infrastructure Upgrading in LIAs

a. ***Measures to mitigate the impact of local flooding due to the poor operation and maintenance***

Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting disposal of wastes into the sewer pipes;

Carrying out periodical dredging and clearing works of the sewer pipes;

Sweeping and cleansing pavements must include clearing the rubbish and obstructing objects on the flow/sewer inlets/heads;

Signing contracts with the responsible agencies on collecting dredged material.

b. ***Measures for traffic safety***

Ensure that traffic safety provisions, including signs, lights, and signals regulating speeds, allowed vehicles load that were installed during construction are permanently and effectively maintained, and renewed as necessary

Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road.

Cooperating with the local government to appoint the staff for traffic regulation at peak hours;

Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the alleys in its as-completed condition;

Operation: Subcomponent 1.2 – Rehabilitation of polluted canals and pond in LIAs

a. ***Mitigation measures for impacts on water pollution and decreased landscape due to direct waste disposal into the canals***

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

Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the canals; PMU and DONRE should be in collaboration to impose much more serious penalty to polluter

Properly arranging the waste baskets along the canal and launching programs of increasing awareness of the community toward environmental protection;

Carrying out periodical dredging and clearing works of the canals at least 6 months/time especially before the wet season;

Signing contracts with the responsible agencies on collecting. transporting and treating dredged material.

b. ***Mitigation measures to prevent the embankment subsidence risk during operation of Rach Rot Canal***

To avoid risk on embankment cracking and subsidence, in detailed design should be implemented hydrology and geological surveys to ensure sustainable and stable designs

Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the embankment periodically

Closely monitor the construction of other infrastructures within the area that potentially affect the embankment structures

Operation: Subcomponent 1.3 – Green park in LIA 2

a. ***Management of solid waste***

Properly arranging the waste baskets in the park area and launching programs of increasing awareness of the community toward environmental protection

The generated solid waste will be collected and managed by Tan An URENCO.

5.1.5.2. ***Component 2: Priority Primary and Secondary Infrastructures***

Subcomponent 2.1. Mitigation measures during the operation of Bao Dinh River embankment and extension road of Bao Dinh river embankment.

a. ***Risk of embankment collapse***

Apply similar mitigation measures as those for Rot Canal embankment (subcomponent 1.2)

b. ***Water pollution and decreased landscape due to waste throwing into the Bao Dinh River***

Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the canals; PMU and DONRE should be in collaboration to impose much more serious penalty to polluter

Properly arranging the waste baskets along the river bank and launching programs of increasing awareness of the community toward environmental protection;

Subcomponent 2.2. Measures to mitigate impacts during operation of Cau Tre Canal, section 2

a. ***Risk of embankment collapse during operation***

Apply similar mitigation measures as those for Rot Canal embankment (subcomponent 1.2)

b. ***Disposal of waste into the canal***

Apply similar mitigation measures as those for canals under subcomponent 1.2

Subcomponent 2.3, 2.4 and 2.5. Measures to mitigate impacts during operation of the Ring Road; Luu Van Te Road, and the road connecting Tran Phong Sac road and Nguyen Minh Duong Roads.

a. ***Road safety***

During operation of the improved road, various vehicles will use the roads, potentially leading to an increase in traffic and pedestrian accidents, due to more, faster traffic; premature failure of pavements, drainage structures due to inadequate maintenance. Other impacts would be possibly localized flooding related.

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

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

Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the road in its as-completed condition.

Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road.

Ensure effective road inspection for any signs of damages, soil erosion and landslide for immediate repairing actions.

Cooperating with the local government to appoint the staff for traffic regulation at peak hours;

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

Cooperating with the local authorities to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the sewer pipes;

Carrying out periodical dredging and clearing works of the sewer pipes;

Sweeping and cleansing pavements must include clearing the rubbish and obstructing objects on the flow/sewer inlets/heads;

Signing contracts with the responsible agencies on collecting dredged material.

5.1.5.3. ***Component 3: Measures to Mitigate Impacts during Operation of Resettlement area***

a. ***Road Safety***

Implementation of similar measures as the road under subcomponent 2.3 - 2.5

b. ***Management of generated domestic waste water and solid waste***

Households in the resettlement sites have to build toilets with septic tanks in accordance with regulations of the Government; the wastes from the toilets must be primarily treated in the septic tanks of each household before discharging into the public drainage system. The wastewater will be then connected to the wastewater collection and treatment system of Tan An city in the future.

The domestic solid waste will be collected and managed by Tan An URENCO.

5.2. SOCIAL NEGATIVE IMPACT MITIGATION MEASURES

5.2.1. Mitigation measures for land acquisition impacts

During the project preparation, the Ressettlement Consultant, Technical Consultant and PMU has worked together to figure out technical and comparative method and selected construction methods on the principle of (i) mitigating impacts from land acquistion for households in the project area; (ii) prioritizing the construction option which requires the smallest land acquisition area.

Compensation is a decisive factor for AH's life and livelihood restoration.Good compensation performance will contribute tosignificant mitigation for negative impacts from land acquisition. To address the adverse impacts related to land acquisition and resettlementa Resettlement Policy Framework and a Resettlement Plan for Tan An City have been preparedThe main principles of RPF and RP are:

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

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

5.2.2. Mitigation measures for events/risks during the construction

For events/risks that may be generated from the construction period,the Project Owner and the construction unit need to make commitments and take measures on monitoring the labor safety commitments. In which:

- The Contractor must comply fully with all Vietnam's regulations on labor safety;

- Prepare and implement the action plan for responding to risks and emergency situations;
- At each construction site and worker camp, the Contractor must equip full emergency medical services at the site (medical cabinet, necessary medical objects such as bandage, first aid medicine, etc);
- Training workers of occupational safety regulations;
- In cases ofusing any explosive methods, mitigation measures and safety measures should be incoporated in the environmental management plan;
- Providing workers with full labor protection equipment, especially those operate noise-causingmachines, welder workers, etc in orderto control noise and protect workers;
- During the demolition of existing infrastructures, workers and people should be protected from fragments by installingchutes; the traffic control and ulterlization of an uncrowded area are recommended.
- Erecting fences, signs of warning surrounding the site to warn people of dangerous risks;
- The Contractor will provide safety methods such as erecting fences, signals of warning, lighting system to prevent traffic accidents as well as other risks on people and sensitive sites;

5.2.3. **Impact mitigation measures for arising social evils**

With possible social evils during the construction time: the construction unit should prioritize recruitment of local workers so as for generating jobs for local people and strenthening the support of the community during the period, saving costs of building camps, reducing disturbances as a result from temporary migration, and not creating social evils caused from free immigration. At the same time, tocal government should prepare an active plan on communication, instructing the business households to comply with the regulationswhich are still satisfactory with local traditions/practices.

In addition, preparation and implementation of community's health management plan are proposed, including: control negative effects and risks on the community's health, actively prevent diseases and epidemics, efficiently respond to the epidemics, promote the communication and education in regards of risks and potentials of epidemics during the subproject constructionfor people and local authorities.

5.2.4. **Mitigation measures for traffics disturbances**

Traffic disturbances: The Construction unit must take specific consideration into location, transportation time and volume of transportation of machines, materials to avoid conflicts with the traffics at the rush hours or to prevent disturbances on traffics. The measures consist of:

- Before construction, holding consultations with the local authorities and community as well as local traffic police;
- The high increase in the number of vehicles must be integrated into the construction method which is approved before the construction phase. The distribution of transportation means, especially heavy duty vehicles must take consideration into sensitive structures as schools, hospitals and markets;
- A lighting system at night if required must be installed to ensure traffic safety;
- Placingsigns/signals surrounding the construction site to ensure traffic safety,erecting

instructions to other areas of the site, providing safety signs;

- Using traffic safety methods, including signs of roads/rivers/canals and appointing a flagger to warn of dangerous situations;
- Avoiding transportation of materials at rush hours;
- Corridors for pedestrians and motor vehicles going in and out of the construction site must be separated with the site and easy, suitable and safe to approach. Signs of warningmust be installed in a visible position for both waterway and roadway.

5.2.5. **Mitigation measures for benefit conflicts and impacts on the local economy**

According to the survey, the most outstanding concern is the free migration group of workers. As mentioned, such immigration will put burden on the demographic, medical, cultural and environmental sanitation management. In fact, issues caused by the free migration can be controlled by recruiting local worker. Currently, as the unemployment rate in the project area is approximately 5.7%, the demand on construction workers, mason required by the project is completely fulfilled. Also, local authorities and the investor should make a consistent direction to the construction unit on this issue.

5.2.6. **Impact mitigation measures on gender**

A gender action plan should be established to call for the participation of women in the construction phase of the project, creating new opportunities for women to increase their income (especially for female headed households), but not put burden on their lives, and contribute to promoting the role and status of women in the project area.

5.2.7. **Information disclosure and social and monitoring accountability**

For ensure the participation of affected households, households and local authorities as well as relevant organizations in the project's information dissemination, the consultant for selection of technical methods will take responsibility for forecasting possible impacts on land, income and assets on land. The information disclosure document is an important contribution to speeding up the progress of the project preparation, implementation and operation with strong support of the community and PMU. This will make contribution to reducing the arising conflicts and other risks, affirming the investment efficiency and the project's social meanings.

5.3. MEASURES TO MITIGATE CUMULATIVE IMPACTS

The assessment indicates that the cumulative impacts of the Subpjoject and the associated projects are mostly positive. The negatives cumulative impacts are minor to moderate and can be addressed individually at the project level.

CHAPTER 6. 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 Tan An Sub-project. The Environmental Management Program will identify the activities/actions to be implemented in the city of Tan An 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. BASIC PRINCIPLES

The ESMP is prepared for the subproject, taken into account the needs to comply with the government's EIA regulations and WB's safeguard policies and Environmental, Health, and Safety (EHS) Guidelines.

The ESMP is developed to ensure that all pollution sources arising from the subproject activities during the preparation stage and the construction stage as well as in the operation period will not cause any negative impacts on the environment and public health. It is compulsory that the management, monitoring and supervision of environmental quality are executed in a scientific, systematic and regular manner.

ESMP's mitigation measures are divided into 2 basic parts: (1) ECOPs, (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 ECOPs has been prepared to describe the specific requirements to be carried out by contractor to mitigate the subproject potential impacts which are considered as the general ones (Section 6.1.1). The contractors will also be required to mitigate site-specific impacts which will be identified in order to address specific issues of the subproject.

(2) In addition to adopting the ECOPs, the specific mitigation measures have been identified (Section 6.1.2) 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 Action Plan (RAP) and those measures will be carried out and supervised separately.

6.1.1. **ECOPS**

Typical common impacts which will be minimized by mitigation measures defined in ECOPinclude: (1) Dust, exhaust gases, noise and vibration; (2) wastewater management; (3) Solid waste management; (4) Hazardous waste; (5) Water pollution management; (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 healthand safety; (14) Measures to secure worker's health and safety, (15)Management of warehouses and borrow pits, (16) Communication to local community.

Table 6.1. Environmental Codes of Practices for addressing general construction impacts (ECOPs)

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
1. Generated dust, emission, noise, vibration	• Maintain the level of emission at construction sites within the permissible limit provided for in QCVN 05: 2013/BTNMT: National Technical Regulation on Ambient Air Quality. • Vehicles in Vietnam must undergo a regular emissions check and obtain certification: "Certificate of conformity from inspection of quality, technical safety and environmental protection" following Decision No. 35/2005/QD-BGTVT • Carry out watering for dust control at least 3 times a day: in the morning, at noon, and in the afternoon during dry weather with temperatures of over 25^{o}C, or in windy weather. Avoid overwatering as this may make the surrounding muddy. • Exposed soil and material stockpiles shall be protected against wind erosion and the location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors. • Dust masks should be used by workers where dust levels are excessive • There should be no burning of waste or construction materials on site. • Cement processing plants should be far from residential areas. • Only use transportation vehicles with valid registry. • Neatly gather construction materials and wastes. Arrange for the workers to collect and gather construction materials and wastes to the designated places at the end of each day or shift. • Do not overload the materials/soils and stones to extreme heights onto trucks, as this may result in drops along transportation routes. Tightly cover the trucks carrying wastes and bulk materials before getting out of construction sites or quarries and borrow pits so as to restrict scattering along transportation routes. • Put temporarily gathered materials and waste heaps with a volume of about 20m^{3}within barriers or covered so as to avoid dust dispersion.	• QCVN 05: 2013/MONRE:National technical regulation on ambient air quality • QCVN 26:2010/BTNMT: National technical regulation on noise • QCVN 27:2010/BTNMT: National technical regulation on vibration • TCVN 6438-2005: Road vehicles. Maximum permitted emission limits of exhaust gas • Decision No. 35/2005/QD-BGTVT on inspection of quality, technical safety and environmental protection;	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	• Transport wastes out of construction sites to the designated locations for reuse or to the disposal sites in the soonest possible time. • Do not put vehicles and machines to run idle in more than 5 minutes. • Avoid preparations of construction materials such as mixing concrete near local people's houses or other sensitive works like pagodas, school gates, or offices. • Periodically wash the trucks used for transporting materials and construction wastes. • Avoid construction operations generating great vibration and loud noise within the time between 6pm and 7am when construction takes place near residential areas. Night construction must be informed to the community at least 2 days in advance. • Perform the method of successive construction for each sewer section in construction sites of long sewer lines. • Observe and secure construction progress correctly. • When needed, measures to reduce noise to acceptable levels must be implemented and could include silencers, mufflers, acoustically dampened panels or placement of noisy machines in acoustically protected areas • Avoiding or minimizing transportation through community areas and avoiding as well as material processing areas (such as cement mixing)			
2. Wastewater management	• The Contractor must be responsible for compliance with Vietnamese legislation relevant to wastewater discharges into watercourses. • Employ local workers to limit the amount of generated domestic wastes and wastewater. • Provide septic tanks for toilets for treating wastewater before it can be discharged into the environment. On-site mobile toilets with 3-compartment septic tanks can be used in areas for major work items. Wastewater from toilets as well as kitchens,	• QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater; • QCVN 40: 2011/ BTNMT: National technical regulationon industrial wastewater	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	showers, sinks, etc. shall be discharged into a conservancy tank for removal from the site or discharged into municipal sewerage systems; there should be no direct discharges to any waterbody. • Wastewater containing pollutants over standards set by relevant Vietnamese technical standards/regulations must be collected in a conservancy tank and removed from site by licensed waste collectors**.** • Clear ditches around the workers' camps every week. • Make appropriate arrangements for collecting, diverting or intercepting wastewater from households to ensure minimal discharge or local clogging and flooding. • Before construction, all necessary wastewater disposal permits/licenses and/or wastewater disposal contracts have been obtained. • At completion of construction works, wastewater collection tanks and septic tanks shall be safely disposed or effectively sealed off.			
3. Solid waste management	• Before construction, a solid waste control procedure (storage, provision of bins, site clean-up schedule, bin clean-out schedule, etc.) must be prepared by the Contractors and it must be carefully followed during construction activities. • Before construction, all necessary waste disposal permits or licenses must be obtained. • Solid waste may be temporarily stored on site in a designated area approved by the Construction Supervising Consultant and relevant local authorities prior to collection and disposal through a licensed waste collector. • Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof. • No burning, on-site burying or dumping of solid waste shall occur. • If not removed off site, solid waste or construction debris shall be disposed of only at sites identified and approved by the	• Decision No, 59/2007/NĐ-CP on garbage management; • Decision No,38/2015/NĐ-CP dated 24/04/2015 on waste and scrap management	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	Construction Supervising Consultant and included in the solid waste plan. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas, such as in areas of natural habitat or in watercourses. • Limit waste pollution from litter and drop of materials. Place dustbins at the workers' camps. • For construction wastes, separate reused or recycled part before transporting to Long An solid waste treatment and recycle Plant in accordance with the design document and will be approved by supervising engineer • 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. • Weathered soil, wood and bricks can be reused for useful purposes such as ground leveling. Wood scraps may be used for cooking. Corrugated iron, iron, steel, packing materials and other materials which can be recycled can be delivered and sold to scrap traders. • Collect waste and tidy up construction sites at the end of a working day/shift and the transport waste out of the construction sites in the soonest possible time. If dredged materials are to be temporarily stored, necessary measures must be applied to control pollution such as gathering them within enclosures, under coverings, within fenced areas, etc. with warning signs. • The Contractor sign a contract with the compentent agency (Tan An urban environment Company) to collect solid waste, compliance with the Decree No. 59/2007/NĐ-CP dated 09/04/2007 on solid waste management and the Decree No. 38/2015/NĐ-CP ngày 24/04/2015 on management of waste and discarded materials			

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
4. Hazardous waste management	• Temporarily collect, store, and transported for treatment all hazardous wastes (road asphalt, waste oil and grease, organic solvents, chemicals, oil paints, etc.) in accordance with Circular No. 36/2015/TT-BTNMT on management of hazardous waste. • Collect and temporarily store used oil and grease separately in specialized containers and place in safe and fire-free areas with impermeable floors roofs, at a safe distance from fire sources. Sign contracts with for oil and grease to be delivered to suppliers/ manufacturers. • Chemical waste of any kind shall be disposed of at an approved appropriate landfill site and in accordance with local legislative requirements. The Contractor shall obtain needed disposal certificates. • The removal of asbestos-containing materials or other toxic substances shall be performed and disposed of by specially trained and certified workers. • Used oil and grease shall be removed from site and sold to an approved used oil recycling company. • Used oil, lubricants, cleaning materials, etc. from the maintenance of vehicles and machinery shall be collected in holding tanks and removed from site by a specialized oil recycling company for disposal at an approved hazardous waste site. • Used oil or oil-contaminated materials that could potentially contain PCBs shall be securely stored to avoid any leakage or affecting workers. • Unused or rejected tar or bituminous products shall be returned to the supplier's production plant. • Relevant agencies shall be promptly informed of any accidental spill or incident • Store chemicals appropriately and with appropriate labeling	• Circular No. 36/2015/TT-BTNMT on hazardous waste management; • Decision No.38/2015/NĐ-CP dated 24/04/2015 on waste and scrap management	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	• Appropriate communication and training programs should be put in place to prepare workers to recognize and respond to workplace chemical hazards • Prepare and initiate a remedial action following any spill or incident. In this case, the contractor shall provide a report explaining the reasons for the spill			
5. Water pollution	• The Contractor is responsible for controlling the surface water quality when discharging it out of the construction site, in accordance with QCVN 08-MT:2015/BTNMT – *National Technical Regulation on surface water quality* and QCVN 14:2008/BTNMT – *National Technical Regulation on domestic wastewater quality*. • Build a ditch, primary settling pond in large site such as embankment and construction of parks on sides of Bao Dinh river, rehabilitation of Cau Tre canal, Ring road, Luu Van Te road and roads in LIAs. • Provide construction workers on site with mobile toilets. • Avoid excavation and backfilling during rains. • Gather materials and wastes generated during excavation and backfilling, collect and transport them out of the construction site to the approved disposal sites within the soonest possible time. • Do not gather construction materials saperately, concrete mixing within a distance of 50m from ponds, rivers, seas or other sources. The construction of embankment and parks on sides of Bao Dinh river, Cau Tre canal, etc should remain a distance as maximum as posible from the gathering yard to the water sources. • Store used and unused oil and petrol in closed containers on impermeable ground covered with roofs and contained within surrounding banks for easy control and collection in case of	• QCVN 09-MT:2015/BTNMT: National technical regulation on underground water; • QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater; • QCVN 40: 2011/ BTNMT: National technical regulationon industrial wastewater; • TCVN 7222: 2002: General requirements for concentrated wastewater treatment plants	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	leakage. Do not locate oil and petrol storages within 25m from ponds, lakes, rivers, and streams. • Collect and transport excavated soils from the construction of sewers and ditches out of the construction site within 24 hours. • Only perform maintenance work of motored vehicles and equipment, including oil replacement or lubrication in designated areas, without allowing chemicals, petrol, oil, or grease to leak onto soil or into the drainage system or water sources. Trays are to be used to hold rags and materials used in maintenance. Collect and discard wastes in accordance with hazardous waste management regulation			
6. Impacts on plants and aquatic species	• The Contractor shall prepare a Clearance, Revegetation and Restoration Management • Plan for prior approval by the Construction Engineer, following relevant regulations. The Clearance Plan shall be approved by the Construction Supervising Consultant and followed strictly by the contractor. Areas to be cleared should be minimized as much as possible. • Limit disturbances to areas with construction operations, especially in locations covered with green trees or vegetation. Do not use chemicals to clear vegetation. • Do not gather materials and wastes at places covered with vegetation or with green trees, but on vacant land instead. • Use sheet pile driving method using Larsen piles to limit impacts on the water quality. • If possible, green trees should be moved and replanted in other places if the trees are in the way of the pipelines to be constructed. • The contractor shall remove topsoil from all areas where topsoil will be 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	• Law on environmental protection No. 55/2014/QH13	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	Construction Supervising Consultant for later use in re-vegetation and shall be adequately protected. • Trees cannot be cut down unless explicitly authorized in the vegetation clearing plan. • When needed, temporary protective fencing will be erected to efficiently protect the preserved trees before commencement of any works within the site. • No area of potential importance as an ecological resource should be disturbed unless there is prior authorization from CSC, who should consult with PMU, IEMC and the relevant local authorities. This could include areas of breeding or feeding for birds or animals, fish spawning areas, or any area that is protected as a green space. • The Contractor shall ensure that no hunting, trapping, shooting, poisoning of fauna takes place.			
7. Impacts on urban landscape and beauty	• Carefully cover transport vehicles for materials and waste and periodically wash and clean the vehicles. • Dismantle the camps as well as other temporary works set up during construction and restore the site before the completed work could be handed over to the subproject owner. Back fill and tightly seal toilet pits, septic tanks, and temporary sewerage ditches. • Do not temporarily gather construction materials and wastes within 20m from the gate of schools, offices temples, pagodas, etc. • The Contractor will have to work out construction plans in such a way as to avoid the 1st and 15th days of each lunar month if construction is to be carried out near historical and cultural works such as pagodas, churches, temples, etc. • Regularly collect materials and wastes and tidy up the construction site**.**	• Law on environmental protection No. 55/2014/QH13 • TCVN 4447:1987: Construction regulation • Circular No. 22/2010/TT-BXD on requirements on safety	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
8. Sedimentation, erosion, flooding, subsidence and slides	• Avoid disturbances and damage to the existing vegetation and green trees. • Periodically and thoroughly remove soils, stones and wastes from drainage sewers and ditches inside and around the construction site. • Neatly gather materials and wastes so as to limit them being swept away by stormwater. • Carry out ground leveling and rolling after discarding materials at disposal sites.	• TCVN 4447:1987: Construction regulation • Circular No. 22/2010/TT-BXD: Regulation on construction safety • QCVN 08:2008/BTNMT – National technical regulation on surface water quality	• Contractor	• PMU, CSC, IEMC
9. Traffic management	• Before construction, carry out consultations with local government and community and with traffic police. • Set up traffic and maintain instruction signs and warnings to secure safety for people and means of transport during construction. • Put speed limit signs at a distance of 200m from the construction site. • Carefully cover materials on trucks. Do not load to a height of 10cm higher than the truck body so as not to spill out and scatter materials onto roads, giving rise to dust and endangering road users. Collect spilt soils and materials at the construction site each day to avoid slippery incidents for vehicles. • Do not park vehicles in the roads longer than necessary. Do not allow construction vehicles and materials to encroach upon the pavements. • During construction near schools, deploy staff at the site to guide the traffic at the start of school time and when school is over. Water the roads to prevent dust, limit the speed of traveling trucks, do not allow flared horns, and do not dispose the waste and wastewater onto areas near schools. • Install night lighting of all construction sites. • Significant increases in number of vehicle trips must be covered in a construction plan previously approved. Routing, especially of heavy vehicles, needs to take into account sensitive sites such as schools, hospitals, and markets.	• Law on communication and transport No. 23/2008/QH12; • Law on construction No. 50/2014/QH13; • Law No. 38/2009/QH12 dated 19/6/2009 amending and supplementing some articles of the Law relating to capital construction investment • Circular No. 22/2010/TT-BXD on regulation on construction safety	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	• Installation of lighting at night must be done, if necessary, to ensure safe traffic circulation. • Employ safe traffic control measures, including road/rivers/canal signs and flag persons to warn of dangerous conditions. • Avoid material transportation for construction during rush hours. • Passageways for pedestrians and vehicles within and outside construction areas should be segregated and provide for easy, safe, and appropriate access. Signposts shall be installed appropriately in both water-ways and roads where necessary			
10. Influence to existing infrastructure and services	• Provide information to affected households on working schedules as well as planned disruptions (at least 2 days in advance). • The Contractor must only use vehicles of sizes and loads within permissible limits for the roads along such vehicles' route. • During the construction under power lines, deploy qualified staff to observe and give instructions to the drivers of cranes and excavators so as to avoid causing damages to power lines, telecommunications lines, etc. • Stop construction when existing works are damaged. Identify causes of related incidents and work out solutions. In case the damages are due to the Contractors' faults, the Contractors have to repair, recover, and compensate for all damages at their own expenses. The results of handling such damages must be approved by the Supervisor Engineer. • Reinstall the road surface and sidewalks at construction sites after the construction of sewer lines has been completed. • The contractor should ensure alternative water supply to affected residents in the event of disruptions lasting more than one day. • Any damages to existing cable utility systems shall be reported to the authorities and repaired as soon as possible.	• Decree No. 73/2010/ND-CP on administrative penalization of violations related to security and social affairs	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
11. Social impacts	• Workers temporarily residing at the camps and rented houses must be registered with the local authorities for temporary residence. • 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. • Limit construction activities at night. In case night construction is inevitable or in case construction causes a disruption of services (power supply, water supply, etc.), inform the community at least 2 days in advance and remind one day in advance. • Place wooden planks over constructed ditches which have not been reinstated to ensure access to the households along the construction route. • 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. • Formulate a code of conduct and behavior, in which workers are requested to comply with the following:: + To use sufficient safety personal protective equipment supplied while at work; + To smoke only at designated places. • Workers are strictly banned from: + Storing and using weapons and toxic substances; + Cutting trees outside the construction sites, making fire, burning waste and plants after clearing the site (except invasive plants, which must be approved the environmental specialist in the Supervision Consultant Team and the PMU); + Consuming alcoholic drinks during working time; + Quarreling and fighting;	• Decree No. 73/2010/ND-CP on administrative penalization of violations against security and social affairs	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	+ Gambling and indulging in social evils such as drug use and prostitution; + Disposing of garbage indiscriminately; + Controlling trucks, machines or construction vehicles on their own initiative and without authorization; + Maintaining trucks, construction machines, and equipment beyond permitted areas.			
12. Control of impacts on cultural works	• Do not gather materials and wastes within 20m from cultural, historical, and religious works such as temples, pagodas, churches, monuments, historic relics, etc. Water spray the construction sites next to such works. • Do not use machines generating loud noise and high vibration levels near cultural, historical, and religious works. • In case of archeological objects being unearthed during the implementation of earthwork, all parties will conform to the following procedures: + In case of archeological objects being unearthed during the implementation of earthwork, all parties will conform to the following procedures: + Suspend construction operations at the place of discovery; + Preliminarily describe the area where the archaeological objects are to be unearthed; + Strictly protect the area of the discovery so as not to damage or lose moveable objects. In case the unearthed objects are moveable or sensitive ruins, provide night protection until the local authorities, the Department of Culture, Sports and Tourism or the Institute of Archaeology takes over these unearthed objects; + Inform the Supervision Engineer of the event and who in turn will immediately inform the subproject owner, the local authorities in charge of the case and the Institute of Archaeology (within 24 hours or less); + Local relevant agencies and the Vietnam National Administration of Tourism will be responsible for	• Law on cultural heritage No. 28/2001/QH10; • Amended and supplemented Law on cultural heritage No. 32/2009/QH12; • Amended and supplemented Decree No. 98/2010/ND-CP	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	protecting and preserving such archaeological relics before making decisions on the next suitable formalities. The Institute of Archaeology may be needed in the preliminarily assessment of the unearthed objects. The significance and importance of such discovered objects will be assessed by different criteria related to the nature of cultural heritages; such criteria would include aesthetic, historical, scientific, social or economic values; + Decisions on handling such discovered objects will be made by competent levels. Such decisions can result in changes in site arrangements (e.g. when the discovered item is a cultural relic which cannot be displaced or is archaeologically important, it is necessary to preserve, recover and excavate it); + The implementation of such decision by competent agencies related to the management of discovered objects will be communicated in writing by local competent agencies; and + Only resume construction activities at the site after being permitted by the local competent agencies and the PMU in relation to safeguarding such relics			
13. Community's safety and health	• The Contractor will have to conform to regulations in Circular No. 22/2010/TT-BXD by the Ministry of Construction on safety in construction. • The subproject owner and contractor are to cooperate closely with the local government in performing effective community sanitation in case of epidemic symptoms breaking out in the area. • The subproject owner and contractor are to cooperate with local authorities in preventing and fighting against social evils. • Fence of excavation pits and open channels and make off with luminous cordon and warning signs. Provide sufficient lighting when carry out construction at night.	• Circular No. 22/2010/TT-BXD regulation on construction safety • Directive No. 02/2008/CT-BXD on safety and sanitation issues in construction units • TCVN 5308-91: Technical regulation on construction safety • Decision No. 96/2008/QD-TTg on clearance of UXOs	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	• Limit the speed of transport means to 20km/h within 200m from the construction site so as to minimize dust and noise. • Keep noise-generating machines and vehicles at such suitable distances that noise transmitted to residential areas will not be higher than 70dBA. • Use static compacting when the road base is constructed near areas with many households and weak temporary works to restrict vibration. • The subproject will cooperate with the local health agency in developing and implementing plans for control of diseases among workers.			
14. Workers' health safety	• Train workers on issues related to environment, safety and health, thus enhancing their awareness of HIV/AIDS and infectious diseases within 2 weeks prior to the commencement of packages with construction items lasting at least 6 months. • Provide workers with and request them to use adequate safety gear such as masks, helmets, shoes/boots, goggles, etc. depending on job characteristics. • Safely install power lines at offices and in construction sites and do not lay connectors on the ground or water surface. Electric wires must be with plugs. Place outdoor electric panels in protection cabinets. • Limit the speeds of vehicles traveling inside construction sites to be 5km/hour. • Provide fire-extinguishers, first-aid bags, and medical cabinets with sufficient medicines for treating general diseases in the locality must be provided at construction sites. • Safely store fuels and chemicals in areas with impermeable ground with roofs and surrounding banks, equipped with safety warning signs located at least 20m from the camps and at the end of prevailing winds. • In case of chemical and fuel leakage, the following steps will have to be taken:	• Decree No. 22/2010/TT-BXD on regulation of construction safety; • Directive No. 02 /2008/CT-BXD on safety and sanitation issues in construction units; • TCVN 5308-91: Technical regulation on safety in construction; • Decision No. 96/2008/QD-TTg on clearance of UXOs.	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	+ Immediate check must be carried out to detect any possible case of injury. In case of injury, first-aid must be given and the injured person must be rushed to the nearest medical station for healthcare, and at the same time the case must be informed to the Supervision Engineer and the PMU; + Carry assessment to determine the kind of leaking/overflowing fuel/chemical; + Do not flush overflowing chemicals into drainage systems. Send staff with suitable safety gear to the site to handle the leakage by scattering sawdust (in case of small volumes of leaks/overflow) or sand (for high volumes of leaks/overflow). Use shovels to remove the surface soil layer if the leakage/overflow takes place on vacant land; and + Subsequent to the occurrence of such incident or accident, the Contractor will have to prepare a detailed report describing the incident and performed activities and submit the same to the Supervision Engineer and the PMU for consideration and filing. Such report will also be presented to the Department of Natural Resources and Environment or functional agencies at their request.. • Set up the camps with sufficient supplies of clean water, power, and sanitation facilities. There must be at least one toilet compartment for every 25 workers, with separate toilets for males and females. Workers' beds must be provided with mosquito nets so as to prevent dengue fever. Temporary tents will be unacceptable. • Clean camps, kitchens, baths, and toilets and sanitize regularly, and keep in good sanitation conditions. Provide dustbins and collect wastes daily from the camps. Clear drainage ditches around the camps periodically. • Stop all construction activities during rains and storms, or upon accidents or serious incidents			

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
15. Management of warehouses and borrow pits	• All borrow pit locations to be used must be previously identified in conformity with approved construction technical specifications. Sensitive sites such as scenic spots, areas of natural habitat, areas near sensitive receiving waters, or areas near water sources should be avoided. An open ditch shall be built around the stockpile site to intercept wastewater. • Retaining walls are to set uparound disposal areas if necessary. • The use of new sites for stockpiling, gathering or exploiting materials necessary for construction operations must obtain prior approval from the Construction Engineer. • In case landowners are affected by the use of their areas for stockpiling, gathering or exploiting materials, such landowners must be included in the project resettlement plan. • If access roads are needed for these new sites, they must be considered in the environmental assessment report.		Contractor	PMU, CSC, IEMC
16. Communication to local community	• Open communications channels are to be maintained with the local government and concerned communities; the contractor shall coordinate with local authorities (leaders of local wards or communes, leaders of hamlets) for agreed schedules of construction operations in areas nearby sensitive places or during sensitive times (e.g. religious festival days). • Copies of Vietnamese versions of these ECOPs and of other relevant environmental protection documents shall be made available to local communities and to workers at the site. • Project information will be disseminated to affected parties (e.g. local authorities, enterprises and affected households, etc.) through community meetings before construction commencement. • A contact address will be provided to the community. • The community will be provided with all information, especially technical findings, in a language that is understandable to the general public and in a form convenient to interested citizens and elected officials through the	• Decree No. 73/2010/ND-CP on administrative penalization of violations related to security and social affairs	• Contractor	• PMU, CSC, IEMC

Environmental –social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	preparation of fact sheets and news releases, when major findings become available during project phase. • Community concerns and requested information are to be monitored as the project progresses. • Inquiries must be responded by telephone and written correspondence in a timely and accurate manner. • Local residents must be informed about construction and work schedules, interruption of services, traffic detour routes and provisional bus routes, blasting and demolition operations, as appropriate. • Technical documents and drawings will be provided to local People's Committees, especially the sketch of construction areas and the EMP of the construction site. • Notification boards shall be erected at all construction sites providing information about the project, as well as contact information about the site managers, environmental staff, health and safety staff, telephone numbers and other contact information so that affected people could have a channel to voice their concerns and suggestions.			

6.1.2. **Site-specific Impacts and Mitigation Measures**

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

Table 6.2. Site-specific impacts and mitigation measures

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
COMPONENT 1: TERTIARY INFRASTRUCTURE UPGRADING IN LIAs				
Infrastructure in LIAs (1, 2, 3, 4)				
Preparation				

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
UXO clearance	The subproject owner (the subproject PMU) will sign a contract with the military civil engineering agency or Long An Provincial Military Base for UXO detection and clearance at the construction sites. UXO clearance will be executed right after the completion of site compensation and before the implementation of demolition and ground leveling. The estimated cost is approximately 50 million VND/ha. No construction activity will be allowed until the UXO clearance is completed.	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	- Counter part fund - IM: approved RP
Construction				
Subcomponent 1.1 – Tertiary Infrastructure Upgrading in LIAs				
Local flooding - Local residents within LIAs 1,2,3,4	- PMU will ensure that detailed design will consider adequate temporary drainage to avoid potential flooding during construction	Detailed design consultant	PMU	- Fund: City or IDA/IDA Suf - IM: detailed design contract
	- The Contractors must apply the specific construction methods, and flood prevention and control alternatives during construction period or the flow diversion alternatives to ensure the drainage in the location. - The contractors must set up temporary drainage at the construction site and ensure that they are cleared of mud and other obstructions - Arranging the standby pumps for rapid drainage in case of heavy rain or extreme weather events	Contractor	PMU, CSC IEMC	- Fund: IDA/IDA Suf - IM: Construction contract conditions
Social disturbance and traffic safety concerns	- Ensure that the contract requires the contractor, before commencing work, to provide a construction plan with a	Contractor	PMU, CSC IEMC	- Fund: IDA/IDA Suf

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
- Local residents within LIAs 1,2,3,4 *Impact on current technical infrastructures* (relocated 75 power poles and electric lines in 4 LIAs) - Local residents within LIAs 1,2,3,4	detailed health, safety, environment and traffic management plan - Inform local residents in advanced (at least 07 days) about construction and work schedules, interruption of services, traffic routes etc. - Put and maintain bulletin boards at the construction site, containing the following information: full name and phone number of the Contractor, Site Manager, Supervision Consultants and Subproject Owner, duration and scope of work. - Construction in a successive manner, section by section in a short a period as feasible. Avoid simultaneous construction and delays that may affect large sections of the LIAs. - Contractors should provide lighting at all construction sites at night; security guard staff at construction sites to moderate vehicles entering and exiting the construction site; - Put road construction warning signs at the site and maintain them for the duration of the work. - Avoiding transporting waste and bulk materials during rush hours; Construction by night time is not allowed - Limit the construction area to be within the site boundary - Assign staff to control traffic during transportation, loading and unloading. - Prepare plans for dismantling and notify the people and production facilities around the area of the dismantling time and electricity supply suspension at least 07 days prior to the dismantling work. - Prior to construction, contractors and Project Management Unit shall coordinate with the relevant authorities Tan An			- IM: Construction contract conditions

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	EVN in the dismantling, proper use of specialized workers for the dismantling to avoid safety risks.			
Impact on PCRs and sensitive receptors *Impacts on the Thien Khanh Pagoda (at a 30m distance from the construction site in LIA 3)* *Impacts on Phuong Hong Kindergarten (at a 50m distance from the construction site in LIA 3)*	*For Thien Khanh pagoda:* - Inform the pagoda of the construction activities and their potential impacts such as, waste, dust, 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 day of the lunar month and during festival days if possible. - Prohibit storage of construction materials within 100m in front of the pagoda. - 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 including installation of fences, barriers warning signs, lighting system to prevent traffic accidents as well as other risk to local people and pagoda visitors. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas, or as required. - Truck drivers shall restrict the use of horns close to the pagoda location - Immediately address any issue/problem caused by the construction activities and any raised by the pagoda. *For Phuong Hong Kindergarten:*	Contractor	PMU, CSC IEMC	- Fund: IDA/IDA Suf - IM: Construction contract conditions

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	- Inform the school management of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction - Construction area to be fenced and marked with warning signs to prevent pupils and unauthorized people from entering. - Teachers to be informed of construction operations to keep pupils off the site during their break time. - Prohibit use of construction methods that cause noise during school learning hours. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Immediately collect any domestic wastes and construction spoils around the school and dispose in a designated site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes when children go to and leave the school. - Do not load construction materials within 20m from school and tidy construction materials and stockpiles every working session. - Cover the incomplete trenches under construction at end of the working day. - Immediately address any issue/problem caused by the construction activities and raised by the schools			
Subcomponent 1.2 – Rehabilitation of polluted canals and pond in LIAs				
Odors from dredging process and management of dredged materials	*To control impacts by dredged sediment (the volume of dredging material estimated about 20,140 m^3)*:	Detailed design consultant Contractor	PMU, CSC IEMC	- Fund: IDA

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
(Mui Tau, Cau Tre – section 1 and Rot Canals) - Local residents at the dredging sites and transfer site - Workers - People commuting along transportation routes	- The Dredged Materials Management Plans (DMMPs) for the Mui Tau, Cau Tre and Rot canals have been prepared and included in Annex 1. Overall, sediment will be disposed at Long An solid waste treatment and recycle Plant at Tan Dong commune (landfill site) or used for agricultural or tree planting purpose based on actual need of the local people. - Ensure that detailed design scope for the canals dredging will include the update of DMMP with additional analysis of sediment quality, detailed information on the amount of generated sediment, requirements on contractor's dredging method, transportation and disposal that are appropriate and cost-effective. The updated DMMPs will be incorporated into the related bidding documents and contracts - Prior to construction, the contractors shall develop a specific DMMP based on the updated DMMP. The contractor's DMMPs shall be submit to the Construction Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary storage of dredged materials, and control of polluting material during temporary handling and transportation, pollution control, and risks at disposal sites. - Manage to ensure sediment will be disposed appropriately according to the approved DMMP. *To control impacts by odors from dredging process:* - Sludge is to be deposited along the work sites on suitable sheeting to limit leachate entering the soil, and is to be transported for disposal within the day. The management plan on dredged materials will be prepared to instruct the contractors to manage the waste source.			- IM: Construction contract conditions

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	- Uncontrolled disposal of the dredged material is prohibited and must be managed effectively under the supervision of the PMU. - In order to limit the effects of odor or contamination from the dredged material, the workers shall be equipped with the minimum personal protective equipment (PPE), including masks, boots and gloves when working in/exposed to this waste. - Spraying EM (Effective Microorganisms) every day, to limit odors from H_2S, CH_4, etc. - Dredged sediment will be collected. transported and treated under contract in the Long An solid waste treatment and recycle Plant at Tan Dong commune (landfill site). Transportation of the dredged material must meet the environmental protection requirements and avoid dredged material leakage; the dredged material carrying trunks must be covered and not overloaded.			
Local flooding (Mui Tau, Cau Tre – section 1 and Rot Canals) - Local residents within LIA 2 and LIA 3	- The same subcomponent 1.1	Detailed design consultant	PMU	- Fund: City/ or IDA/IDA Suf - IM: detailed design contract
Risks on shore erosion and subsidence; infrastructures collapse and cracking during the embankment process of Quan Pond (in Lia 1) and Rot canal (in Lia 4) - Local residents within LIA1 and LIA 4 - Workers	- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure sustainable and stable of the embankment; - Ensure that the detailed design and contractor's construction method take into account the risk of potential damage to nearby houses or other structures.	Detailed design consultant	PMU	- Fund: City/ or IDA - IM: detailed design contract
	- Before dredging, reinforcement of banks will be conducted if considered nececssary. The construction method proposed	Contractor	PMU, CSC IEMC	- Fund: IDA

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	must be submitted to the relevant authorities for approval by the contractors. - Maximise the use of high-tech equipment to reduce vibration during embankment work and closely monitor the vibration levels; - Construction of side slope in accordance with the design - Limiting dredging works during the rainy season. - Do not place heavy macheryor loaded vehicles near the canals ban edges. - Inspection and supervision to prevent landslide risks must be done regularly to prepare the appropriate reinforcement plans. - Inform the potential affected people of the nature of work and get their agreement; - In the case that property damage is likely to occur ,the affected households shall be temporarily relocated prior to construction. This temporary relocation shall be carried out with appropriate consultation and and adequate compensation.			- IM: Construction contract conditions
Social disturbances and traffic safety concerns (Mui Tau, Cau Tre – section 1, Rot Canals) - Local residents within LIAs 1,2,3,4	- The same subcomponent 1.1	Contractor	PMU, CSC IEMC	- Fund: IDA/IDA Suf - IM: Construction contract conditions
Operation				
Subcomponent 1.1- Tertiary Infrastructure Upgrading in LIAs				
Measures for minimizing the effects of O&M of the drainage system	- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the sewer pipes;	O&M unit (City Drainage Company)	City	- City Budget

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	- 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 material.			- IM: City Operation and Maintenance Plan
Measures for traffic safety	- Ensure that traffic safety provisions, including signs, lights, and signals regulating speeds, allowed vehicles load that were installed during construction are permanently and effectively maintained, and renewed as necessary - Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road. - Cooperating with the local government to appoint the staff for traffic regulation at peak hours; - Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the alleys in its as-completed condition;	O&M unit (City Drainage Company)	City	- City Budget - IM: City Operation and Maintenance Plan
Subcomponent 1.2 – Rehabilitation of polluted canals and pond in LIAs				
Mitigation measures for impacts on water pollution and decreased landscape due to direct waste disposal into the canals	- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the canals; PMU and DONRE should be in collaboration to impose much more serious penalty to polluter - Properly arranging the waste baskets along the canal and launching programs of increasing awareness of the community toward environmental protection; - Carrying out periodical dredging and clearing works of the canals at least 6 months/time especially before the wet season;	O&M unit (City Drainage Company)	City	- City Budget - IM: City Operation and Maintenance Plan

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	- Signing contracts with the responsible agencies on collecting, transporting and treating dredged material.			
Mitigation measures to prevent the embankment subsidence risk during operation of Rach Rot Canal	- To avoid risk on embankment cracking and subsidence, in detailed design should be implemented hydrology and geological surveys to ensure sustainable and stable designs - Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the embankment periodically - Closely monitor the construction of other infrastructures within the area that potentially affect the embankment structures	Detailed design Consultant O&M unit (City Drainage Company)	PMU, City	- Fund: IDA and IDA Suf - City Budget - IM: Construction contract conditions
COMPONENT 2: PRIORITY PRIMARY AND SECONDARY INFRASTRUCTURE (i) *Embankment of Bao Dinh river and construction of an extension road of Bao Dinh river embankment*; (ii) *Rehabilitation of Cau Tre canal (section 2)*, (iii) *Construction of Ring Road*; (iv) *Upgrading of Luu Van Te road*; (v) *Construction of a link between Tran Phong Sac road and Nguyen Minh Duong road.*				
Subcomponent 2.1 – Embankment of Bao Dinh river and construction of an extension road of Bao Dinh river embankment.				
Preparation phase				
UXO clearance	The same component 1	Competent Military Unit	PMU	- Counterpart fund. - IM: Contract
Land acquisition and resettlement	The same component 1	PMU, City People's Committee	ISMC	- Counter part fund - IM: approved RP
Construction phase				
Management of dredged soils and sediments (require dredging of 10850 m^3 of soils and sediment): - Local resident in ward 7	- Only conduct dredging work during the dry seasons - Upon forecasted stormy weather, suspend all the construction activities, tidy up the sites, stabilize and protect any loose materials and construction machinery.	Contractor	PMU, CSC IEMC	- Fund: IDA Suf - IM: Construction contract conditions

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
- People commuting on the transportation route.	- In case construction needs to be executed at night time or early morning, inform the community at least 2 days in advance, and only carry out the activities that will not generate excessive noise and vibration. - Place warning signs along the construction route, both on land and water surface (arrange the road and waterway traffic guide). - The dredged materials will be used to backfill at low areas in the Tan An city (as per organizations / household needs) or used to level landfill cells at Long An solid waste treatment and recycle Plant at Tan Dong commune (landfill site).			
Impacts on water environment and aquatic communities of Bao Dinh river	- The dredging operation is conducted only during the dry season; - Create sedimentation traps and maintain them periodically to ensure that most solids in surface runoff are retained in the traps before entering the existing drains or water sources surrounding the sites; - Leachate from sediments must be first deposited in sedimentation hole/trap before entering the river. - Strictly prohibit contractors to discharge waste into river - Upon forecasted stormy weather, suspend all the construction activities, tidy up the sites, brace and protect the materials and construction machines. - Do not gather construction materials as well as machinery and equipment near the river. Gathering small quantities of materials, fit with the schedule. Materials must be covered with tarpaulin, avoiding the upwind location, near the canal. - Strictly prevent hazardous waste, waste oils or particularly greasy rags from entering the flow.	Contractor	PMU, CSC IEMC	- Fund: IDA Suf - IM: Construction contract conditions

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
Risk of embankment subsidence and bank erosion during construction process - Local residents nearby construction site in Ward 7 - Workers	- Ensure that the detailed design for the embankment includes hydrological and geological surveys to ensure sustainability and stability of the embankment; - Ensure that the detailed design and contractor's construction method take into account the risks on collapse and cracking of local house and nearby structure	Detailed design consultant	PMU	- Fund: City/ or IDA - IM: detailed design contract
	- Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted to the authorities concerned for approval by the construction contractors. - Ensure that land acquisition and house relocation at the site boundary is completed piror to commencing construction work - Use construction method to reduce vibration for construction activities of embankment i.e. pipe jacking instead of pile driving; closely monitoring the vibration level; - Construction of side slope is made in accordance with the design - Do not carry out dredging works in rainy season. - Do not place heavy machineries and transportation vehicles near the canals banks. Inspection and supervision on land subsidence risks must be taken regularly in order to prepare the appropriate reinforcement plans.	Contractor	PMU, CSC IEMC	- Fund: IDA - IM: Construction contract conditions
Impact on irrigation scheme across the new construction road starting from the Bao Dinh embankment	- Informing the community of the construction schedule at least one week before the construction. - Arrange drainage around the construction sites to prevent soil erosion and sedimentation into the rice fields and irrigation canals. - Regularly check the affected on-field irrigation canals to ensure they are not blocked by construction spoil or waste	Contractor	PMU, CSC IEMC	- Fund: IDA SUF - IM: Construction contract conditions

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	and if they are affected, provide alternative irrigation water from canals to the locations the local people request. - Immediately rehabilitate irrigation canals if they are damaged by construction activities to ensure that water supply for the rice fields is maintained. - Closely consult with the local community to ensure that suitable solutions to problems are taken and communities' concerns related to construction activities are addressed.			
Impacts on Thien Chau Pagoda (50 m from Bao Dinh Embankment); Binh Yen Dong Temple (30 m from Bao Dinh Embankment) and Long Chau pagoda (20m from extension road of Bao Dinh river embankment)	- 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. - Inform the pagodas of the construction activities and their potential impacts such as, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction. - Prohibit storage of construction materials within 100m in front of the pagodas. - Pile driving activities will not be carried out before 7 am or after 6 pm, or at days and hours advised by the local authority. - Environmental training for the workers includes codes of conducts when working in public areas and sensitive receptors such as pagodas. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at the area of the pagodas, or as required. - The contractor shall provide safety measures including installation of fences, barriers warning signs, lighting	Contractor	PMU, CSC IEMC	- Fund: IDA - IM: Construction contract conditions

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	system to prevent traffic accidents as well as other risk to local people and pagoda visitors. - Truck drivers shall restrict the use of horns close to the pagoda areas - Immediately address any issue/problem caused by the construction activities and raised by the pagodas.			
Disruption of business activities - Business on the two sides of road along Bao Dinh embankment	- Inform the street household businesses of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 02 weeks before start of the construction. - Set up construction and traffic warning signs at the construction site. - Provide safe and easy access to the household businesses putting clean and strong thick wood panels or steel plates over the open ditches. - Do not gather materials and wastes within 20m from household businesses and shops. - Do not use machines generating loud noise and high vibration levels near the businesses. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes, and to guard high risk operations. - Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session. - Cleaning up construction areas at the end of the day, especially construction areas in front of business shops. - Providing night lighting system with luminously painted fence and night lamp.	Contractor	PMU, CSC IEMC	- Fund: IDA Suf - IM: Construction contract conditions ons

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	- Manage the worker force to any avoid the conflict with the local people and traders. - Compensate goods, products damaged by construction activities of the subproject. - Immediately address any issue/problem caused by the construction activities and raised by the local household traders.			
Subcomponent 2.2 – Rehabilitation of Cau Tre canal (section 2)				
Local flooding - Local residents living along section 2 of Cau Tre canal, in Ward 4	- Ensure that the detailed design includes adequate geotechnical survey, taking into account the possibility of encountering groundwater. - Ensure the detailed design includes temporary drainage to prevent potential flooding during construction	Detailed design consultant	PMU	- Fund: City/ or IDA Suf - IM: Construction contract conditions
	- The Contractors must apply the specific construction methods, incorporating flood prevention and control alternatives during construction divert flow accordingly to ensure effective drainage at work locations. - Contractor shall et up temporary drains as required to ensure drainage at the construction site. - Arranging standby pumps for rapid drainage in case of heavy rain or extreme weather events.	Contractor	PMU, CSC IEMC	- Fund: IDA Suf - IM: Construction contract conditions
Social disturbance and traffic safety concerns - Local residents living along section 2 of Cau Tre canal, in Ward 4	- The same subcomponent 1.1	Contractor	PMU, CSC IEMC	- Fund: IDA Suf - IM: Construction contract conditions
Odors from dredging process, and management of dredged sediments - Local residents living along section 2	- The same as those for the Rot and Cau Tre Canals, section 1 under subcomponent 1.2	Contractor	PMU, CSC IEMC	- Fund: IDA Suf

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
of Cau Tre canal, in Ward 4 - Workers - People commuting on the transportation routes				- IM: Construction contract conditions
Risks on bank erosion, soil subsidence and house cracking during piling operation for embankment foot protection. - Distance of 1-3 from construction site of Cau Tre embankment. - Local residents along the Cau Tre Canal, especially those from 50-100 m at the two ends intersected with 1A National Highway and Nguyen Cuu Van Street	- The same as those for the Rot Canals under subcomponent 1.2	Contractor	PMU, CSC IEMC	- Fund: IDA Suf - IM: Construction contract conditions
Subcomponent 2.3 – Construction of Ring Road				
Traffic safety concerns during the construction of overpassing bridges across Can Dot Canal and Trung Luong Highway- - Local resident in Binh Nhon Commune and Khanh Hau ward. - People commuting on Trung Luong highway - Workers.	- Prior to construction, the contractor shall prepare a Traffic Management Plan maintain safety, to minimize disturbance to local traffic and pedestrians and to maintain public and private access throughout the works areas. The Plan will show routes provided to maintain access, e.g., a passing lane retained along the road during construction or temporary bypasses, or scheduled access times. The Plan will be presented to communities and officials before finalization and approval by the CSC/PCC and subsequent implementation by the Contractor; - During the prepartion, the contractor shall carry out consultation and coordination with O&M unit of Trung Luong Highway (under Department of Transport) to propose proper construction measure and detailed plan	Contractor	PMU, CSC IEMC	- Fund: IDA Suf - IM: Construction contract conditions

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	- Prior annoucement of the construction schedule and method to the O&M unit at least 2 weeks in advance. - Contractors should provide lighting at a construction site at night; security guard staff at construction sites to moderate vehicles go out and in the construction site; - Ensure that traffic safety provisions, including signs, lights, and pavement markings, that were installed during construction is permanently and effectively maintained, and renewed as necessary.			
Impact on the relocation of power poles and electric lines along the road - Local resident in Binh Nhon Commune and Khanh Hau ward. - Workers	- Prepare plans for dismantling and notify the people, production facilities around the area of the dismantling time and electricity supply suspension. - Contractors, Project Management Unit coordinate with the relevant authorities Tan An EVN in the dismantling, proper use of specialized workers for the dismantling to avoid risks.	Contractor	PMU, CSC IEMC	- Fund: IDA Suf - IM: Construction contract conditions
Impacts on irrigation canals and agriculture activities	- Informing the community of the construction schedule at least one week before the construction. - Arrange drainage around the construction sites to prevent soil erosion and sedimentation into the rice fields and irrigation canals. - Regularly check the affected on-field irrigation canals to ensure they are not blocked by construction spoil or waste and if they are affected, provide alternative irrigation water from canals to the locations the local people request. - Immediately rehabilitate irrigation canals if they are damaged by construction activities to ensure that water supply for the rice fields is maintained. - Closely consult with the local community to ensure that suitable solutions to problems are taken and communities' concerns related to construction activities are addressed.	Contractor	PMU, CSC IEMC	- Fund: IDA Suf - IM: Construction contract conditions

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
Impacts on water quality of Can Dot canal during the construction of Mang Bridge	- In case of material leakage from the dredged materials, the contractors will have to take all necessary measures to tidy up the areas to prevent the spread of pollution. - The construction of the bridge and as well as structures at both sides should only take place in the dry season to minimize the possibility of wash out of material into the canal - Upon forecasted stormy weather, suspend all the construction activities, tidy up the sites, stabilize and protect any loose materials and construction machinery. - Strictly prohibit contractors from disposing of water pumped out from excavations into the canal to avoid water quality issues. - Do not store construction materials or heavy machinery and equipment near the canal (at least 50m away). - Prevent hazardous waste, waste oils or particularly oily rags from entering the canal. - Limit the use of construction vehicles working in-stream, as there is a risk of oil or lubricating fluids contaminating the water and also causing vibration and noise that can affect the aquatic ecosystem. - If works require restrictions to canal flow, they must be evaluated for their effect on aquatic species and allowances should be made.	Contractor	PMU, CSC IEMC	- Fund: IDA Suf - IM: Construction contract conditions
Risks on piers collapse and damages to adjacent local houses during construction of two bridges across Trung Luong highway and Can Dot canal	- Ensure that the detailed design for the bridge includes hydrological and geological surveys to ensure sustainability; - Ensure that the detailed design and contractor's construction method take into account the risk on local house cracking	Detailed design consultant	PMU	- Fund: City/ or IDA Suf - IM: Construction contract conditions
	- Before dredging, reinforcement of banks will be conducted. This construction method must be proposed and submitted	Contractor	PMU, CSC	- Fund: IDA Suf

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
- Local residents near the two ends of bridge across Can Do Canal - People commuting on Trung Luong Highway - Workers	to the authorities concerned for approval by the construction contractors. - Ensure that land acquisition and house relocation at the site boundary is completed piror to commencing construction work - Construction of side slope is made in accordance with the design - Do not place heavy machineries and transportation vehicles near the canals banks. Inspection and supervision on land subsidence risks must be taken regularly in order to prepare the appropriate reinforcement plans.		IEMC	- IM: Construction contract conditions
Upgrading of Luu Van Te road (subcomponent 2.4) and Construction of a link between Tran Phong Sac road and Nguyen Minh Duong road (subcomponent 2.5)				
Social disturbance and traffic safety concerns - Local residents along the Luu Van Te road alignment - Local residents along road connecting Tran Phong Sac and Nguyen Minh Duong Roads.	- The same as those for the road under subcomponent 1.1	Contractor	PMU, CSC IEMC	- Fund: IDA - IM: Construction contract conditions
Increased dust, noise, traffic, waste and social disturbance to daily activities of Thien Khanh Pagoda (7 m distant) and Phuong Hong Kindergarten (0.5 m distant) on Luu Van Te road.	- See in the subcomponent 1.1 above. - The construction method shall include the measures to protect the foundation of the fence/gate of the school and pagodas, such as using supporting pillars or steel frame. - In case damages happen, the contractor should take full responsibility in compensating or reconstructing the broken facilities as agreed with the pagoda or the school.	Contractor	PMU, CSC IEMC	- Fund: IDA - IM: Construction contract conditions

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
Impact on the relocation of power poles on Luu Van Te road - Local residents	- Prepare plans for dismantling and notify the people, production facilities around the area of the dismantling time and electricity supply suspension. - Contractors, Project Management Unit coordinate with the relevant authorities Tan An EVN in the dismantling, proper use of specialized workers for the dismantling to avoid risks.	Contractor	PMU, CSC IEMC	- Fund: IDA Suf - IM: Construction contract conditions
Operation				
Subcomponent 2.1. Mitigation measures during the operation of Bao Dinh River embankment and extension road of Bao Dinh river embankment				
Risk of embankment collapse	- The same subcomponent 1.2	O&M unit (City Drainage Company)	City	- City Budget - IM: City Operation and Maintenance Plan
Water pollution and decreased landscape due to waste throwing into the Bao Dinh River	- Cooperating with the local government to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the canals; PMU and DONRE should be in collaboration to impose much more serious penalty to polluter - Properly arranging the waste baskets along the river bank and launching programs of increasing awareness of the community toward environmental protection;	O&M unit (City Drainage Company)	City	- City Budget - IM: City Operation and Maintenance Plan
Subcomponent 2.3, 2.4 and 2.5. Measures to mitigate impacts during operation of the Ring Road; Luu Van Te Road, and the road connecting Tran Phong Sac road and Nguyen Minh Duong Roads.				
Road safety	- Ensure that traffic safety provisions, including signs, lights, and pavement markings that were installed during construction are permanently and effectively maintained, and renewed as necessary. - Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the road in its as-completed condition.	O&M unit	City	- City Budget - IM: City Operation and Maintenance Plan

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	- Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road. - Ensure effective road inspection for any signs of damages, soil erosion and landslide for immediate repairing actions. - Cooperating with the local government to appoint the staff for traffic regulation at peak hours;			
Risk of local flooding due to the poor operation and maintenance	- Cooperating with the local authorities to disseminate information on hygiene practices to the people, and prohibiting to release wastes into the sewer pipes; - Carrying out periodical dredging and clearing works of the sewer pipes; - Sweeping and cleansing pavements must include clearing the rubbish and obstructing objects on the flow/sewer inlets/heads; - Signing contracts with the responsible agencies on collecting dredged material.	O&M unit (City Drainage Company)	City	- City Budget - IM: City Operation and Maintenance Plan
COMPONENT 3: Resettlement area				
Operation				
Road safety	- The same subcomponent 2.3-2.5	O&M unit	City	- City Budget - IM: City Operation and Maintenance Plan
The impacts from domestic wastewater and solid waste generated from the resettlement sites	- Households in the resettlement sites have to build toilets with septic tanks in accordance with regulations of the Government; the wastes from the toilets must be primarily treated in the septic tanks of each household before discharging into the public drainage system. The wastewater will be then connected to the wastewater collection and treatment system of Tan An city in the future.	URENCO	Tan An City and DONRE	- Fund: Counter part fund - IM: Regulation of operation and maintenance

Site-specific impacts Sensitive receptors	Specific mitigation measures	Responsibility	Monitored	Budget & Implementing Mechanism (IM)
	- The domestic solid waste will be collected and managed by Tan An URENCO.			

6.1.3. **Responsibilities for the implementation**

The operating unit has responsible for implementing environmental mitigation measures during operation of the project. Responsibilities for the implementation are shown in the Table 6.3 below:

Table 6.3. Responsibilities for implementation of mitigation measures in operation phase

No	Items	Subproject owner	Representative of subproject owner	Operator
1	LIAs	Tan An CPC	Tan An PMU	Tan An CPC
2	Embankment of Bao Dinh River			
3	Construction of Ring road			
4	Upgrading of Luu Van Te street			
5	Rehabilitation of Cau Tre canal			
6	Construction of connecting road between Tran Phong Sac and Nguyen Minh street			
7	Resettlement site	Tan An CPC	Tan An PMU	Tan An CPC

6.2. ROLE AND RESPONSIBILITY FOR ESMP IMPLEMENTATION

6.2.1. **Implementation Arrangement**

The tables and figures below summarize the roles and responsibilities of the key parties and their relationships regarding the implementation of the ESMP.

- Contractors will be responsible for implementing mitigation measures. These measures will be included in bidding documents and their costs are included in construction bid packages;

- CSC will be responsible for monitoring the day-to-day implementation of mitigation measures. Related 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.

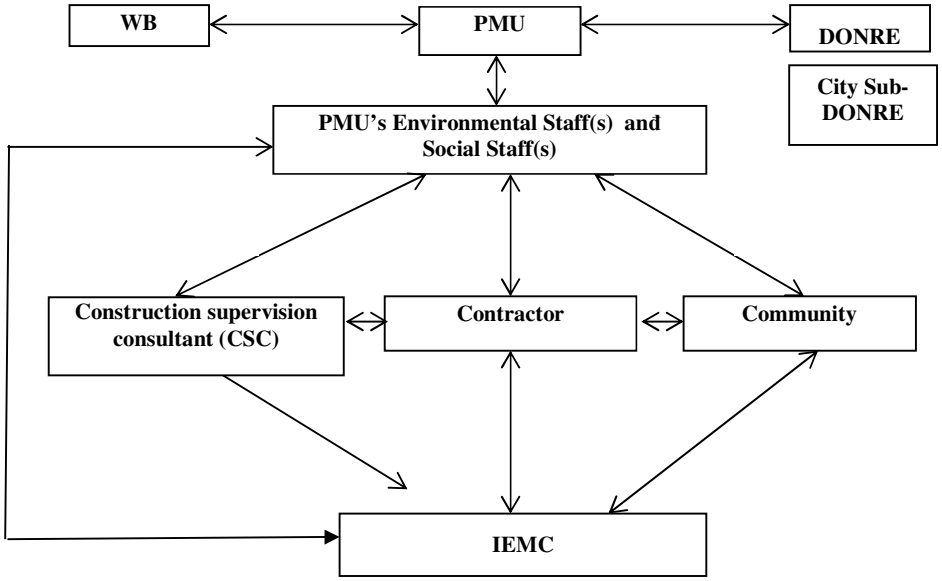


Figure 6.1. Organization diagram for ESMP Implementation

Table 6.4. Annotation on Roles and responsibilities

Community/Agencies	Responsibilities
PMU	- PMU will be responsible for monitoring the overall subproject implementation, including environmental compliance of the subproject. PMU will have the final responsibility for ESMP implementation and environmental performance of the subproject during the construction and operational phases. - Specifically the PMU will: (i) closely coordinate with local authorities in the participation of the community during subproject preparation and implementation; (ii) Ensure that the detailed design include all environment provisions as indicated in the ESMP; (iii) monitor and supervise ESMP implementation including incorporation of ESMP into the detailed technical designs and bidding and contractual documents; (iv) ensure that an environmental management system is set up and functions properly; (v) be in charge of reporting on ESMP implementation to the DONRE and the World Bank. - In order to be effective in the implementation process, PMU will assign Environmental Staff(s) (ES) to help with the environmental aspects of the subproject.
PMU Environmental and Social Staff(s) (ES)	- The ES is responsible for monitoring the implementation of the World Bank's environmental and social safeguard policies in all phases and process of the subproject. Specifically, ES will be responsible for: (i) helping PMU incorporate ESMP into the detailed technical designs and civil works bidding and contractual documents; (ii) helping PMU incorporate responsibilities for ESMP and RAP monitoring and supervision into the TORs, bidding and contractual documents for the Construction Supervision Consultant (CSC) and other safeguard consultant (IEMC) as needed; iii) providing relevant inputs to the consultant selection process; (iv) reviewing reports submitted by the CSC and safeguard consultants; (v) conducting periodic site checks; (vi) helping the PMU on solutions to handle social and resettlement issues of the subproject; and vii) preparing environmental and social performance section on the progress and review reports to be submitted to the DONRE and the World Bank.
Construction Supervision Consultant (CSC)	- The CSC will assgin Environmental and Social Staff(s) and will be responsible for routine supervising and monitoring all construction activities and for ensuring that Contractors comply with the requirements of the contracts and the ECOP. The CSC will engage sufficient number of qualified staff (e.g. Environmental Engineers) with adequate knowledge on environmental protection and construction subproject management to perform the required duties and to supervise the Contractor's performance. - The CSC will also assist the PMU in reporting and maintaining close coordination with the local community.
Contractor	- The contractor will assign Enviromental and Social Staff(s) to carry out Enviromental and Social mitigation measures proposed in ESIA/ESMP. - Based on the approved environmental specifications (ECOP) in the bidding and contractual documents, the Contractor is responsible for establishing a

	Contractor ESMP (CESMP) for each construction site area, submit the plan to PMU and CSC for review and approval before commencement of construction. In addition, it is required that the Contractor get all permissions for construction (traffic control and diversion, excavation, labor safety, etc. before civil works) following current regulations. - The Contractor is required to appoint a competent individual as the contractor's on-site *Safety and Environment Officer (SEO)* who will be responsible for monitoring the contractor's compliance with health and safety requirements, the CESMP requirements, and the environmental specifications (ECOP). - Take actions to mitigate all potential negative impacts in line with the objective described in the CESMP. - Actively communicate with local residents and take actions to prevent disturbance during construction. - Ensure that all staff and workers understand the procedure and their tasks in the environmental management program. - Report to the PMU and CSC on any difficulties and their solutions. - Report to local authority and PMU and CSC if environmental accidents occur and coordinate with agencies and keys stakeholders to resolve these issues.
Independent Envionmental Monitoring Consultants (IEMC)	- IEMC will, under the contract scope, provide support to PMU to establish and operate an environmental management system, offers suggestions for adjusting and building capacity for relevant agencies during subproject implementation and monitor the site-speific ESMP implementation in both construction and operation phases. IEMC will also be responsible to support PMU to prepare monitoring reports on site-speific ESMP implementation. - The IEMC will have extensive knowledge and experience in environmental monitoring and auditing to provide independent, objective and professional advice on the environmental performance of the subproject. - Carry out the periodical environmental quality monitoring during construction period.
Local community	- Community: According to Vietnamese practice, the community has the right and responsibility to routinely monitor environmental performance during construction to ensure that their rights and safety are adequately protected and that the mitigation measures are effectively implemented by contractors and the PMU. If unexpected problems occur, they will report to the CSC and PMU.
Province and City People's Committees (PPCs/DPCs), Provincial DONRE	- Oversee implementation of subprojects under recommendations of DONRE and PMU to ensure compliance of Government policy and regulations. DONRE is responsible for monitoring the compliance with the Government environmental requirements.

Evaluation of PMU's existing

Regarding project implementation experience: Tan An city has not implemented any projects financed by WB/ADB or other IFCs, especially urban upgrade projects like SUUP. At the same time, organizational structures and duties have no unit/agency specialized in

management/implementation of projects with capital sources from donors. Therefore, experience and implementation capability is very limited in comparison with the donor's requirements.

Capability of staff: An assessment of safeguards implementation capacity of existing PMU staff indicates that PMU staffs have limited knowledge on WB safeguard requirements as well as limited knowledge of environment and social issues. Such lack of capacity represents a risk to project implementation of safeguards requirements contained in the ESMP and, as required by the WB policy, is to be addressed through capacity building. Therefore it is proposed to provide capacity building through technical assistance that will support the PMU during the implementation of the safeguards requirements. The technical assistance will provide the necessary technical support the PMU in its work with contractors as well as other entities involved in the implementation of the ESMP.

Equipment: The PMU will also need to be provided, equipped and updated with new computer software to be used in financial and accounting managementas well as data analyses and consolidation, suiting the accounting standards of both the Vietnamese system and the Donor's system, so that a most suitable and optimal accounting system could be set up to handle finance-accounting management tasks.

6.2.2. **Environmental Compliance Framework**

(i) Environmental Duties of the Contractor

The contractor firstly shall adhere to minimize the impact that may be result of the project construction activities and secondly, apply the mitigation measures under ESMP to prevent harm and nuisances on local communities and environment caused by the impacts in construction and operation phases.

Prior to construction, the contractor will be required to prepare and submit a contractor's site-specific Environmental Management Plan (Contractor's SEMP) to the CSC and PMU based on the ESMP of the project and requirement in the Specification of Bidding Document. The contractor's site-specific SEMP shall demonstrate compliance with Vietnamese environmental technical regulations/ standards, the mitigation measures set down in the specifications and the World Bank Safeguard Policies. The content of the site-specific SEMP shall be in line with the subproject specific ESMP and shall be enhanced by the Contractor's works practices, implementation procedures and program. The site-specific SEMP shall be certified by the CSC with subsequent submission to the PMU for approval. No construction activity should be implemented before approval of the contractor's site-specific SEMP.

Remedial actions that cannot be effectively carried out during construction should be carried out on completion of the works (and before issuance of the acceptance of completion of works)

The duties of the Contractor include but not limiting to:

- Compliance with relevant legislative requirements governing the environment, public health and safety;
- Work within the scope of contractual requirements and other tender conditions;
- Organize representatives of the construction team to participate in the joint site inspections undertaken by the Environmental Staff of the CSC;
- Carry out any corrective actions instructed by the Environmental Staff of the PMU and CSC;
- In case of non-compliances/discrepancies, carry out investigation and submit proposals on mitigation measures, and implement remedial measures to reduce environmental impact;

- Stop construction activities, which generate adverse impacts upon receiving instructions from the Environmental Staffof PMU and CSC. Propose and carry out corrective actions and implement alternative construction method, if required, in order to minimize the environmental impacts; Non-compliance by the Contractor will be cause for suspension of works and other penalties until the non-compliance has been resolved to the satisfaction of the ES of PMU and CSC.

(ii) Contractor's Safety, Social and Environmental Officer (SEO)

The contractor shall be required to appoint competent staff(s)as the Contractor's on-site safety, social and environment officer (SEO). The SEO must be appropriately trained in environmental management and must possess the skills necessary to transfer environmental management knowledge to all personnel involved in the contract. The SEO will be responsible for monitoring the contractor‘s compliance with the ESMP requirements and the environmental specifications. The duties of the SEO shall include but not be limited to the following:

- Carry out environmental site inspections to assess and audit the contractors' site practice, equipment and work methodologies with respect to pollution control and adequacy of environmental mitigation measures implemented;
- Monitor compliance with environmental protection measures, pollution prevention and control measures and contractual requirements;
- Monitor the implementation of environmental mitigation measures;
- Prepare audit reports for the site environmental conditions;
- Investigate complaints and recommend any required corrective measures;
- Advise the contractor on environment improvement, awareness and proactive pollution prevention measures;
- Recommend suitable mitigation measures to the contractor in the case of non-compliance. Carry out additional monitoring of noncompliance instructed by the ES of PMU and CSC
- Inform the contractor and ES (of PMU and CSC) of environmental issues, submit contractor's ESMP Implementation Plan to the ES of PMU and CSC, and relevant authorities, if required;
- Keep detailed records of all site activities that may relate to the environment.

(iii) Independent Environmental Monitoring Consultant (IEMC)

In order to minimize the environmental impacts during construction phase of the Project, the Project owner shall ensure that environmental quality monitoring requirements are established for the project. An IEMC appointed by PMU shall carry out the monitoring.

- IEMC will be responsible for carrying out environmental sampling, monitoring and marking report during subproject implementation. Environmental monitoring will be report periodically to PMU and World Bank (respectively every 03 months for PMU and every 6 months for WB in construction phase).
- IEMC will also supply specialized assistance to PMU and ES in environmental matters.

(iv)Environmental Supervision during Construction (CSC)

During construction phase, a qualified CSC reporting to the PMU shall carry out the environmental supervision. The CSC will assign environmental and social staff(s), will be responsible for inspecting, and supervising all construction activities to ensure that mitigation measures adopted in the ESMP are properly implemented, and that the negative environmental impacts of the subproject are minimized. The CSC shall engage sufficient number of Environmental Supervision Engineers with adequate knowledge on environmental protection and

construction project management to perform the required duties and to supervise the Contractor's performance. Specifically ES of CSC will:

- Review and assess on behalf of the PMU whether the construction design meets the requirements of the mitigation and management measures of the ESMP,
- Supervise site environmental management system of contractors including their performance, experience and handling of site environmental issues, and provide corrective instructions;
- Review the ESMP implementation by the contractors, verify and confirm environmental supervision procedures, parameters, monitoring locations, equipment and results;
- Report ESMP implementation status to PMU and prepare the environmental supervision statement during the construction phase; and

(v) Compliance with Legal and Contractual Requirements

The constructions activities shall comply not only with contractual environmental protection and pollution control requirements but also with environmental protection and pollution control laws of the Socialist Republic of Viet Nam.

All the works method statements submitted by the Contractor to the CSC and PMU for approval to see whether sufficient environmental protection and pollution control measures have been included.

The CSC and PMU shall also review the progress and program of the works to check that relevant environmental laws have not been violated, and that any potential for violating the laws can be prevented.

The Contractor shall copy relevant documents to the SEO and the ES of CSC and PMU. The document shall at least include the updated work progress report, the updated work measure, and the application letters for different license/permits under the environmental protection laws, and all the valid license/permit. The SEO and the ES shall also have access, upon request, to the Site Log-Book.

After reviewing the documents, the SEO or the ES shall advise the PMU and the contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the SEO or the ES concludes that the status on license/permit application and any environmental protection and pollution control preparation works may not comply with the work measure or may result in potential violation of environmental protection and pollution control requirements, they shall advise the Contractor and the PMU accordingly.

(vi) Environmental Claims and Penalty System

In the compliance framework, if non-compliance with environmental regulations are discovered by CSC/ES/IEMC/PMU during the site supervision, 2% values of interim payment of the contractor of this month will be held back. The Contractor will be given a grace period (determined by CSC/PMU) to repair the violation. If the Contractor performs the repairs within the grace period (confirmed by CSC/PMU), no penalty is incurred and keeping money will be pay. However, if the Contractor fails to successfully make the necessary repairs within the grace period, the Contractor will pay the cost for a third party to repair the damages (deduction from keeping money).

In case of IEMC/CSC/PMU not detected of non-compliance with environmental regulations of the contractor, they will be responsibility payment to repair the violation.

(vii) Reporting Arrangements

ESMP monitoring and reporting requirements are summarized in table 6.5.

Table 6.5. Regular Reporting Requirements

No.	Report Prepared by	Submitted to	Frequency of Reporting
1	Contractor to the Employer	PMU	Once before construction commences and monthly thereafter
2	Construction Supervision consultant (CSC)	PMU	Weekly and monthly
4	Community Monitoring	PMU	When the community has any complaint about the subproject safeguards implementation
5	IEMC	PMU	Every three-month
6	PMU	DONRE	Every six-month
7	PMU	WB	Every six-month

6.2.3. **Estimated Costs for Each Work of Environmental Protection Measures**

Table 6.6. Regular Reporting Requirements

No.	Works	Costs (estimated)	
		VNĐ	USD
1	Renting areas for dumping mud/dredged material	100,000,000	4,480
2	Construction site fencing	100,000,000	4,480
3	Prevention and control of fire and explosion (fire extinguishers, fire hoses, emergency lights)	100,000,000	4,480
4	Watering and sprinkling	150,000,000	6,720
5	Trash bins on site	50,000,000	2,240
6	Portable toilet	60,000,000	2,688
7	Standby pump	50,000,000	2,240
8	Planting trees at the roads and canals	200,000,000	8,961
9	Demining	600,000,000	26,882
10	**Total**	**1,410,000,000**	**63,172**

6.3. ENVIRONMENT MONITORING PROGRAM

6.3.1. **Monitoring Location, Parameters and Frequency**

The environmental monitoring and supervision for pre-construction, construction and operation phases for the entire project is presented in the below table. Sampling locations are described in the Annex and the number of samples is made in accordance with progress of each work.

Table 6.7. Location, parameters and frequency of monitoring

No	Monitored items	Preparation and construction phase
I	**Monitoring of air quality, noise, vibration**	
	1. Monitoring parameters	Noise, TSP, CO, NO_2, SO_2, L_{eq}, vibration
	2. Monitoring frequency	Preparation phase: 01 time before construction Construction phase: measurements taken every six-months
	3. Applied Regulation	QCVN 05:2013/BTNMT, QCVN 06:2009/BTNMT; QCVN 26:2010/BTNMT; QCVN 27:2010/BTNMT
	4. Monitoring positions	120 samples (Sampling locations are presented in Appendix)

No	Monitored items	Preparation and construction phase
II	**Surface Water Quality Monitoring**	
	1.Monitoring parameters	pH, DO, COD, BOD, $N\text{-}NH_4^+$, $N\text{-}NO_2^-$, $N\text{-}NO_3^-$, $P\text{-}PO_4^{3-}$, oil & grease, Coliform, Cl^-, Fe, TSS
	2. Monitoring frequency	Preparation phase: 01 time before construction Construction phase: measurements taken every six-months
	3. Applied Regulation	QCVN 08-MT:2015/BTNMT
	4. Monitoring positions	69 samples (Sampling locations are presented in Appendix)
III	**Wastewater quality monitoring**	
	1.Monitoring parameters	pH, BOD_5, COD, H_2S, $N\text{-}NH_4$, $N\text{-}NO_3$, $P\text{-}PO_4$, oil & grease, Coliforms, TSS
	2.Monitoring frequency	Preparation phase: 01 time before construction Construction phase: Do not monitor
	3. Applied Regulation	QCVN 14:2008/BTNMT
	4. Position monitoring	31 samples (Sampling locations are presented in Appendix)
IV	**Soil/sediments**	
	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; QCVN 43:2012/BTNMT
	4. Monitoring positions	90 samples (Sampling locations are presented in Appendix)
V	**Monitoring of erosion**	**During embankment construction**
VI	Monitoring of solid waste	Monitoring volume of waste generated and dredged materials
VI	Monitoring of hazardous waste	Monitoring volume at storage location

6.3.2. **Estimated Costs for Environmental Monitoring Program**

According to the unit price of environmental monitoring in the locality, the estimated cost for environmental quality monitoring of the project is stated in the table below:

Table 6.8. Estimated cost for samples and analysis

No.	Works	Unit	Quantity	Price	Sub-Total (1 USD = 22,320 VNĐ)	
				VND	*VND*	*USD*
I	**Pre-construction phase**					
1	*Air, noise*	sample	***20***			
	Component 1	sample	8	2,000,000	16,000,000	716.8

No.	Works	Unit	Quantity	Price	Sub-Total (1 USD = 22,320 VNĐ)	
				VND	*VND*	*USD*
	Component 2	sample	10	2,000,000	20,000,000	896.1
	Component 3	sample	2	2,000,000	4,000,000	179.2
2	*Surface water*	sample	***11***			
	Component 1	sample	4	2,500,000	10,000,000	448.0
	Component 2	sample	7	2,500,000	17,500,000	784.1
	Component 3	sample	0	2,500,000	-	-
3	*Wastewater*	sample	***5***			
	Component 1	sample	0	2,000,000	-	
	Component 2	sample	4	2,000,000	8,000,000	358.4
	Component 3	sample	1	2,000,000	2,000,000	89.6
4	*Soil, sediment*	sample	***14***			
	Component 1	sample	4	1,000,000	4,000,000	179.2
	Component 2	sample	9	1,000,000	9,000,000	403.2
	Component 3	sample	1	1,000,000	1,000,000	44.8
6	*Preparing report*	Report	***1***	10,000,000	10,000,000	448.0
II	**Construction**					
1	*Air, noise*	sample	***100***			
	Component 1	sample	32	2,000,000	64,000,000	2,867.4
	Component 2	sample	56	2,000,000	112,000,000	5,017.9
	Component 3	sample	12	2,000,000	24,000,000	1,075.3
2	*Surface water*	sample	***58***			
	Component 1	sample	16	2,500,000	40,000,000	1,792.1
	Component 2	sample	42	2,500,000	105,000,000	4,704.3
	Component 3	sample	0	2,500,000	-	-
3	*Wastewater*	sample	***26***			
	Componen1	sample	0	2,000,000	8,000,000	358.4
	Componen2	sample	20	2,000,000	40,000,000	2,150.5
	Componen3	sample	6	2,000,000	12,000,000	537.6
4	*Soil, sediment*	sample	***76***			
	Component1	sample	16	1,000,000	16,000,000	716.8
	Component 2	sample	54	1,000,000	54,000,000	2,419.4
	Component 3	sample	6	1,000,000	6,000,000	268.8
5	*Preparing report*	Report	***16***	5,000,000	80,000,000	3,584.2
TOTAL					**662,500,000**	**30,040**

6.4. TRAINING AND CAPACITY BUILDING

The table 6.9 below provides a typical training program on safety policies. Training programs will be developed and implemented by a team of Technical Assistance for the implementation of safety policies for PMU. PMU/IEMC with the help of the Technical Assistance Team will provide training for contractors, CSC and other groups.

- *Trainee groups:* the PMU staff, the ESU department staff, the field engineers (FE), construction supervision consultants (CSC), the building contractors, representatives of

relevant stakeholders and local communities in the project area. The contractors take the responsibility for training workers and drivers.

- *Training Schedule:* Training will be given at least one month before performing the first construction contract. Subsequent training sessions can be modified to suit the construction schedule for project components.
- *Frequency of training:* The basic training programs given in the table below will be provided every 6 months annually, and the contents will be updated and tailored to items to be implemented. Training programs for PMU staff are expected to continue in the first years of the Project. Three-day training for CSC and contractors is also planned to take place twice a year for at least 2 years.

Table 6.9. Advanced training program on environmental monitoring management capacity

I. Subjects	**PROJECT MANAGEMENT UNIT**
Training course	Environmental monitoring and reporting
Participants	Staff in charge of environmental issues;environmental managers
Training frequency	Immediately after the project becomes valid, but at least one month prior to the first bid package. The next training will be planned on demand.
Duration	Four days
Content	Project-related general environmental management including the request from World Bank, Department of Natural Resources and Environment, in collaboration with competent authorities and concerned stakeholders; Environmental monitoring for the Subproject includes: - Requirements of environmental monitoring; - Monitoring and implementation of mitigation measures; - Community involvement in environmental assessment; - Guiding and monitoring contractors, CSC and community representatives in the implementation of environmental monitoring; - Forms used in environmental monitoring processes; - Reaction and risk control; - Manner of receiving and submit forms; - Other issues to be determined.
Responsibility	With the help of the Technical Assistance Team, the Independent environmental Monitoring Consultant (IEMC) and PMUimplement safety policies.
II. Subjects	**CSC, CONTRACTORS, REPRESENTATIVESOF LOCAL AUTHORITIES (WARDS/COMMUNES), COMMUNITIES**
Training course	Implementation of mitigation measures
Participants	CSC;construction engineers, site construction field manager. staff in charge of environment issues, the contractor; representatives of local authorities; representatives of urban groups
Training frequency	Shortly after awarding contracts to the contractors with updates on demand
Duration	Three-day training for CSC and contractors, and two-day training for others
Content	- Overview of the overall environmental monitoring; - Requirements of environmental monitoring; - The roles and responsibility of the contractors and CSC; - The content and method of environmental monitoring;

	- Reaction and risk control; - Introducing monitoring forms and instructing on filling out forms and reporting incidents; - Other issues to be determined - Preparing and submitting reports
Responsibility	With the help of technical assistance teams, PMU, the independent environmental monitoring consultant (IEMC) implement safety policies.
III. Subjects	**COMMUNITIES / WORKERS**
Training course	Safety and environmental sanitation
Participants	Representatives of workers (team leaders) working directly for the project components
Training frequency	As appropriate
Duration	One day of presentation and one day of on-site presentation
Content	- Brief presentation on safety issues and overview on the environment; - Key issues requiring the attention of the community and construction workers to mitigating safety risks (land roads, waterways, equipment, machinery, etc.) as well as reducing pollution (dust, exhaust gases, oil spills, waste management, etc.); - Management of safety and environmental sanitation on site and at workers' camps; - Mitigation measures applied on site and camps; - Safety measures for electricity, mechanical engineering, transportation, air pollution; - Methods of dealing with emergency situations; - The rights and responsibilities of environmental monitoring - Environmental monitoring, environmental monitoring form - Measures to mitigate the social impact and monitoring implementationOther issues to be determined
Responsibility	Contractors, PMU with the assistance of IEMC

Estimated cost for training program on environmental monitoring management capacity is presented in the following table:

Table 6.10. Estimated costs for training and capacity building

Training content	Trainee	Unit	Quatity	Price	Total	
				VND	*VND*	*USD*
I. Environmental monitoring and reporting						
PMU	Staff in charge of environmental issues; environmental managers	course	5	10,000,000	50,000,000	2,240
II. Implementation of mitigation measures						
Component 1:	CSC; construction engineers, site manager	course	5	10,000,000	50,000,000	2,240
Component 2:	CSC; construction engineers, site manager	course	17	10,000,000	170,000,000	7,616
Component 3:	CSC; construction engineers, site manager	course	3	10,000,000	30,000,000	1,344
III. Safety and environmental sanitation						
Component 1:	Representatives of workers	course	3	5,000,000	15,000,000	672

Training content	Trainee	Unit	Quatity	Price	Total	
				VND	*VND*	*USD*
Component 2:	Representatives of workers	course	7	5,000,000	35,000,000	1,568
Component 3:	Representatives of workers	course	2	5,000,000	10,000,000	448
				Total:	**360,000,000**	**16,129**

6.5. TOTAL ESTIMATED COSTS

The following table provides a cost estimate for the implementation of environmental management plan (ESMP). The cost of ESMP[1] implementation will include (i) the costs of implementing mitigation measures by the contractor, (ii) expenses supervised by CSC, (iii) cost of the independent environmental monitoring consultant (IEMC), (iv) the costs of environmental quality monitoring, (v) the cost of safety management for the PMU, including both technical assistance in implementing safety policies and training programs. The costs of implementing mitigation measures during construction will be a part of the value of construction contracts, while the costs for a site-specific environmental monitoring plan (SEMP) by the construction supervision consultant (CSC) will be provided in construction supervision contracts. The costs of the PMU operations relating to EMP are allocated from the project management budget of the PMU, including safety training programs, and basic allowances to participants in the monitoring programs. After the project has been completed, the costs of environmental monitoring of constructed works will be taken from the operation and maintenance budget of the city.

It should be noted that the involvement of the community in the process of ESMP implementation is completely voluntary participation for the benefit of own community and households. Therefore, communities partaking in monitoring the ESMP will not get paid. However, in order to encourage communityparticipation, it is necessary to allocate costs of materials and instruments for monitoring activities and some remuneration for a small number of members chosen by the public to participate in monitoring activities. As stipulated in the Prime Minister's Decision No. 80/2005 / QD-TTg dated 18 April 2005 promulgating the regulations on investment supervision by the community and Joint Circular guiding the implementation of Decision 80/2005 / QD-TTg, "expenses for the community' s investment monitoring in the commune/ward in are reflected in the cost estimates of the Communal Fatherland Front Committee's budget and allocated from the communal/municipal budget; support funds for the dissemination, organization of training courses, guidance, preliminary and final report on investment monitoring by the community at provincial 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.

[1]Excluding costs for RP implementation and independent monitoring the performance of RP/EMP

Table 6.11. Estimated costs of EMP implementation (USD million)

Content	Items of Tan An sub-project (million USD)	Funded by
(a) Mitigation during construction	As a part of the contract	WB
(b) Monitoring safety policies during construction	As a part of the cost for Construction Supervision Consulting (CSC)	WB
(c) PMU's units in charge of environmentalsafety policies	As part of the costs for the PMU	Counterpart funds
(d) Environmental quality monitoring	0.03	WB
(e) Independent environmental monitoring consulting (IEMC)	0.227	WB
(f) Capacity building programs on safeguard policies	0.016	WB

Estimated cost for IEMC is presented in the following table:

Table 6.12. Estimated costs of IEMC

(Exchange rate: 1 USD = 22,320 VND)

No	Content	Unit	Amount	Unit price (VND)	Sub-total (VND)	Sub-total (USD)
1	Experts'salary	person-month	80	40,000,000	3,200,000,000	143,369
2	Accommodation, expenses for business trip	person-day	600	500,000	300,000,000	13,441
3	Travel expenses	Trip/ person	160	6,000,000	960,000,000	43,011
4	Training course	Class	20	10,000,000	200,000,000	8,961
5	Office and communication	month	80	5,000,000	400,000,000	17,921
6	Environmental quality monitoring	Table 6.8			662,500,000	30,040
	Total				**5,722,500,000**	**264,696**

6.6. GRIEVANCE REDRESS MECHANISM (GRM)

Complaints relating to any subproject's problems will be solved through negotiations to achieve the consensus. A complaint will go through three stages before it can be transferred to the court. The enforcement unit will pay all administrative and legal fees relating to the acceptance of complaints. This cost is included in the project budget.

Complaint procedures and resolution will be performed as follows:

The first level *People's Committee of ward/commune*. An affected household is to take his/her complaint to any member of the People's Committee of the ward / commune, through the village head or directly to People's Committee of the commune / ward, in written or oral form. The said member(s) of the People's Committee or the village head will inform the People's Committee of the ward/commune on the complaint. The People's Committee of Ward/Commune will work directly in person with the said affected household and will decide on the settlement of the complaint 5 days after receiving such complaint (this may take 15 days in mountainous or remote areas). The Secretariat of the People's Committee of the relevant commune/ward is responsible for documenting and recording all the complaints that it is handling.

After the Ward/Commune People's Committee issues its decision, the relevant household can make an appeal within 30 days. In case a second decision has been issued but the said

household is still not satisfied with such decision, such household can appeal to the municipal (city) People's Committee (CPC).

The second level *The CPC*. Upon receiving a complaint from a household, the CPC will have 15 days (or 30 days in case of remote and mountainous areas) after receiving the complaint to resolve the case. The CPC is responsible for filing and storing documents on all complaints that it handles.

When the CPC has issued a decision, the household can make an appeal within 30 days. In case a second decision has been issued and the household is still not satisfied with such a decision, they can appeal to the Provincial People's Committee (PPC).

The third level *The PPC*. Upon receiving a complaint from the household, the PPC will have 30 days (or 45 days in case of remote and mountainous areas) after receiving the complaint to resolve the case. The PPC is responsible for filing and storing documents for all complaints to be submitted.

After the PPC has issued a decision, the household can appeal within 45 days. In case a second decision has been issued and the household is still not satisfied with such decision, they can appeal to the court within 45 days. The PPC will then have to pay the compensation into an account.

The Forth level *Provincial Court*. In case a complainant brings his/her case to a provincial court and the court rules in favor of the complainant, the provincial authorities will have to increase the compensation up to such a rate as may be ruled by the court. In case the court's ruling is in favor of the PPC, the complainant will be refunded the amount of money that has been paid to the court.

The decision ruling the settlement of complaints will have to be sent to complainants and concerned parties, and shall be publicly posted at the headquarters of the People's Committee of the relevant level. The complainant will receive such ruling three days after the result of complaint resolution at the ward / commune / town level has been decided upon and 7 days at the district or provincial level.

Personnel: The environment and resettlement staff chosen by the PMU will design and maintain a database of the project-related complaints from affected households, including information such as: the nature of the complaint, the source and date of receipt of the complaint, the name and address of the complainant, action plan, and current status.

For oral complaints, the receiving / mediator board will record these requests in a complaint form at the first meeting with the affected person.

Contractor and Construction Supervision Consultant:

During construction, the GRM will also be managed by the contractors under supervision of the CSC. The contractors will inform the affected communities and communes about the GRM availability to handle complaints and concerns about the project. This will be done via the community consultation and information disclosure process under which the contractors will communicate with the affected communities and interested authorities on a regular basis. Meetings will be held at least quarterly, monthly information brochures will be published, announcements will be placed in local media, and notices of upcoming planned activities will be posted, etc.

All complaints and corresponding actions undertaken by the contractors will be recorded in project safeguard monitoring reports. Complaints and claims for damages could be lodged as follows:

- Verbally: direct to the CSC and/ or the contractors' safeguard staff or representatives at the site offices.
- In writing: by hand-delivering or posting a written complaint to specified addresses.

- By telephone, fax, e-mails: to the CSC, the contractors' safeguard staff or representatives.

Upon receipt of a complaint, the CSC, the contractors' safeguard staff or representatives will register the complaint in a complaint file and maintain a log of events pertaining to it thereafter, until it is resolved. Immediately after receipt, four copies of the complaint will be prepared. The original will be kept in the file, one copy will be used by the contractor's safeguard staff, one copy will be forwarded to the CSC, and the fourth copy to the PPMU within 24 hours since receipt of the complaint.

Information to be recorded in the complaint log will consist of:

- The date and time of the complaint.
- The name, address and contact details of the complainant.
- A short description of the complaint.
- Actions taken to address the complaint, including contact persons and findings at each step in the complaint redress process.
- The dates and times when the complainant is contacted during the redress process.
- The final resolution of the complaint.
- The date, time and manner in which the complainant was informed thereof.
- The complainant's signature when resolution has been obtained.

Minor complaints will be dealt with within one week. Within two weeks (and weekly thereafter), a written reply will be delivered to the complainant (by hand, post, fax, e-mails) indicating the procedures taken and progress to date.

The main objective will be to resolve an issue as quickly as possible by the simplest means, involving as few people as possible, and at the lowest possible level. Only when an issue cannot be resolved at the simplest level and/ or within 15 days, will other authorities be involved. Such a situation may arise, for example, when damages are claimed, the to-be-paid amount cannot be resolved, or damage causes are determined.

Independent monitoring consultants (environmental, social and resettlement), who have enough the specialized capacity, would be selected by PMU through bidding. Independent monitoring consultants are responsible for checking the procedures and decisions on settling complaints. Independent monitoring consultants may propose additional measures to address any outstanding complaints. While checking the procedure for complaint resolution and reviewing the decision on complaint resolution, the independent monitoring agencies are required to closely coordinate with the Vietnam Fatherland Front, whose members are responsible for monitoring law enforcement of local complaints.

World Bank Grievance Redress Mechanism: Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanism or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaints to the WB's independent Inspection Panel which determines whether harms occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the WB's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit www.worldbank.org/grs. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

6.7. SOCIAL MONITORING PROGRAM

6.7.1. **Social Action Plan**

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 DOLISA management in the project areas, the occupational training centers may organize the training courses on IT, textile and sewing skills, mechanics, electrical techniques, mushroom planting, animal husbandry, other agricultural technical supporting services…; organize training courses, expanding programs for the high schools pupils and even for the members of the rural households. It is necessary to train both men and women in the project areas. Moreover, it requires setting up the training courses on occupational re-training for men and women just in case they loose the jobs after completing the project. It also includes the training for the households having people with disability.

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.

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.

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 dredged material 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 6.13. Social impact mitigation measures

Negative impacts	Mitigation measures	Implementing agencies
Impacts on transport and incremental social evils	Public awareness improvement on safe transport and prevention of social evils for the local citizens	PMU should coordinate closely with the various level authorities in carry out the communication strategy. Based on the available communication system in the communes, to take necessary action on dissemination of information on Project's activities to the households.
Effects to the infrastructures	Contractors' compliance with the rules on infrastructure recovery	PMU should request the contractors to follow the regulations on loads and environment and sanitation measures in transporting materials as well as regulations stipulated for cases of creating effects on roads.

6.7.2. **Social Monitoring Plan**

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 6.14:

Table 6.14. Proposed social monitoring program for Tan An city subproject

Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
Land acquisition and resettlement works	- The affected households are able to receive compensation according to WB policy and their income will be recovered; - HHs which have no land will receive one	- Setting up Resettlement policy framework in accordance with the GoV regulations harmonized with WB's policy - Establishing Resettlement	- Resettlement policy frameworks and plans are established. - Number of the affected HHs, quantity/level of grassroots affection - Number of affected HHs on illegal land assets is clearly identified. - Number	- PMU - Center of Municipal Land Fund Management and Development - Local authorities - Consultants

Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
	slot in resettlement area.	Action Plan for land acquisition, compensation, support and implementation of resettlement works - Implementing land acquisition and resettlement works	of HHs participating in livelihood recovery, occupational training, occupational change.	
Monitoring livelihood and income recovery: primary financial supports as per policies; expediting Occupational training programs	HHs participating in livelihood/income are well assisted.	- Assistances are made following Resettlement Plan Framework - Loan programs - Occupational training	- Number of HHs are assisted as per Resettlement policy framework - Number of HHs has access to loan programs - Number of people/HHs have the occupational trainings	
Supervising the implementation of impacts mitigation program on community health and safety	Minimizing risks during construction period, social evils and traffic disturbance.	- Developing action plans on risks and emergency response during construction - Developing social evils mitigation plans during construction - Developing action plans on reducing traffic disturbance during construction	- Number of site shelters/camps fully equipped by first aid services - Number of training courses on occupational safety regulations delivered to the workers - Number of provided labor protective equipment/ total number of laborers - Number of entry restriction sign boards installed in the fences, barriers, warning boards. - Number of local workers (living <5km far from the sites) - Number of site visits by the grassroots health staff - Activities on traffic lane control and divergence	As the above

Contents	Targets/Outcomes	Proposed activities	Indicators	Implementing units
Supervising mitigation of conflicts of benefits and local economic effects	Minimizing local conflicts of benefits due to free labor migration	Recruiting local labor force instead of recruiting workers from other areas.	- Number of recruited local laborers / total workers of the construction structures	As the above
Supervising mitigation of gender impacts	Assuring maximum participation of the women during the Project implementation as well as the economic role of the women in the HHs	- Mobilizing women to join in community activities of the Project - Supporting to maintain the previous occupation or change to the new ones. - Training on new occupations for women if needed	- Ratios of women participating in Project's community activities - Number of women is assisted to maintain the previous occupations. - Number of women attends in the new occupational training courses.	As the above
Supervising information release and accountability	Project information is fully, timely disclosed and easy to be accessed by the local citizens.	- Information disclose is made on wards' radio broadcast, residence information boards, cultural houses, ward People's Committee office areas… - Distribution of leaflets if necessary	- Number of communication sessions on the radio - Number of information stations/wards/work items - Number of distributed leaflets	as the above

CHAPTER 7. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

7.1. PUBLIC CONSULTATION PROCESS

Public consultation is specifically required by the World Bank's environmental and social safeguard policies. The public consultation in preparation of the subproject ESIA also must comply with the requirements in the Government's Decree No. 18/2015/ND-CP dated 14 February 2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan, and Circular No. 27/2015/TT-BTNMT dated 29 May 2015 of the Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment and environmental protection plan. The objectives of public consultation for this ESIA are:

- To share all information on the items and tentative activities of the Subproject with local community and stakeholders;

- To gather opinions/comments and concerns from local authorities and the community on local particularities and environmentally sensitive matters in the subproject area, especially matters that the environmental assessment impact group has not been aware of. On such basis, the concerns of the local community may be proposed for proper settlement during the selection of subproject design options;

- To collect opinions/comments from the local community on the Subproject's tasks in the preparation of the ESIA as well as comments on the draft ESIA to adequately and precisely assess environmental impacts and propose the most effective and feasible mitigation measures for negative environmental impacts.

The public consultations were conducted during the subproject preparation to ensure that affected households and key stakeholders to participate and express their opinions about environmental and social issues. Key topics covered in the public consultations are:

i. Disseminate key information related to policies of the World Bank, the Government and the subprojects.

ii. Provide locals with subproject on resettlement, environment, gender as well as ethnic minority issues through village loudspeaker system and subproject information brochures/leaflets;

iii. Collect opinions and feedback of the local communities regarding the subproject implementation;

iv. In the community consultation, needs to introduce and public all information of subproject and WB's safeguard policies, collect opinions and comments of the residents on design and resettlement options as well as their aspirations and expectations are recorded;

v. Respond questions to local communities concerning the subproject and safeguard policies;

vi. CPCs and PMU provided answers to questions to local residents related to subproject and local policies;

vii. Local communities, representatives of the CPC's and other stakeholders' contributions

This is a Category A subproject, thus according to WB's requirements, consultation is implemented into two times during environmental and social impact assessment process.

The public consultation was carried out with local communities and authorities at project area including 8 wards/communes (1, 2, 3, 4, 6, 7, Khanh Hau and Loi Binh Nhon). The first consultation was conducted from 29 June to 5 July, 2016 and second consultation was conducted from 2 to 7 December 2016. The first public consultation discussed about the subproject scope, investment and ESIA preparation process. The second public consultation followed up on the first consultation

inputs and substance of the draft ESIA. The public consultation meetings were held at the Ward/Commune PC.

About 7 days prior to public consultation, the consultant informed the local authority about the proposed investment and cooperated with the local authority to invite the affected people and representatives of the affected HHs to attend public consultation meeting.. Attending the meeting were representatives of the People's Committee, the Veterans Association, the Vietnam Fatherland Front, Women's Union, Youth Union, administration officials, head of residential areas and affected households by the subproject. The number of participants in the first and second consultations was 225 and 221 respectively. The results of the two public consultation meetings are described in the following Table 7.1 and 7.2.

7.2. PUBLIC CONSULTATION RESULTS

7.2.1. **The first consultation**

The first consultation was conducted during 29 June to 5 July, 2016 in the project wards. The results of the first consultation are summarized in the following table:

Table 7.1. Results of the first environmental consultation

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
1	Ward 1 7h30 on 05/7 (Tuesday); 24 Participants	• Chariman/ Vice Chairman of Ward • Representatives from Father Land Front, Women Union, Land Registration Office, Farmer Union, Youth Union: 4 people • Head of resedential clusters in the subproject area: 1 people • Affected households: 15 • Investment owner: 3 • Consultant: 3 people	• 100% AHs support the project implementation and want the project to implement soon. • Propose to expand alley 148 Thu Khoa Huan 4m to ensure traffic safety for people in the area. • Currently, drainage systems in the area is poor, project must take consideration into the issue to avoid flooding, inundation and ensure sanitation surrounding environment. • The vast majority of households in Ao Quan area are poor and disadvantaged; the project should support an amount or land for people.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • This issue will be considered during the ESIA process • This issue will be considered and addressed in the RP. • This issue will be addressed in the ESIA report and included in the bidding documents of construction packages.
2	Ward 2 14h on 29/6 (Wednesday); 30 Participants	• Chariman/ Vice Chairman of Ward • Representatives from Father Land Front, Women Union, Land Registration Office, Farmer Union, Youth Union: 2 people • Head of resedential clusters in the subproject area: 1 people • Affected households: 26 people • Investment owner: 1 people • Consultant: 3 people	• AHs support the project implementation and want the project to implement soon. • Upgrade alley between Hoang Hoa Tham road and NH1. • Alley 80 locate in low area where is under water once water level rise. People face many difficulties, especially the canals in residential area is seriously polluted because of illegal encroachment as a result from people's low awareness. The project should rehabilitate, dredge the canal to protect and improve environmental conditions in the area.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • This issue will be considered during the ESIA process • This issue will be considered and addressed in the RP. • This issue will be addressed in the ESIA report and included in the bidding documents of construction packages.
3	Ward 3 8h on 30/6 (Friday)/ 26 Participants	• Chariman/ Vice Chairman of Ward • Representatives from Father Land Front, Women Union, Land Registration Office,	• AHs support the project implementation and want the project to implement soon. • Bordering residential areas 159 is a 1ha pond polluted as a result from people's poor awareness. the project should	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • This issue will be considered during the ESIA process

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
		Farmer Union, Youth Union: 3 people • Head of resedential clusters in the subproject area: 1 people • Affected households: 19 people • Investment owner: 1 people • Consultant: 3 people	rehabilitate and dredge the pond to improve environmental sanitation, • Have clear and mainstreaming procedures for compensation and resettlement for people when project implementation. • For alley 123 Nguyen Thong Nho road (above 1m wide), people has encountered into difficulties and accessibility to public services such as fire fighting, medical. The project should expand the alley. • Water supply in Alley 89 Huynh Van Nhut road is too poor to deal with inundation in rainy season, the project should take consideration for measures for addressing. • Upgrade and construct additional canals in residential areas.	• This issue will be considered and addressed in the RP. • This issue will be addressed in the ESIA report and included in the bidding documents of construction packages.
4	Ward 4 14h on 05/7 (Tuesday)/ 30 Participants	• Chariman/ Vice Chairman of Ward • Representatives from Father Land Front, Women Union, Land Registration Office, Farmer Union, Youth Union: 2 people • Head of resedential clusters in the subproject area: 1 people • Affected households: 26 people • Investment owner: 1 people • Consultant: 3 people	• All households strongly support the project. • Reservoir of Bao Dinh river used for water storage is currently not used and become a polluted swamp where creates infectious diseases; the project should propose a settlement methods. • Cau Tre canal running through 3 area are causing serious impacts on people's health and mentality of the. • Companies in the polluted area. What are commitments of the companies when implementing the project? • Inform people of specific time when implementing the project • Ensure the construction with advance agreement with people. • In alley 92 Nguyen Cuu Van road, the drainage capacity is poor with frequent flooding; causing difficulties for people, the project should rehabilitate and upgrade the alley.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • This issue will be considered during the ESIA process • This issue will be considered and addressed in the RP. • This issue will be addressed in the ESIA report and included in the bidding documents of construction packages.

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
			• People want the alley 106 Nguyen Cuu Van road to be expanded to 5m. The branch alley connecting Tran Phong Sac road needs expanding to 2m. • Upgrade, rehabilitate Cau Tre Canal, build an extension to QL1 through Tran Quang Nghi road which is the start point of the canal to ease the environmental press of people over the past time. • Roads from the Public Security of Tan An city with a length of 200m to the residential area of ward 4 is seriously run-down, affecting the travel of people in rainy season. The project should take the issue into consideration for addressing.	
5	Ward 6 8h on 01/7 (Friday)/ 22 participants	• Chariman/ Vice Chairman of Ward • Representatives from Father Land Front, Women Union, Land Registration Office, Farmer Union, Youth Union: 4 people • Head of resedential clusters in the subproject area: 1 people • Affected households: 20 people • Investment owner: 1 people • Consultant: 3 people	• Households are glad to the project implementation • Rot canal is seriously polluted because of people's poor awareness and factories in the wards as Trong Nhan company. The project must rehabilitate and require the factories and companies to jointly coordinate to mitigation of pollution from water discharged into canals. • Place box culverts or round culverts at the time of rehabilitation of Rot canal and construction of road on each side with a width from 3-4m to collect domestic waste and encroachment of households. • The project must be adequately and fully implemented	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • This issue will be considered during the ESIA process • This issue will be considered and addressed in the RP. • This issue will be addressed in the ESIA report and included in the bidding documents of construction packages.
6	Ward 7 14h on 01/7 (Friday)/ 22 participants	• Chariman/ Vice Chairman of Ward • Representatives from Father Land Front, Women Union, Land Registration Office, Farmer Union, Youth Union: 3 people	• Households support the project implementation • Reduce vibration, noise and dust on households near the construction site. • Disseminate information on project implementation time and provide appropriate policies. • Implement centralized method, avoid prolonged construction.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • This issue will be considered during the ESIA process • This issue will be considered and addressed in the RP.

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
		• Head of resedential clusters in the subproject area: 1 people • Affected households: 18 people • Investment owner: 1 people • Consultant: 3 people	• Inform people of compensation plan. • Affected households must be supported and provided will full information.	• This issue will be addressed in the ESIA report and included in the bidding documents of construction packages.
7	Khanh Hau ward 8h on 04/7 (Monday)/ 28 participants	• Chariman/ Vice Chairman of Ward • Representatives from Father Land Front, Women Union, Land Registration Office, Farmer Union, Youth Union: 4 people • Head of resedential clusters in the subproject area: 2 people • Affected households: 18 people • Investment owner: 1 people • Consultant: 3 people	• Need supporting policies and publish information for AHs • Require fast and synchronous implementation to reinstate the site after completed. • In Quyet Thang 2 street, roads are poor; thus, material transportation must be informed to people and ensure the load of roads. • Construction and materials transportation must apply measures to minimize dust • Compensation must be clear and timely to ensure the people's life.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • This issue will be considered during the ESIA process • This issue will be considered and addressed in the RP. • This issue will be addressed in the ESIA report and included in the bidding documents of construction packages.
8	Loi Binh Nhon ward 14h on 04/7 (Monday)/ 43 Participants	• Chariman/ Vice Chairman of Ward • Representatives from Father Land Front, Women Union, Land Registration Office, Farmer Union, Youth Union: 4 people • Head of resedential clusters in the subproject area: 4 people • Affected households: 33 people • Investment owner: 1 people • Consultant: 3 people	• Have bypasses for people travel during road construction. • Investigate the road elevation for avoiding flooding. • When upgrading and rehabilitating Phan Van Tuan road to NH1 crossing the agricultural land area, a ditch for drainage must be built for business households. • If case of displacement, resettlement with full infrastructure must be arranged to ensure people's life. • During the construction period, the application of mitigation measures for ensuring dust quality. • Install and erect signs of warning in the course of construction.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • This issue will be considered during the ESIA process • This issue will be considered and addressed in the RP. • This issue will be addressed in the ESIA report and included in the bidding documents of construction packages.

Minutes of the first consultation meetings are provided in Appendix.

7.2.2. **The results from the second consultation**

The second consultation was conducted during 2 to 7 December 2016. The second consultation was conducted with local authorities and representatives of households, enterprises in the wards/communes.

Table 7.2. Results of the second environmental consultation in the project area

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
1	Ward 1 14h – 16h30', on 2/12/2016	• Tan An CPC: 1 person • Chairman/Vice Chairman of the Ward. • Mass organizations of the ward (Fatherland Front Committee, Women union or Farmer's union, cadastral officers, Youth Union): 4 people • Head/deputy head of villages in project areas: 1 person • Affected households: 23 people. • Consultant: 3 people	• Agree with contents about environmental impacts and mitigation measures for investment items in ward 1. • During construction time, the Project Owner must ensure not to obstruct the transportation and travel of local people; prior inform the Ward PC and community of the construction plan to avoid social conflicts. • Project Owner must ensure appropriate compensation and resettlement for affected or relocated households under the project. • Project Owner must comply with commitments and environmental potection as decleared in the report.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • Issues will be acknoledged and considered in ESIA, RP.
2	Ward 2 8h – 10h30' on 3/12/2016	• Tan An CPC: 1 person • Chairman/Vice Chairman of the Ward. • Mass organizations of the ward (Fatherland Front Committee, Women union or Farmer's union, cadastral officers, Youth Union): 2 people • Head/deputy head of villages in project areas: 1 person	• Agree with contents about environmental impacts and mitigation measures for investment items in ward 2. • For dredging of Mui Tau canal, a proper measure for dredged material treatment should be taken; do not gather dredged material near people's house in order to avoid offensive odors and risks of epidemics • Ensure not to obstruct the transportation and travel of local people; prior inform the Ward PC and	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • Apply option of dredging dried Mui Tau canal to reduce the of leachate; the dredged dredged material will be immediately transported within the day through successive construction method. • Issues will be acknoledged and considered in ESIA. RP.

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
		• Affected households: 24 people. • Consultant: 3 people	community of the construction plan to avoid social conflicts.	
3	Ward 3 14h – 16h30', on 3/12/2016	• Tan An CPC: 1 person • Chairman/Vice Chairman of the Ward. • Mass organizations of the ward (Fatherland Front Committee, Women union or Farmer's union, cadastral officers, Youth Union): 3 people • Head/deputy head of villages in project areas: 1 person • Affected households: 23 people. • Consultant: 3 people	• Agree with contents about environmental impacts and mitigation measures for investment items in ward 3. • For Lia 1 in ward 3, Project Owner must prepare a project on connection of domestic wastewater, stormwater sewers to avoid flooding during construction. • As for construction of resettlement area, full technocal infrastructure (transport road, lighting system, water drainage and waste collection system) and social infrastructures (schools, cultural houses, ect) must be provided to ensure living conditions of relocated households in new place.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • Design the stormwater sewer in LIA 1 (general sewer); • The project proposes construction of resettlement Area with full of technical and social infrastructure • Issues will be acknoledged and considered in ESIA, RP.
4	Ward 4 8h30' – 10h30', on 5/12/2016	• Tan An CPC: 1 person • Chairman/Vice Chairman of the Ward. • Mass organizations of the ward (Fatherland Front Committee, Women union or Farmer's union, cadastral officers, Youth Union): 2 people • Head/deputy head of villages in project areas: 1 person • Affected households: 22 people. • Consultant: 3 people	• Agree with contents about environmental impacts and mitigation measures for investment items in ward 4. • Take mitigation measures for wastewater runoff from cement, sand and stone, etc to ensure not to affect the agricultural production of people. • As for dredging of Cau Tre canal, the dredged sludge must be transported in order for mitigating malodor and leachate dropping in the progress of transportation. • In the segment between Cau Tre canal and Luu Van Te road, there is a pagoda and kintergadern is affected; As these are sensitively regious structures, detailed mitigation measures should be proposed to call for agreement.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • Apply option of dredging dried Cau Tre canal to reduce the of leachate; the dredged sludge will be immediately transported within the day through successive construction method. • Pagodas and sensitive structures of the project will be considered and a mitigation measure will be integrated clearly in ESIA; Additionally, in the project preparation, consultation with representatives of pagodas is carried out and received strong support. • Issues will be acknoledged and considered in ESIA, RP.

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
			• For traffic safety, apart from risks stated in the report, occurrences from material carriers should be noted because the trucks are large while the existing roads are narrow. • In terms of noise: Do not implement noise-induced work items in break time at noon and at night. • Comply with the compensation and resettlement plan as stated in the consulation with the community	
5	Ward 6 14h – 16h30', on 5/12/2016	• Tan An CPC: 1 person • Chairman/Vice Chairman of the Ward. • Mass organizations of the ward (Fatherland Front Committee, Women union or Farmer's union, cadastral officers, Youth Union): 3 people • Head/deputy head of villages in project areas: 1 person • Affected households: 24 people. • Consultant: 3 people	• Agree with contents about environmental impacts and mitigation measures for investment items in ward 6. • During construction time, the Project Owner must ensure not to disturb the transportation and travel of local people. • Take mitigation measures to limit damages on property of citizens in the process of construction in residential areas. • Project Owner must ensure appropriate compensation and resettlement for affected or relocated households under the project. • Project Owner must comply with commitments and environmental protection as stated in the report.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • This issue will be considered during the ESIA process • This issue will be considered and addressed in the RP. • This issue will be addressed in the ESIA report and included in the bidding documents of construction packages.
6	Ward 7 9h – 10h30', on 6/12/2016	• Tan An CPC: 1 person • Chairman/Vice Chairman of the Ward. • Mass organizations of the ward (Fatherland Front Committee, Women union or Farmer's union, cadastral	• Agree with contents about environmental impacts and mitigation measures for investment items in ward 7. • Fences must be erected to avoid regrettable cases at the site as the results from of people's and children's curiosity at the site. • Comply with commitments in environmental potection as stated in the report.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • This issue will be considered during the ESIA process • This issue will be considered and addressed in the RP.

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
		officers, Youth Union): 4 people • Head/deputy head of villages in project areas: 1 person • Affected households: 21 people. • Consultant: 3 people	• Carry out appropriate, equal compensation and resettlement as regulated for residential areas. • Comply with environmental mitigation and dredged material collection measures to avoid dredged material dropping while stransportation. • Comply with project schedule; the construction unit must clean the site after completion.	• This issue will be addressed in the ESIA report and included in the bidding documents of construction packages.
7	Khanh Hau ward 14h – 16h30', on 6/12/2016	• Tan An CPC: 1 person • Chairman/Vice Chairman of the Ward. • Mass organizations of the ward (Fatherland Front Committee, Women union or Farmer's union, cadastral officers, Youth Union): 4 people • Head/deputy head of villages in project areas: 2 people • Affected households: 25 people. • Consultant: 3 people	• Agree with contents about environmental impacts and mitigation measures for investment items in Khanh Hau ward. • Fences must be erected to avoid regrettable cases at the site as the results from of people's and children's curiosity at the site. • Comply with commitments in environmental potection as stated in the report. • Carry out appropriate, equal compensation and resettlement as regulated for residential areas in the area. • Comply with environmental mitigation and dredged material collection measures to avoid dredged material dropping while stransportation. • Comply with project schedule; the construction unit must clean the site after completion.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • This issue will be considered during the ESIA process • This issue will be considered and addressed in the RP. • This issue will be addressed in the ESIA report and included in the bidding documents of construction packages.
8	Loi Binh Nhon ward 14h – 16h30', on 7/12/2016	• Tan An CPC: 1 person • Chairman/Vice Chairman of the Ward. • Mass organizations of the ward (Fatherland Front Committee, Women union or Farmer's union, cadastral	• Agree with contents about environmental impacts and mitigation measures for investment items in Loi Binh Nhon ward. • Fences must be erected to avoid regrettable cases at the site as the results from of people's and children's curiosity at the site. • Comply with commitments in environmental potection as stated in the report.	• To thank and acknowledge the comments on ESIA report by the community and local authorities. • This issue will be considered during the ESIA process • This issue will be considered and addressed in the RP.

No	Location, Time	Participants	Community's opinions	PMU and Consultant's responses
		officers, Youth Union): 3 people • Head/deputy head of villages in project areas: 2 people • Affected households: 25 people. • Consultant: 3 people	• Carry out appropriate, equal compensation and resettlement as regulated for residential areas in the area. • Comply with environmental mitigation and dredged material collection measures to avoid dredged material dropping while stransportation. • Comply with project schedule; the construction unit must clean the site after completion.	• This issue will be addressed in the ESIA report and included in the bidding documents of construction packages.

7.2.3. **Consultation with ward PC/Fatherland Front Committee**

The Project Owner also held a consultation with 8 Wards/Communes People Committees and Fatherland Front Committees on the environmental impacts and mitigation measures of the project on 10 Oct 2016.

Table 7.3. Results of the consultation with ward PC/Fatherland Front Committee

No.	Ward/Communes	Opinions from Ward People's Committee	Opinions from Fatherland Front
1	1	1. The Project's negative impacts on socio-economic environment: - People's Committee of ward 1 agrees with opinions of the consulting agency about assessment scale; levels of the Project's impacts on soil, air, ecosystem environment and socio-economic condition in project area; project preparation, construction and operation. 2. The Project's environmental impact mitigation measures: - People's Committee of ward 1 agrees with mitigation, prevention and environmental events resilience measures stated in the report in environmental assessments. - People's committee of ward 1 adds some opinions as follows: + During construction time, the Project Owner must ensure not to obstruct the transportation and travel of local people; prior inform the Ward PC and community of the construction plan to avoid social conflicts.	The Fatherland Front agrees with opinions of People's Committee.

No.	Ward/Communes	Opinions from Ward People's Committee	Opinions from Fatherland Front
		+ Have appropriate construction methods to minimize the damages on assets of people and other public works (water, power supply, etc) in the ward. 3. Recommendations to the Project Owner: - Project Owner must ensure appropriate compensation and resettlement for affected or relocated households under the project. - Project Owner must comply with commitments and environmental potection as decleared in the report. - Take measures on environmental pollution (soil, air, water and ecosystem environment), on solid waste and wastewater collection and treatment and on fire protection as stated in the report. - The project must ensure the project schedule by successive methods; avoid prolonged construction which causes impacts on living activities, health and life of people at the site.	
2	2	1. The Project's negative impacts on socio-economic environment: - People's Committee of ward 2 agrees with opinions of the consulting agency about assessment scale; levels of the Project's impacts on soil, air, ecosystem environment and socio-economic condition in project area; project preparation, construction and operation. - People's committee of ward 2 adds some opinions as follows: + For upgrading Mui Tau canal in the component 2, dredging and construction of infrastructure (greenery, lighting and drainage system) along canals must be provided. 2. The Project's environmental impact mitigation measures: - People's Committee of ward 2 agrees with mitigation, prevention and environmental events resilience measures stated in the report in environmental assessments - People's committee of ward 2 adds some opinions as follows: + During construction time, the Project Owner must ensure not to obstruct the transportation and travel of local people; prior inform the	1. The Project's negative impacts on socio-economic environment: Agrees with contents described in attached documents. 2. The Project's environmental impact mitigation measures: Agrees with contents described in attached documents 3. Recommendations to the Project Owner: Besides contents in the document, occurrences arising during construction or operation phase, the PMU and project owner must promptly take remedy measures.

No.	Ward/Communes	Opinions from Ward People's Committee	Opinions from Fatherland Front
		Ward PC and community of the construction plan to avoid social conflicts. + Have appropriate construction methods to minimize the damages on assets of people and other public works (water, power supply, etc) in the ward. 3. Recommendations to the Project Owner: - Project Owner must ensure appropriate compensation and resettlement for affected or relocated households under the project. - Project Owner must comply with commitments and environmental potection as decleared in the report. - Take measures on environmental pollution (soil, air, water and ecosystem environment), on solid waste and wastewater collection and treatment and on fire protection as stated in the report. - The project must ensure the project schedule by successive methods; avoid prolonged construction o ensure living activities, health and life of people at the site.	
3	3	1. The Project's negative impacts on socio-economic environment: People's Committee of ward 3 agrees with contents in the EIA report for negative impacts on socio-economic and natural environment of the project in the ward 2. The Project's environmental impact mitigation measures: People's Committee of ward 3 agrees with opinions of the consulting agency about assessment scale; levels of the Project's impacts on soil, air, ecosystem environment and socio-economic condition in project area; project preparation, construction and operation. 3. Recommendations to the Project Owner: For Lia 1 in ward 3, Project Owner must prepare a project on connection of domestic wastewater, stormwater sewers to avoid impacts on people during project implementation and operation, in which:	1. The Project's negative impacts on socio-economic environment: Fatherland Front of ward 3 agrees with the "Vietnam Scaling-up Urban Upgrading Project – Tan An city subproject", with negative impacts of the projects on soil, air, water source and ecological environment in project phases. 2. The Project's environmental impact mitigation measures: During the construction, the construction unit must ensure not to disturb the travel of local people; prior inform the community of the construction schedule to avoid possible social conflicts. 3. Recommendations to the Project Owner: - Project Owner must ensure appropriate resettlement and compensation for affected or relocated households. The Project Owner must ensure sanitation and environmental protection (soil, air, water and ecosystem environment) and take

No.	Ward/Communes	Opinions from Ward People's Committee	Opinions from Fatherland Front
		Because of dense population, large area and low floor of houses, request the Project Owner to build a connection to drainage sewers in Nguyen Dinh Chieu for ensure good drainage.	measures on solid waste and wastewater collection and treatment and measures for fire protection. - The project implementation must ensure the project schedule by successive method; avoid prolonged construction to ensure living activities, people's health and life. - The Project Owner must comply with the laws.
4	4	1. The Project's negative impacts on socio-economic environment: People's Committee of ward 4 agrees with contents stated in the executive summary of "EIA report" of the project People's Committee of ward 4 adds some opinions as follows: - Take mitigation measures for wastewater runoff from cement, sand and stone, etc causing impacts on agricultural production of people. - As for dredging of Cau Tre canal. the dredged material must be transported in order for mitigating malodor and leachate dropping in the progress of transportation. - For construction of Luu Van Te road, appropriate construction method should be applied for ensuring safety for neighboring buildings and labor safety because the site locates in dense residential area. - For traffic safety, apart from risks stated in the report, occurrences from material carriers should be noted because the trucks are large while the existing roads are narrow. 2. The Project's environmental impact mitigation measures: People's Committee of ward 4 agrees with negative impacts stated the report. People's Committee of ward 4 adds some opinions as follows: - Use specialized trucks to transport dredged material dredged from Cau Tre canal. - Noise: Do Not implement noise-induced work items at break time at noon and at night. 3. Recommendations to the Project Owner:	1.The Project's negative impacts on socio-economic environment: Fatherland Front Committee of ward 4 agrees with contents stated in the executive summary of "EIA report" of the project. Fatherland Front Committee of ward 4 adds some opinions as follows: - During project implementation, environmental issues should be taken consideration to limit complaints which are claimed by crowded people. - Create favorable conditions for activities of religious facilities, especially on festivals which gather crowded people. - When dredging Cau Tre canal, it should pay attention to religious facilities such as Thien Khanh pagoda. Avoid dropping of leachate in and behind the campus of the facilities, ensuring impacts on religious activities. - Minimize environmental-related issues as smoke, noise, dust, effluent from the work that affects people's activities. 2. 2. The Project's environmental impact mitigation measures: Fatherland Front Committeeof ward 6 agrees with negative impact mitigation measures stated in the report. 3. Recommendations to the Project Owner: - In case of arising claims or complaints, especially for Religious facilities, the Project Owner should contact with the Fatherland Front Committee in ward 4 to work with relevant agencies for radical settlement of environmental related complaints.

No.	Ward/Communes	Opinions from Ward People's Committee	Opinions from Fatherland Front
		- Comply with commitments in environmental potection measures and mitigation measures as decleared in the report - Comply with the compensation and resettlement plan as stated in the consulation with the community. - During construction, a temporary path should be opened at the site; Project Owner and construction unit must prior inform local people before implementing construction. - The construction should be soon implemented and completed to create favorable conditions for people's living stabilization	- When receiving the document of Fatherland front committee on celebration of festivals, request the Project Owner to create favorable conditions for festival period. - Comply with commitments on environmental protection, environmental impact mitigation measures presented in the project. - The construction should be soon implemented and completed to create favorable conditions for people's living stabilization
5	6	1. The Project's negative impacts on socio-economic environment: People's Committee of ward 6 agrees with opinions of the consulting agency about assessment scale; levels of the Project's impacts on soil, air, ecosystem environment and socio-economic condition in project area; project preparation, construction and operation - As for dredging of Cau Tre canal, the dredged material must be transported in order for mitigating malodor and leachate dropping in the progress of transportation - For rehabilitation of drainage system, avoid impacts on neighboring areas after rehabilitation. 2. The Project's environmental impact mitigation measures: People's Committee of ward 6 agrees with mitigation, prevention and environmental events resilience measures stated in the report in environmental assessments During construction time, the Project Owner must ensure not to disturb the transportation and travel of local people. Take mitigation measures to limit damages on property of citizens in the process of construction in residential areas. 3. Recommendations to the Project Owner: - Project Owner must ensure appropriate compensation and resettlement for affected or relocated households under the project. - Project Owner must comply with commitments and environmental potection.	1. The Project's negative impacts on socio-economic environment: Fatherland Front Committee of ward 6 agrees with assessment on environmental negative impacts. During site clearance and construction period, avoid impacts on households because this is dense residential area. 2. The Project's environmental impact mitigation measures: Fatherland Front Committee of ward 6 agrees with environmental impact mitigation of the project. - The project construction must ensure not to obstruct the travel of people 3. Recommendations to the Project Owner: During the site clearance, appropriate compensation and resettlement should be paid much attention to facilitate the displacement of households. The project owner must comply with commitments and environmental protection and ensure the schedule to avoid prolonged construction.

No.	Ward/Communes	Opinions from Ward People's Committee	Opinions from Fatherland Front
		- Take measures on environmental pollution (soil, air, water and ecosystem environment), on solid waste and wastewater collection and treatment and on fire protection as stated in the report. - The project must ensure the project schedule by successive methods; avoid prolonged construction to ensure living activities, health and life of people at the site.	
6	7	1. The Project's negative impacts on socio-economic environment: People's Committee of ward 7 agrees with contents on the project's negative impacts on socio-economic and natural environment as well as people's health. 2. The Project's environmental impact mitigation measures: People's Committee of ward 7 agrees with contents about mitigation measures for negative impacts on natural, socio-economic environment and people's health. However, it should take environmental impact mitigation on malodor, damages on assets and travel of local people During construction, fences must be erected to avoid regrettable cases at the site as the results from of people's and children's curiosity at the site. In case of claims or complaints of people, the Project Owner should contact with the People's Board at the site or PC of ward 7 for settlement. 3. Recommendations to the Project Owner: - Comply with commitments in environmental potection as stated in the report. - Carry out appropriate, equal compensation and resettlement as regulated for residential areas in the area. - Comply with environmental mitigation and dredged material collection measures to avoid dredged material dropping while stransportation. - Comply with project schedule; the construction unit must clean the site after completion.	1. The Project's negative impacts on socio-economic environment: Fatherland Front Committee of ward 7 agrees with the assessment scale; levels of the Project's impacts on soil, air, ecosystem environment and socio-economic condition in project area over project phases. 2. The Project's environmental impact mitigation measures: During the construction, the project Owner must ensure not to disturb the travel of local people; prior inform the community of the construction schedule to avoid possible social conflicts. 3. Recommendations to the Project Owner: - Project Owner must have appropriate compensation and resettlement policies for affected households. - The Project Owner must ensure sanitation and environmental protection (soil, air, and water and ecosystem environment) and take measures on solid waste and wastewater collection and treatment before discharging into the environment, and measures for fire protection. - The project must ensure the project schedule by successive methods; avoid prolonged construction to ensure living activities, health and life of people at the site. - Project Owner must comply with laws and regulations.

No.	Ward/Communes	Opinions from Ward People's Committee	Opinions from Fatherland Front
7	Khanh Hau	1. The Project's negative impacts on socio-economic environment: People's Committee of Khanh Hau ward agrees with contents on the project's negative impacts on socio-economic and natural environment as well as people's health. 2. The Project's environmental impact mitigation measures: People's Committee of Khanh Hau ward agrees with contents about mitigation measures for negative impacts on natural, socio-economic environment and people's health. However, environmental impact mitigation measures should be taken to reduce malodor, damages on assets and travel of local people During construction, fences must be erected to avoid regrettable cases at the site as the results from of people's and children's curiosity at the site. In case of claims or complaints of people, the Project Owner should contact with the People's Board at the site or PC of Khanh Hau ward for settlement 3. Recommendations to the Project Owner: - Comply with commitments in environmental potection as stated in the report. - Carry out appropriate, equal compensation and resettlement as regulated for residential areas in the area. - Comply with environmental mitigation and dredged material collection measures to avoid dredged material dropping while stransportation. - Comply with project schedule; the construction unit must clean the site after completion.	1. The Project's negative impacts on socio-economic environment: Fatherland Front Committee of Khanh Hau ward agrees the assessment scale; levels of the Project's impacts on soil, air, ecosystem environment and socio-economic condition in project area over project phases. 2. The Project's environmental impact mitigation measures: During the construction, the project Owner must ensure not to disturb the travel of local people; prior inform the community of the construction schedule to avoid possible social conflicts. 3. Recommendations to the Project Owner: - Project Owner must have appropriate compensation and resettlement policies for affected households. - Project Owner must apply measures on environmental pollution (soil, air, water and ecosystem environment), on solid waste and wastewater collection and treatment and on fire protection. - The project must ensure the project schedule by successive methods; avoid prolonged construction which causes impacts on living activities, health and life of people at the site. - Project Owner must comply with laws and regulations.
8	Loi Binh Nhon	1. The Project's negative impacts on socio-economic environment: People's Committee of Loi Binh Nhon agrees with contents on the project's negative impacts on socio-economic and natural environment as well as people's health. 2. The Project's environmental impact mitigation measures:	1. The Project's negative impacts on socio-economic environment: Fatherland Front Committee of Loi Binh Nhon ward agrees the assessment scale; levels of the Project's impacts on soil, air, ecosystem environment and socio-economic condition in project area over project phases.

No.	Ward/Communes	Opinions from Ward People's Committee	Opinions from Fatherland Front
		People's Committee of Loi Binh Nhon ward agrees with contents about mitigation measures for negative impacts on natural, socio-economic environment and people's health. However, environmental impact mitigation measures should be taken to reduce malodor, damages on assets and travel of local people During construction, fences must be erected to avoid regrettable cases at the site as the results from of people's and children's curiosity at the site. In case of claims or complaints of people, the Project Owner should contact with the People's Board at the site or PC of Loi Binh Nhon ward for settlement 3. Recommendations to the Project Owner: - Comply with commitments in environmental potection as stated in the report. - Carry out appropriate, equal compensation and resettlement as regulated for residential areas in the area. - Comply with environmental mitigation and dredged material collection measures to avoid dredged material dropping while stransportation. - Comply with project schedule; the construction unit must clean the site after completion.	2. The Project's environmental impact mitigation measures: During the construction, the project Owner must ensure not to disturb the travel of local people; prior inform the community of the construction schedule to avoid possible social conflicts. 3. Recommendations to the Project Owner: - Project Owner must have appropriate compensation and resettlement policies for affected households. - The Project Owner must take measures on environmental pollution (soil, air, water and ecosystem environment), on solid waste and wastewater collection and treatment and on fire protection as stated in the report - The project must ensure the project schedule by successive methods; avoid prolonged construction which causes impacts on living activities, health and life of people at the site. - Project Owner must comply with laws and regulations.

The detail documents are reported in the Appendix

7.3. INFORMATION DISCLOSURE

Draft Environmental Impacts Assessment reports and executive summary in Vietnamese were locally disclosed at the ward on 5th January, 2017. Local people could get the subproject information and contribute their additional opinions/comments on environmental issues to the ward offices or subproject owner.. The draft Environmental Impacts Assessment reports and executive summary were also disclosed in the World Bank's Operations Portal on 10th January, 2017.

After disseminating the report on the above-mentioned locations, the Project Owner will collect all comments (if any) for review and adjustment of the report if necessary. The final copy shall be returned and replaced for the disseminated ones.

CONCLUSIONS, RECOMMENDATIONS AND COMMITTMENTS

CONCLUSIONS

1. "***Scaling-up Urban Upgrading Project (SUUP) – Tan An city subproject"*** is implemented to upgrade and rehabilitate existing infrastructures, urban environmental sanitation, especially for the low income areas to promote the urban development and growth. The overall impact of the project is positive which meets the demand of local residents about drainage and sanitation system. This is effective tool for managing, monitoring and protecting environment;.

2. The project brings positive impacts in both social and environmental aspects for Tan An City in general and Tan An province in particular. Therefore, the project meets desires of the local people about a clean environment and contributes to create a beautiful urban landscape, attracting tourists, investors for the city;

3. Environmental problems arised in the site clearance process:

- Change the purposes of land use for 3 components: Losing residential land, farming land, existing works and buildings, religious works (temples, market, etc) of people and local organizations.
- Directly affected to residents who use land at the project area for production/ trading/ doing business and practicing tradition culture and religious activities.

4. Problems arised in the site clearance and construction period:

- Exhaust gas, dust, noise caused by transportation vehicles and construction machines; the construction and installation of stormwater drainage, sewerage, construction of roads, bridges, etc;
- Domestic wastewater and wastewater discharged by construction workers at site;
- Solid waste discharged by construction workers at site.
- Sludge from dredging of canals.

These impacts are only taken place during the construction period and completely dealt with by mitigation measures presented in the Chapter 5.

5. Environmental impacts during the operation of the project:

- Wastewater and storm water collection system are broken and blocked due to soil, rock or waste.
- Sludge deposited in manholes in LIAs and in sewer lines of component 2, 3.
- Potential environmental problems: Subsidence, breakdown on surface of works, especially for canals embankment, bridges, roads (component 2) both in construction and operation period.
- Potential risk of traffic accidents because the roads are widen and high density of traffic participants.

7. Environmental and social management plan (ESMP)shall be strictly implemented by the Project Owner, consultant, contractor, project operation and management unit with the cooperation and guidance of regional environmental management agency. The objectives of the plan consist of close management and minimizing the negative changes of environment;

8. Strict compliance with environmental regulations and mitigation measures stated in this report, the project shall bring positive efficiencies of socio-economic and environmental aspects.

RECOMMENDATIONS

1. Environmental management agency in the region shall support the Project Owner in training to enhance the capacity of staff, training workers for operating and managing the project; organizing community educational sessions to raise their awareness of environmental protection.

2. The Project Owner should issue and plan to prepare sanctions enclosed with the Project to submit Long An Provincial People's Committee for approval.

3. Department of Natural Resources and Environment of Long An province appraise EIA so that the project is soon put into consideration. In addition, this shall be considered as the basis for management and protection of environment when the project is put into operation

4. It kindly requests the PMU to transfer the work to the local authorities for management after items of the project are put into use.

5. In order to change the landscape of Tan An City, it requires another project of constructing a hygienic waste treatment site, a domestic wastewater treatment plant for the City. It is kindly requested that component agencies should early have appropriate measure.

COMMITMENTS

During the environmental impacts arising during the project implementation, provisions and conditions in Environmental Protection Laws, Decrees, Circulars, Ordinance on environmental protection, Safeguards Policies of the World Bank:

1. The Project Owner and management unit will commit to comply with mitigation measures, environmental management program, environmental monitoring program as stated in chapter 4 and 5; implement the commitment with the community as mentioned in Chapter 6 of the EIA; Conform to environmental protection regulation related to the project's phases.

2. The Project Owner and management shall commit for implementing environmental mitigation measures during the operation phase in accordance wtih the approved EIA, commitment to compliance with Vietnam Standards, Regulations on environmental and environmental commitment.

3. The Project Owner, the management Unit shall commit for compensation and addressing of environmental pollution arising because of the implementaion and operation of the project.

APPENDICES

APPENDIX 1: SUUP TAN AN DREDGED MATERIALS MANAGEMENT PLAN

1. Location of Dredging. Volume and Characteristics of Dredged Materials

Dredging area: Cau Tre and Rot canals. The volume of dredged material estimated about 20,140 m^3.

Several other areas such as embankment of Bao Dinh river; Construction of Ring road; Upgrading of Luu Van Te street; Rehabilitation of Cau Tre canal (at the section from Bao Dinh river to National Highway No.1); Construction of connecting road between Tran Phong Sac anh Nguyen Minh Duong street; 4 Lias and Resettlement site generate about 84,000 m^3 of excavating soil.

2. Final Disposal Site

Based on analysis result of sediment/soil samples in Chapter 2, the quality of sediment/soil samples is within allowable limits accrodnig to QCVN 03-MT:2015/BTNMT – National technical regulation on allowable limits of heavy metal in soils (forestry land) and QCVN 43:2012/BTNMT – National technical regulation onsediment quality

The disposal site is away 15 km from dredging areas to Long An solid waste treatment and recycle Plant (landfill site).

Although a separate management plan is prepared for the excavated materials of the entire project, disposals of the excavated materials will also follow the above principles. During construction phase additional tests for deeper layer will also be carried out by the contractors.

3. Contractor's Dredging Management Plan

To supplement the work done during the feasibility study, detailed design scope will include additional analysis of chemical composition, and update the DMDP with more details information on amount and quality of dredged material, transportation, and disposal that are appropriate and cost-effective.

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 (as if) 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) If the content of the heavy metals in the dredged materials exceeds the national standards, the contractor need to follow Circular No. 36/2015TT-BTNMT of MONRE dated 30 June 2015 providing detailed regulations on management of hazardous wastes to dispose the dredged materials in the designated landfill with hazardous waste treatment facility.

10) For soil and sediment: The number of samples taken will follow the following guidelines

Table 1. The number of Sediment samples

Volume of dredged (m3)	*No of Sediment Samples*
Up to 25,000	3
25,000 to 100,000	4-6
100,000 to 500,000	6-10
500,000 to 2,000,000	10-20
For each 1,000,000 above 2,000,000	Additional 10

At least one water, soil and sediment sample must be taken for each contract package

- Consultation with affected community about the draft CDMP
- Excavated soils are separated from dredged materials from source. Excavated soils will be reused on-site and off-site as much as possible and transported to the nearest disposal site appraised under ESIA, or identified and approved during detail engineering design or construction phase;
- The mitigation measures are adequate to address the potential social and environmental impacts associated with various steps and activities, areas of influence and receptors of dredging, temporary storage, transportation and final disposal of the dredged materials.
- Field survey are carried out by the Contractor during the preparation of the CDMP in order to identify if there are additional sensitive receptors not identified previously under CCSEP and proposed additional site-specific mitigation measures accordingly.
- Contractor's environmental monitoring plan are included
- Commitments to carry out corrective actions when excessive pollution is determined, or when there are complaints about environmental pollution, social impacts from any stake holders

4. Potential Impacts and Mitigation Measures for Dredging and Embankment lining

Impacts and Description	Mitigation Measures
AT DREDGING and TEMPORARY LOADING AREAS	
Odour and air pollution, nuisance Decomposition of organic matters under anaerobic conditions generates strong odour-generated gases such as SO_2, H_2S, VOC etc. When the muds are disturbed and excavated, these gases are released much faster into the air. Exposure to odour pollution affect the health of workers, local residents and cause public nuisance	- Inform the community at least one week before dredging is started - Minimise the duration of temporary loading of dredged materials on-site - temporary loading materials must be transported to the disposal site within 48 hours - Load the materials on-site tidily - Do not load the materials temporarily outside the construction corridor determined for each canal section - Avoid loading the dredged material in populated residential areas or near public buildings such as

Impacts and Description	Mitigation Measures
	kindergarten. Load the dredged material as far from the houses and buildings as far as possible - Cover the temporary dredged material loads when loading near sensitive receptors or longer than 48 hours unavoidable
Dust and nuisance Temporary loading of dredged material at the construction site cause nuisance to the public Dry and wet mud may be dropped along the dredging area and on transportation route causing nuisance to the public and traffic safety risks	- Avoid temporary loading of dredged materials on-site - Dredged materials must be transported to the final disposal sites earliest possible and no later than 48 hours from dredging. - Use truck with water-tight tank to transport wet/damp dredged materials; - All trucks must be covered tightly before leaving construction site to minimise dust and mud dispersion along the road
Traffic Disturbance The placement and operation of dredging equipment and construction plants on the ground, temporary loading of the dredged materials may obstruct or disturb traffic and cause safety risks for the people travelling on the canal-side road, particularly on canal-crossing bridges which are usually very narrow	- Arrange worker to observe and direct excavators driver when traffic is busy
Social Disturbance Concentration of workers and equipment, construction plants, temporary loading of materials and wastes, traffic disturbance, dusts and odour pollution etc. will disturb daily activities and the lives of local residents Conflicts may also be arisen if workers, waste, materials, equipment etc. are present outside the construction corridor	- Inform the community at least one week before construction is started - Monitor to ensure that physical disturbances are within the construction corridors only - Contractor recruit local labours for simple works, brief them about project environmental and safety requirements before started working - Contractor register the list of workers who come from other localities to the commune at the construction site - Led the water leaked from wet/damp dredged materials going back to the river, not to affect garden or agricultural land - Keep the areas to be disturb minimal - Enforce workers to comply with codes of conducts
Landslide and soil subsiding risks at dredging area Relative deep excavation or cut and fills on the embankments that create slopes may lead to landslide and soil subsiding at the slops or excavated areas, particularly in rainy weather Deep excavation also cause risks to the existing buildings nearby, particularly the weak structures or located too close to the deep excavation area.	- During field survey for the preparation of CDMP, the contractor in coordination with the Environmental Officer of PMU and the Environmental Consultant of the CES identify weak structures that may be at risk and determine appropriate mitigation measures accordingly - Consider and select appropriate dredging method that allow minimising soil subsiding risks, for example carry out stepped excavation, stabilise slops in parallel to dredging

Impacts and Description	Mitigation Measures
	- Apply protective measures such as sheet piles at risky locations
Water Quality Degradation Turbidity in water will be increased when the mud is disturbed; Water leaked from dredged material and suface runoff through disturbed ground also contain high solid contents. Muddy water entering irrigation ditch will cause sedimentation. Aquatic livest in the canal would also be affected by turbid water.	- Build coffer dams surrounding the dredging area and pump the water out before starting dredging - If dredging is carried out directly onto the water, dredge at intervals to allow suspended materials to resettle before continuing. Observe water colour at 20 m upstream and stop dredging when water colour there started to change
Increased Safety risk for the Public	- Place stable barriers along the construction corridor boundary to separate the site with nearby structures - Place warning signs and reflective barriers along the construction area, at dangerous locations and within sensitive receptors - Ensure adequate lighting at
Health and Safety risk to the workers The health of workers may be affected due to exposure to odour and other contaminants from dredged material Risk of being drown	- Within two weeks before dredging is started, the contractor will coordinate with local authority to identify good swimmers or those who can dive in the locality, and hire at least one of them at each canal construction site deeper than 3 m and there are workers working on or near water surface. - Provide and enforce the workers to use masks. If and when working in the water, protective cloths, rubber boots, gloves and hats must be wore.
Others	- Other relevant measures specified in ECOP or proposed by the contractors as necessary
MATERIAL LOADING AND TRANSPORTATION	
Dust and nuisance. traffic safety risks Dust or wet materials may be dropped along the transportation route	- Use water-tight tank trucks for transporting wet/dam materials - Cover the materials tightly before leaving the construction site - Do no overload material on the trucks
AT FINAL DISPOSAL SITE	
Landslide and soil subsiding risks at final Disposal site Landslide and subsiding risk may happen on slopes created at the final disposal site of dredged materials if the slopes created are too high, steep or unstable	- Level the materials after being disposed off - Slopes of the dumps will not be steeper than 45^{o} - Build/create the walls to protect slopes - Create and maintain drainage at the foot of each dump higher than 2m
Soil and Water Quality Pollution - The disposal of salty soil (as if) would not affect the existing soil quality - No risks of subsidence and landslide for residential areas around this area - No impacts on river/canal water quality.	- Apply measures that ensure rainwater onto the materials is not mix with the surface runoff from the surrounding to overflow uncontrolled at the site; rainwater will be infiltrated onto the ground on-site. This can be done by the following mitigation measures: + Build drainage ditches surrounding the designated disposal area

Impacts and Description	Mitigation Measures
	+ Use impermeable materials to cover the walls surrounding the materials to isolate it with the surrounding + Other measures proposed by the contractors to meet pollution control targets

5. Specific Guidance for Dredging at Cau Tre and Rot 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. 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. This could rather 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 Tan An Waste Treatment facility.
- 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, and 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/canal. In order to limit the negative impacts of mud (produced by dredging) on the environment as well as the water quality of the canals, the dredged sediment will be transported to a containing area which is appropriately located and properly design with an adequate size. The dredged spoil will be pumped to the disposal land and then overflow to a settlement pond, where turbidity and total suspended solids are settled. After some time, effluent is returned to the river. A typical design of the dike around each disposal may be as follows: Height: 2m, Footing width: 5 m, and Surface width: 1m. The plan should set out a basic layout.
- Monitoring the Disposed Dredged Materials. A plan for monitoring the dredged materials as well as water quality of effluent would be required. As stated before, an intensive monitoring would be required if the dredged materials contains higher content of the heavy metals and other harmful materials than the national thresholds.
- In order to mitigate the issue of turbidity during dredging operation, the DMP shall set out dredging equipment and/or techniques suitable to the particular site. On laying dredging machines on a barge, contractors can use a proper mud –stopping net for enclosing the dredging site and keeping back mud on land, not to let it goes back to the canal. If the disposal

site for dredge materials is located far away from the dredger, a suction dredger should be used to transfer all the mud and soil in water to the disposal sites. The length of dredging sections should be limited less than 1 km and the dredging should be done one by one.

At the completion of the contract, carry out an assessment on dredged materials, and determine the use of the dredged materials for activities such as: (a) construction (roads and dykes), (b) basis for individual houses, and (c) gardening.

APPENDIX 2: DUE DILIGENCE REVIEWS

For Tan An, due diligence review of the the related projects is presented in Table below.

01. Project name	Thanh Hoa Domestic Waste Treatment Plant Project – Capacity of 400 tons/day
Description	Waste generated in Tan An City is being collected and transported to the treatment site in Tan Dong commune, Thanh Hoa district. The facility is located in the North of the city, at 17 km far from the city. It has an area of 336,051m^2 and it is now running at 80% capacity. ***Relationship with SUUP***: Waste from construction work and dredging canals in SUUP subproject will be transported to the site for further treatment.
Current Status	According to the Urban Management Division of Tan An city, the volume of domestic waste in the last 6 months of 2015 in the city was: • The volume of collected waste was 15,369.4 tons, accounting for 87,45% of waste generated in the city. • Serving areas of ward 1, ward 2, ward 3, ward 4, ward 5, ward 6, Tan Khanh ward, Khanh Hau ward, Loi Binh Nhon, Binh Tam commune, Huong Phu Tho commune, An Vinh Ngai commune, My An communeand My Phu commune of Thu Thua district. • The plant has been constructed by Tam Sinh Nghia Company and put into operation since 2012
EIA	Environmental Impact Assessment (EIA) Report of the project was approved by Long An provincial People's Committee by Decision No. 3213/QĐ-UBND dated 07 December 2009.
Details of EMP	• Leachate treatment (capacity of 52 m^3/day): Collected leachate → UASB tank → aeration tank → biological pond → discharge. The effluent meets the acceptable limits under column B, TCVN 5945:2005 (currently QCVN 14:2008/BTNMT) • Treatment of emitted gases: Gas emiited from the landfill cells are collected by HDPE D200 tube and are burnt/ fired off. • Treatment of offensive odors and and pathogenic organisms: EM enzyme is sprayed on the disposal waste at landfill to accelerate the biodegradation process. Trees are planted to creaate a green belt/buffer zone.
Due Diligence Review	• The landfill will accommodate solid waste and dredged sediments from Tan An SUUP subproject. Waste from the SUUP subproject includes the construction waste and dredged soils and sediments (Cau Tre canal: 7,440 m3; 03 canals in LIAs: 13,350 m3) will be treated in landfill in Thanh Hoa. • Currently the landfill is operating and complying with the mitigation measures as specified in its environmental management plan and is reporting to the local authorities on a regular basis. • This is existing landfill which has been established since 2012. There will not be any further civil work or expansion of its capacity due to Tan An subproject activities. Therefore, it is not considered as a linked/related project
Recommendations	PMU of SUUP must establish a close cooperation with Thanh Hoa landfill operation unit (Sinh Nghi Tam Development Investment JSC) to: ✓ Exchange on actual capacity, operation, and management of the operation unit of WTP ✓ Exchange information on environmental compliance of construction contractors of Tan An SUUP Project

02. Project name	Binh Tam resettlement site (Binh Tam RS) at Binh Tam Commune, Tan An City
Description	In 2003, Tan An City People's Committee approved the decision on construction of Binh Tam RS at Binh Tam Commune, Tan An City. Land acquisition for the project was conducted during 2003 – 2007. The resettlement site was completed providing full technical and social infrastructures. Other related information on Binh Tam resettlement site is provided below: - Project's Owner: Tan An CPC - Location: Binh Tam Commune, Tan An City. The distance between the RS and the City center is about 4 km - RS area: 77,600 m^2; Building density: 60.42%. - Allocation of land use: ▪ Residential land: 46,805 m^2 (60.42%). ▪ Public infrastructures and public space: 5,873 m^2 (5.19%). ▪ Transportation land: 26,643 m^2 (34.39%). - Total number of residential land plots: 437 plots of which 50 plots are still available, being located in between the used landplots. - Technical infrastructure includes: Power supply, water supply, roads, lighting system, drainage system and waste collection - Social infrastructures include public spaces, market etc.. **Relationship with the Tan An SUUP subproject:** The resettlement site can provide 50 available land plots for the Tan An subproject to settle for 50 out of 198 relocated households. The resettlement site will provide full access to technical and social infrastructures for the new coming households, ensuring the relocated households will have better living conditions compared to their previous conditions.
Current status	- The Project was approved in 2003. - Construction was started in 2005 and completed by 2007
EIA/EMP	The Environmental Impact Assessment (EIA) was not required by the regulation dated back in 2001.
Due Diligence Review	- The land acquisition and site clearance started in 2003 and completed in 2007. The Government resettlement policy was applied for this proiect. - To date, the project has not received any claims from affected households. Survey results showed that livelihoods of affected households have been restored. The affected people have been compensated and supported in full in accordance with the regulations.
03. Project name	**Construction of Bao Dinh river embankment, section from Vanh Dai canal to Vo Van Mon road (wards 4&7)**
Description	The project is planned to embank Bao Dinh river banks within Ward 4 and 7 of Tan An City. The length of the embankment will be 700 m long in each riverside, starting at 200m from the first culvert of Vanh Dai canal (on one end of Nguyen Phong Sac road) and ending at the location which is adjacent to the Bao Dinh bridge on Võ Văn Môn Street. The tentative plan for the construction work to take place in between 2014 - 2016 State budget: 265 billion VND **Relationship with the SUUP project:** - The section of Bao Dinh river embankment under SUUP will connect with this embankment section of Bao Dinh river under this project.
Current Status	To date, there is no clear plan for this project implementation due to the lack of state funding.
Status of EIA	Not yet available

Detail of EMP	Not yet available
Due Diligence Review	- Cumulative construction related impacts of the two projects are not expected as there is so far not yet any plan on the construction of this project. - In the long- term, impacts would be positive as both projects will contribute to prevent the soil erosion risks along the river bank, reduce wastewater discharge to the bao Dinh River, and enhance the landscape of the city. - The Project is considered as a related project of SUUP. Once implemented, land acquisition and compensation should follow the provisions of the RPF of the SUUP.
04. Project name	**Construction of ring road (Loi Binh Nhon, Binh Tam Commune, Wards 4, 6 and 7)**
Description	- The Tân An City's ring road has a total length of 17.5 km, runnning through 8 communes and wards of Thu Thua District (My An and My Phu commune) and of Tan An City (Lợi Binh Nhơn commune, ward 7, Khanh Hau ward, Tan Khanh ward, An Vinh Ngai and Binh Tam commune). - The starting point is at Km 0+000 which crosses NH62 at the intersection Mỹ Phú - Thủ Thừa district. - The ending point at Km 17+500 crosses with Nguyễn Thông street then continues tot he van Co Tay bridge which is a project owned by Long An Department of Transport. - State budget: 343 billion VND. **Relationship with the SUUP project:** The connecting road between Phan Van Tuan and Nguyen Tan Chinh street under the SUUP is a part of the ring road of Tan An city. The ring road project will help to improve urban development, transport connectivity and social economic development of Tan An City and the surrounding districts (Thủ Thừa, Châu Thành, Tân Trụ). The completed ringroad will become the main route that connects Tan An with other provinces, including Tiền Giang, Long An and Ho Chi Minh City.
Current Status	- The road is not yet implemented due to the lack of state funding.
Current status of EIA/EMP	The Environmental Impact Assessment (EIA) report was approved by DONRE at the Decision No. 1018/QĐ-STNMT dated on 27/09/2016. The key environmental impacts and mitigation measures are identified in the EIA and are summarized below: - The proposed alignment runs mainly through agriculture land to minimize resettlement however there will still be about 776 households affected. Total agriculture land will be acquired about 382,585m^2, accounting for 70% of total acquired land of 400 households. There are 20 households to be relocated due to land acquisition. Compensation, support and resettlement will follow Vietnamese regulations and Long An policy. - During the construction phase, the key environmental concerns are about air quality (dust, noise and vibration), water quality (wastewater from worker camps and machinery cleaning) , soil quality due to solid waste and excavated soild and other impacts such as labor safety and traffic safety on waterway along Vam Co Tay and Bao Dinh River and on roadway at the junctions between the alignment and NH1, provincial way 62, 827A. The generic impacts can be minimized through the adoption of measures that are similar to ECOP. Impacts on waterway transport can be reduced by regulating material transportation boats/barges on Vam Co tay River, unblocking waterway for other boats, docking at permitted area, complying with the technical regulations on boat vehicles. On roadway, the

	mitigation measures are among having temporary detour pathways, placing warning signs, limiting vehicle speeds… to address the traffic safety concerns. - During the operation phase, impacts are noise, dust and vibration which can be reduced by the proposed mitigation measures. Environmental monitoring and supervision are developed. The EIA has been consulted with the public and related stakeholders.
Due Diligence Review	- In conclusion, the project is in compliance with the Vietnamese regulations on environmental assessment, which is also consistent with the Bank's safeguard policies. - The Project is considered as a related project of SUUP. Once implemented, land acquisition and compensation should follow the provisions of the RPF of the SUUP.
05. Project name	**Construction of Huynh Van Nhut road**
Description	Huynh Van Nhu road has a total length of 500.72m running along the right side of Bao Dinh River through Ward 3 in Tan An City. The key information of the project is provided below: - Project name: Huynh Van Nhut Road Upgrading Project (the right side of Bao Dinh river) - Project owner: Tan An City Project Management Unit - Executive agency: Tan An City People's Committee - Duration: 2015 to 2017 - Fund: State budget - Construction works of the project included: ▪ Total length of the road: 500.72 m ▪ Travelled way: 9 m ▪ Width of sidewalk: 3 m ▪ Construction of a sewerage system along the roadsides ▪ Construction of a street lighting system Total of investment budget: 28,592,510,978 VND **Relationship with the SUUP project:** This project is considered as a linked project as it is part of the proposed investment of the Bao Dinh River embankment rehabilitation under the SUUP in Tan An City. This road section, along the Bao Dinh river, was planned to be rehabilitated under the SUUP (road improvement along the river is part of the proposed investment). This road rehabilitation, implemented under GoV fund, is necessary to achieve the objectives of the proposed Bao Dinh River embankment rehabilitation under the SUUP. The compensation to the affected households followed the Vietnamese resettlement policies and payment started in 2015 and was completed in 2016.
Current Status	Construction is ongoing and will be completed by Q2 2017;
Current status of EIA/EMP	The environmental impact analysis and mitigation measures (EIA/EMP) have been intergrated in to the project feasibility report (FS). The EIA content is summarized below: During the construction phase, the key environmental concerns are about air quality (dust, noise and vibration), water quality (wastewater from worker camps and machinery cleaning) , soil quality due to solid waste and excavated soild. The generic impacts can be minimized through the adoption of measures that are similar to ECOP.
Due Diligence Review	The total number of PAHs is 33, of which 6 PAHs only have their land affected without assets on land; 25 PAHs affected land and assets on land, the remaining 02 PAHs are landless and only have structure, which were built on other person's land. There are no displaced household in the project site. Compensation, support and resettlement will follow Vietnamese regulations and Long An policy.

	Compensation plans were prepared in December 2014 and compensation took place in 2015-2016 following Long An PPC regulation. Because compensation took place recently and is directly linked to the project, it should follow the same policy as the investment under the SUUP. Findings of the DDR shows that the implementation of this project presents some non-compliances with the RPF prepared under the SUUP. These non-compliances are listed below: • Under the Tan An City funded Project, the level of job training and career change support is 0.4 of the affected land price for households whose agricultural land is affected, while in the SUUP – Tan An City policy, the support level will be from 1.5 to 5 time of the land prices as stipulated by the People's Committee of Long An PPC. • For households, whose agricultural land is affected by more than 20%, HH under the Tan An City funded Project are provided with vocational training and career change allowance in cash. While for the RPF, in addition to the compensation and support, including career change support as prescribed, the affected households will participate in the income restoration program (job training, job introduction etc.) developed by the Project. To comply in the RPF prepared under the SUUP, during RP implementation, the following actions will be taken: • HH, entitled to career change support, will receive an additional support to fill the gap between 0.4 times and 1.5 times of the land price; • HH losing more than 20% of their productive land will be entitled to the IRP under the SUUP;