HA NAM PROVINCIAL PEOPLE'S COMMITTEE

PEOPLE'S COMMITTEE OF PHU LY CITY

MEDIUM CITIES DEVELOPMENT PROJECT

PHU LY CITY SUB-PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR ADDITIONAL COMPONENTS

(FINAL REPORT)

Ha Nam, December 2016

HA NAM PROVINCIAL PEOPLE'S COMMITTEE
PEOPLE'S COMMITTEE OF PHU LY CITY

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CLIENT **CONSULTANT**

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ABBREVIATIONS

AH	Affected household
DO	Demand oxygen
DONRE	Department of Natural and resource Environment
EIA	Environment Impact Assetment
ESIA	Environmental and Social Impact Assetment
ECOP	Environmental Codes of Practice
ESMP	Environmental and Social Management Plan
GOV	Government of Vietnam
OP	Operation Policy
PPC	People Province Committee
QCVN	Vietnam Regulation
RP	Resettlement Plan
RPF	Resettlement Plan Framework
TCVN	Vietnam Standard
WB	Worldbank

CHAPTER 1: INTRODUCTION AND DESCRIPTION OF THE PROJECT

1.1 CONTEXT AND OBJECTIVES

1.1.1. Summary of MCDP and Phu Ly Subproject

The Medium Cities Development Project (MCDP) was approved by the Prime Minister for the project portfolio in the document No.602/TTg-QHQT dated April 16, 2010.

The Credit Agreement No.5031-VN was signed between the Government of Vietnam and the World Bank (WB) on January 2012. The Project uses the World Bank's IDA fund and counterpart fund from the provincial budget/support from central fund.

The development objective of the project is to increase access to improved urban infrastructure services in Lao Cai City, Phu Ly City, and Vinh City in a sustainable and efficient manner.

The MCDP parent project is implemented in three provincial cities including Phu Ly (Ha Nam), Lao Cai (Lao Cai) and Vinh (Nghe An); consisting of 4 components: (1) upgrading of basic infrastructure and improvement of services; (2) water supply and sanitation; (3) urban roads and bridges; (4) Project management and technical assistance.

Implemented from 2012, the project is on the right track to gradually achieve its development objectives. Investments in the parent project are promoting a huge economic efficiency and enhancing people's living conditions, creating motivation for infrastructure development, improving the urban face and gradually bring the city toward clean and sustainable development.

The total World Bank's IDA committed initially was 210 million USD. In fact at this stage, it is only 182.91 million USD (down 12.0% due to the fall in the exchange rate of SDR against the dollar) for 3 cities. Lack of IDA funding due to declining of SDR exchange rate against the dollar made some important investments of Lao Cai and Phu Ly impossible to be implemented in the original project, resulting in risk of affecting the development objectives of the project. Also, the funding source is limited because of the allocation of the original project (Lao Cai, Phu Ly were allocated only 57.5 million US dollars), some of the important investments of Lao Cai and Phu Ly project were omitted from the original project.

Like other cities in the country, urbanization is happening rapidly in Phu Ly and Lao Cai. The rapid growth of urban population causes pressure on infrastructure and improvement of environmental sanitation.

Lao Cai and Phu Ly propose to add IDA fund to offset the deficit of exchange rate and improve the project investment efficiency through additional investment of some necessary items. Lao Cai and Phu Ly would like the World Bank to continue further funding in order to implement these contents.

The proposed AF would be utilized to support two subprojects of Lao Cai City and Phu Ly City to finance:

a. Investments that were excluded from the scope of MCDP project because of the financing gap arising from the appreciation of the US Dollar vis-à-vis the SDR (~US$13 million); and

b. Additional investments in critical areas to strengthen the achievement of the PDO (~US$40 million). Total AF proposal is US$68.06 million, of which US$53 million blended fund from the WB and US$15.06million counterpart fund (CF)[1].

The proposed scaled-up activities are aligned with the MCDP's existing components.Due to the necessity of capital supplement for the project, the World Bank has already agreed to provide Additional Finanfing (AF) to Ha Nam and Lao Cai Province to complete the project desigend investments and finance scale-up activities to enhance achievment of project objective (Shown in the Management Letters dated November 13, 2015 and Febuary 15, 2016 of Ms. Victoria Kwakwa - Country Director in Vietnam of the World Bank, which were sent to the Chairmans of Ha Nam, Lao Cai and Nghe An PPCs).

The Deputy Prime Minister's (DPM's) decision, as in letter no. 2003/Ttg-QHQT dated November 8, 2016, sanctioned the following:

a. Agreement to proceed with the additional IDA amount of US$13 mil due to exchange rate loss (US$6.5 million each province);
b. Approval of the proposals from Lao Cai and Phu Ly requested for additional IBRD amount of US$40 mil (Lao Cai: US$20.5 million; Phu Ly: US$19.5 million) for scale up activities following request from MPI and applicable financing mechanism;

The proposed scale-up investments are outlined below

Proposed Scale-up in Phu Ly City: Total AF cost for Phu Ly is US$32.91 mil, of which IDA is US$6.5 mil, IBRD is US$19.5 mil and Counterpart Fund (CF) is US$6.91 mil.

a. **Component 1: Urban Infrastructure Upgrading** (~US$5.67 million, IDA: US$2.19 mil, IBRD: US$3.03 mil, and CF: US$0.45 mil): includes upgrading secondary and tertiary infrastructure for the: (i) Northern Quang Trung Ward; (ii) Duong Am Community - Lam Ha Ward; and (iii) Quynh Chan Community - Lam Ha Ward. Project will provide basic service of water supply, electricity, drainage and sewer collection, rehabilitation of roads and lighting. Sewer of Duong Am, Quynh Chan and Quang Trung communities will be collected and transmitted to the WWTP is being constructed by the project. Under this component, Tran Quoc Toan primary school will be upgraded to increase numbers of classrooms and Phu Van kindergarten will be newly constructed to serve the area which has no kindergarten at this moment. IDA fund will finance the construction and rehabilitation of these schools.

b. **Component 2: Urban Water Supply and Sanitation** (~US$9.37 million, IDA: US$2.95 mil, IBRD: US$3.82 mil and CF: US$2.6 mil) consists of (i) dredging, embankment and rehabilitation of the Lam Ha 1 regulation lake; (ii) rehabilitation of drainage systems and related infrastructure along Bien Hoa Road to increase drainage capacity, which were postponed because of budget shortfalls; and (iii) embankment of Chau Giang River (southern part) for flood control. While the northern part of Chau Giang River has been embanked partly by the MCDP, which resulted in reduced significant flooding for Lam Ha ward. Embankment of southern bank would prevent flooding for Liem Chinh community. IDA fund will finance investment (i) and (ii), while IBRD will finance investment (iii).

c. **Component 3: Urban Roads and Bridges** (~US$9.19 million, IBRD: US$7.13 mil and CF: US$2.06 mil) consists of the rehabilitation of Tran Hung Dao Road to increase connectivity from city to the Ninh Binh-Cau Gie Expressway.

[1] Figures refer to costs including contingencies and taxes.

d. **Component 4: Project Management Support and Technical Assistance**(~US$1.57 million, IBRD: US$0.7 mil and CF: US$0.87 mil) will support: (i) project management and supervision of additional investments; and (ii) independent social, environmental and financial monitoring..

1.1.2. Summary of Items Using Additional Financing of Phu Ly City Subproject

Table 1. Brief description of additional investment

No.	Item	Description
1	**Component 1**	**Basic Infrastructure Upgrade And Service Improvement (US$5.51 million)**
1.1	Upgrading infrastructure for the residential area in the North Quang Trung ward	Investments include: i) Construction a road of 254 m long and 9.5 - 11.5 m wide following the approved plan; ii) Upgrading existing internal roads, total length of about 1.9 km, within the existing width of 2 – 4.5 m; iii) Installing combined drainage-sewer pipelines, 3,922 km long; iv) Construction of wastewater lifting station capacity of 65 m^3/h *v)* Power supply for lighting system at low-voltage power poles and adding new poles at the planned routes.
1.2	Upgrading infrastructure in Duong Am residential group, Lam Ha ward	Investments include: i) Upgrading existing internal roads, about 1,876 km long, within the existing width of 1.5 – 4.5 m; ii) Installing combined drainage-sewer pipelines, about 2,142 km long; iii) Installing water supply network connecting to the existing main supply network, total about 4,589 km long; *iv)* Power supply for lighting system at low-voltage power poles and adding new poles at the planned routes.
1.3	Upgrading infrastructure in Quynh Chan residential group, Lam Ha ward	Investments include: i) Upgrading existing internal roads, about 3,246 km long, within the existing width of 1.5 – 4.5 m; ii) Installing combined drainage-sewer pipelines, total length of about 3,069 km; iii) Installing a water supply network connecting to the main supply network, total length about 6,507 km; iv) Power supply for lighting at low-voltage power poles and adding new poles at the planned routes
1.4	Upgrading Tran Quoc Toan primary school, Hai Ba Trung ward	Construction 2 blocks and upgrading 1 block of Tran Quoc Toan Primary School with total area of 3,300 m^2 for 1,200 pupils i) A new block of 3-floors: 31 classrooms (44.53 m^2/room); 2 functional rooms (49.6 m^2/room) *ii)* Upgrading a 2-floor block to a 3-floor building: 11 rooms (20.9-64.8 m^2/room)
1.5	Construction of Phu Van kindergarten in Phu Van commune, Phu Ly	Construction of 9,335 m^2 kindergarten for 480 pupils" i) Construction of 04 U-shaped , 2-floor building; consisting of 16 classrooms and functional rooms (19.5 – 90.28 m^2); ii) Areas for outdoor activities of children within kindergarten age range: Bio-landscape garden, sand playground, water-

No.	Item	Description
	city	splash tank; green vegetable garden; iii) Construction of accessing concrete road 170 m long and 3.75 m wide.
2	**Component 2**	**Environmental Sanitation Improvement (US$9.37 million)**
2.1	Upgrading Lam Ha 1 regulation lake, Lam Ha ward	Upgrading Lam Ha 1 Lake in Lam Ha Ward (7.78 ha) i) Lake embankment, interceptors and protected road (1,702 m) ii) Tree, lighting system
2.2	Upgrading drainage and technical infrastructure system for Bien Hoa road	Scope includes: i) Rehabilitation of water and combined drainage-sewer pipeline, about 923 m long, ii) Re-surfacing of road and intersections, about 906 m long; iii) Rehabilitation of lighting system, *iv)* Rehabilitation sidewalk and green tree system.
2.3	Construction of Chau Giang river southern embankment from Liem Chinh bridge to Cau Gie- Ninh Binh expressway	Construction of Chau Giang river southern embankment from Liem Chinh bridge to Cau Gie-Ninh Binh expressway with total length of 3,300 km and construction of the prevented road of 1.8 km long and 13.5 m wide.
3	**Component 3**	**Urban Roads And Bridges (US$9.19 million)**
3.1	Upgrading Tran Hung Dao road	Upgrading Tran Hung Dao road from Liem Chinh bridge to Cau Gie-Ninh Binh expressway: i) Length: 1.6 km ii) 4 standard lanes, sidewalk, drainage/lighting system, utilities for walkers
4	**Component 4**	**Project Management And Technical Assistance (US$1.57 million)**
4.1	Construction supervision and contract management	The scope includes: Supporting all activities of the PMU in construction supervision and contracts management.
4.2	Independent environmental and social safeguard monitoring	The scope includes the independent services for: i) Environmental safeguards monitoring; *ii)* Social safeguards monitoring;
4.3	Independent financial audit	Executing independent audit following the agreed schedule during the project time.
4.4	Project Assessment	Conduct post project implementation evaluation at closing date;

1.1.3. Objectives

a. Overall objectives

The objective of the AF Project is to increase access to improved urban infrastructure service in selected medium-sized cities in support of Vietnam's urban development program.

b. Specific objectives

The specific objectives of Phu Ly City subproject – additional items are:

(i) Continue to contribute to building Phu Ly City to become a big city, an economic center and a locomotive of growth meeting the socio-economic development goals of Ha Nam province; a driving force of exchange that contributes to the economic development of the whole south of Northern Delta. Invest in construction in order to create a technical infrastructure frame towards the planning of Phu Ly city until 2020, thereby attracting investors into the city, promote economic development and create momentum for the city to complete and become a satellite city of Hanoi capital.

(ii) Meet the objectivies of socio-economic development of Ha Nam until 2020 and vision 2030 approved by the Prime Minister; Plan to develop Phu Ly city to become class II city before 2020.

(iii) Improve and enhance living conditions for the low income residential areas in the project area such as the residential area in the north Quang Trung ward, Duong Am and Quynh Chan residential group, Lam Ha ward by upgrading local roads and constructing water supply pipelines, combined sewer lines and wastewater overflow chambers, etc.

(iv) Improve environmental sanitation, urban landscape and overcome flood and inundation situation in rainy season by constructing Lam Ha 1 regulation lake, constructing embankment in the south of Chau Giang river from Liem Chinh bridge to Cau Gie – Ninh Binh expressway.

(v) Upgrade and rehabilitate Bien Hoa road because it is the main road axis of Phu Ly city. Currently, the road is low and frequently suffers from local inundation in rainy season which affect the transportation and urban aesthetics as well as environmental sanitation.

(vi) Rehabilitate and upgrade kindergarten and primary schools to provide adequate physical facilities for pupils in particular and local residents in the area, which bring significant benefits for pupils who are the future of the country.

(vii) Enhance the service capability of the urban roads, ensure environmental sanitation, create driving force for urban development and inter-regional exchanges by investment in upgrading and improving Tran Hung Dao road for the section from Liem Chinh bridge to Cau Gie - Ninh Binh expressway. This route is the link between Ninh Binh, Nam Dinh, Hung Yen ... with the new urban areas and has important projects such as Bach Mai Hospital (base 2), Viet Duc Hospital (Base 2), the central bus station and the center of economics and services of high quality, etc.

1.1.4. Scope of ESIA Report

Based on the original project structure consisting of 04 components, the ESIA report evaluates social and environmental impacts of the investment items using additioanl financing of Phu Ly city, as presented in section 1.1.1 above.

1.2 LEGAL AND TECHNICAL BASIS FOR SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT

1.2.1. Legal and National Technical Basis

a. The legal documents, national regulations, national standards, technical guidelines on environment as a basis for the preparation and implementation of EIA.

Regarding environmental protection

- Environmental Protection Law adopted by the National Assembly of the Socialist Republic of Vietnam on June 23, 2014 and the President signed an order of publishing on January 01, 2015.
- Decree No. 179/2013/ND-CP dated November 14, 2013 of the Government on the sanction of administrative violations in the domain of environmental protection
- Decree No.18/2015/NĐ-CP dated February 14, 2015 of the Government on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plans.
- Decree No.35/2014/ND-CP dated April 29, 2014 of the Government on amending and supplementing some articles of the Decree No. 29/2011/ND-CP dated April 18, 2011 of the Government providing strategic environmental assessment, environmental impact assessment and environmental protection commitment.
- Circular No.27/2015/TT-BTNMT dated May 29, 2015 of Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment and environmental protection plans.
- Decree No.25/2013/NĐ-CP of the Government on environmental protection fees on wastewater.
- Circular No. 36/2015TT-BTNMT of MONRE dated 30 June 2015 providing detailed regulations on management of hazardous wastes.

Land resources

- Land law No.45/2013/ adopted by the National Assembly of the Socialist Republic of Vietnam on November 29, 2013.
- Decree No. 43/2014/NĐ-CP promulgating the execution of some articles of Land Law.
- Decree No. 44/2014/NĐ-CP on land price.
- Decree No.42/2012/NĐ-CP dated May 11, 2012 of the Government on management and use of rice-farming land;
- Decree No. 45/QD-CP dated 15 May 2014 of Government providing land use cost regulations;
- Decree No. 47/QD-CP dated 15 May 2014 of Government providing regulations about compensation, support, resettlement upon land acquisition by the State;
- Circular /no. 37/2014TT-BTNMT of MONRE dated 30 June 2014 providing detailed regulations about compensation, support, resettlement upon land acquisition by the State;
- Circular No. 36/2014TT-BTNMT of MONRE dated 30 June 2014 providing detailed regulations about land pricing, land price table development and adjustment; specific land pricing and land pricing consultancy;
- Decicison No. 52/2012/QD-TTg dated 16 October 2012 about policies to support job and job training for peasants having agricultural land acquired by the State;

Water resources

- Water Resources Law No.17/2012/QH13 passed by the National Assembly of the

Socialist Republic of Vietnam on June 21, 2012;

- Decree No. 201/2013 / ND-CP detailing the implementation of some articles of the law on water resources
- Decree No.120/2008/NĐ-CP dated December 01, 2008 of the Government on the management of river basin.
- Decree 80/2014/ NĐ-CP dated June 08, 2014 of the Government on drainage and waste water treatment
- Decree No.142/2013/NĐ-CP, dated October 24, 2013 of the Government on sanction of administrative violations in the domain of water and mineral resources.

Safety

- Law No. 84/2015/QH13 on occupational safety and hygiene adopted by the National Assembly of the Socialist Republic of Vietnam on June 25, 2015;
- Decree No.36/2016/NĐ-CP dated May 15, 2016 of the Government on execution of some articles of occupational safety and sanitation.
- Decree No. 44/2016/ND-CP dated May 15, 2016 of the Government detailing some articles of the Law on Occupational safety and sanitation, technical inspection of occupational safety, training of occupational safety and sanitation and monitoring of occupational environment.

Social policies

The legal framework related to land acquisition, compensation and resettlement is based on the Constitution of the Socialist Republic of Vietnam (2013) and the Land Law 2013 (amended) and the decrees/other relevant guidelines. The main legal documents applied in the resettlement policy framework include:

- Constitution of the Socialist Republic of Vietnam in 2013.
- Land Law2013 takes effect as from July 1, 2014
- Decree No. 43/2014/ ND-CP guiding the implementation of some articles of the Land Law 2013
- Decree No.44/2014/ND-CP guiding the determination of land price, establishment and adjustment ofthe land price frame, land price list; valuating a specific area and providing consultancy on land price.
- Decree No.47/2014/ND-CP guiding the compensation, support and resettlement when the State recovers land.
- Decree No.38/2013/ND-CP dated April 23, 2013 on the management and use of Official Development Assistance fund (ODA) and preferential loans from donors.
- CircularNo.36/2014/TT-BTNMT dated June 30, 2014 on land pricing method; compilation of and adjustment to land price; determination of specific land prices and consultancy on land pricing.
- Circular No.37/2014/TT-BTNMT dated June 30, 2014 on compensation, support and resettlement when the State recovers land.
- Decision No.1956/QĐ-TTg, dated November 17,2009 of the Prime Minister approving the scheme of vocational training for rural workers until 2020.
- Decision No. 52/2012/QD-TTg dated November 16, 2012 of the Prime Minister on

employment and vocational training support policies for laborers subject to agricultural land recovery.

- Decisions and other regulations related to the resettlement plan issued by Ha Nam Provincial People's Committee relating to the Land Law 2014 and circulars, decrees on guiding the execution.

Vietnam Environmental Regulations

The current regulations of Vietnam (TCVN), Vietnam Regulations (NTR) are the national standards established by MONRE and applied to all agencies, enterprises, projects implemented in Vietnam.

- QCVN 05:2013/ BTNMT - National technical regulations on ambient air quality;
- QCVN 08-MT:2015/BTNMT - National technical regulations on surface water quality;
- QCVN 09-MT:2015/BTNMT - National technical regulations on groundwater quality;
- QCVN 14:2008/BTNMT - National technical regulations on domestic wastewater.
- QCVN 39/2011/BTNMT National technical regulations on irrigation water quality;
- QCVN 26:2010/BTNMT - National technical regulations on noise;
- QCVN 27:2010/BTNMT - National technical regulations on vibration;
- QCVN 07: 2009/BTNMT- National technical regulations on harzadous waste threshold;
- QCVN 03-MT: 2015/BTNMT- National technical regulations on allowable limits of some heavy metals in soilt;
- QCVN 15: 2008/BTNMT- National technical regulations on plant protection chemical residues in soil;

QCVN 43:2012/BTNMT - National technical regulations on amount of sediments.

b. The documents and data by the Project Owner in the EIA process

- Feasibility Study Report – Medium Cities Development Project - Phu Ly City subproject - additional investment 2016.
- Report on topographical survey results; Report on geological survey results

1.2.2. Safeguard Policies and The World Bank's Guidelines

The objective of safeguard policies is to prevent and mitigate direct and indirect impacts on the residents and the environment in the development process.

The relevant safeguard policies of the WB triggered for the subproject are decribed:

Environmental assessment (OP/BP 4.01)[2],

The proposed subproject would mainly involve the following physical investments under Components 1, 2, 3: i) Construction, upgrading, and rehabilitation of short urban roads; ii) Installation of combined wastewater and drainage systems; iii) Installation of water supply

[2]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

distribution network; iv) Construction of river and lake embankment; and v) Construction of school and kindergarten block.

The subproject's overall potential socio-environmental impacts would be positive as it is expected to bring about: i) improved environmental sanitation and urban landscape; ii) increased wastewater collection and urban drainage capacity; iii) minimized discharge of untreated wastewater into the environment; iv) reduction of public health risks associated with water-born diseases and related healthcare cost; v) reduction of safety risks and asset loss caused by inundation; vi) increased the accessibility of local people to nearby areas.

There are also potential negative socioenvironmental impacts associated with the proposed physical investments. These include commonly known construction impacts and risks, such as: i) loss of vegetation cover and trees, disturbance to the habitats of aquatic species ii) increased level of dust, noise, vibration; iii) pollution risks related to generation of waste and wastewater, particularly large amount of excavated/dredging materials; iv) traffic disturbance, and increased traffic safety risks; v) erosion and land slide risk on slopes and deeply excavated areas as well potential negative impacts on existing weak facilities; vi) interruption of existing infrastructure and services such as water and power supply; vii) disturbance to daily socio-economic activities in project area and social disturbance; viii) health and safety issues related to the public and the workers at construction sites; and ix) social impacts associated with land acquisition, construction disrupting businesses by construction related activities and mobilization of workers to the site. Theseimpacts are site-specific; temporary; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily. Therefore, the subproject has been proposed to be classified as a Category A subproject.

Natural habitats (OP/BP 4.04)[3];

The subproject will not impact any protected area nor will it affect important/endangered flora or fauna species or biodiversity areas of high value. The environmental and social screening and scoping of the subproject confirmed that Chau Giang river, a natural river that provide habitats for aquatic species. Construction and operation of the embankments would have some potential adverse impacts on natural habitats of the river, including loss of benthic habitats and disturbance of benthic organisms. Impacts and mitigation measures have been included in the subproject ESIA and ESMP to address these impacts.

Physical cultural resources (OP/BP 4.11)[4]

The subproject does not necessitate relocation of physical cultural resources (PCRs) such as monuments, temples, churches, religious/spiritual and cultural sites. This policy is triggered as the subproject civil works will involve relocation of 10 graves, which are also considered PCR. Since the project includes dredging and excavation activities, which may result in chance finds, a chance finds procedure has been included in the subproject ESMP.

Resettlement (OP/BP 4.12)[5]

[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

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

World Bank-financed projects should also take into account the World Bank Group Environmental, Health, and Safety Guidelines (known as the "EHS Guidelines"). The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice.

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

1.3 DESCRIPTION OF SUBPROJECT

1.3.1 Location

The subproject is located in Phu Ly City, Ha Nam Province. The study scope of the subproject is focused on the areas of critical need, important nature and as the driving force for urban development, environmental improvement, and improvement of the local people's living conditions, which include:

- Residential community in the North Quang Trung ward.
- Duong Am and Quynh Chan residential groups in Lam Ha ward.
- Residential community in the West Bac Chau Giang urban area (bordering Lam Ha 1 Lake).
- Residential area at Bien Hoa roadsides.
- Residential community in Liem Chinh ward from Liem Chinh bridge to Cau Gie – Ninh Binh express-way.
- Residential community along Chau Giang river southern embankment from Liem Chinh bridge to Trieu Xa culvert.

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

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

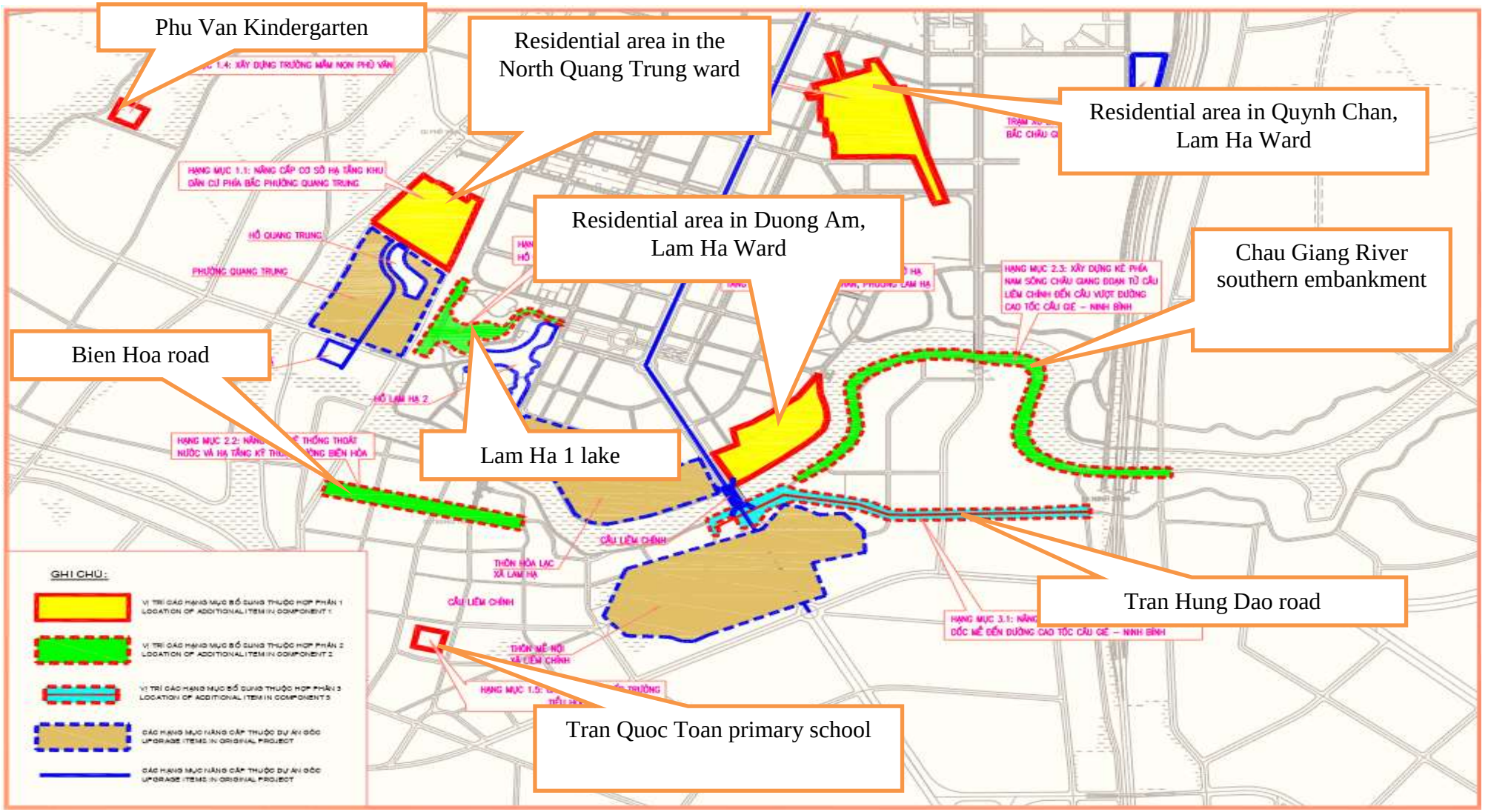


Figure 1.Layout of location of subproject investment items

1.3.2 Detailed Description of Subproject Investment Items

Component 1: Basic Infrastructure Upgrade And Service Improvement

Upgrading and improving infrastructure services in the community areas of group 40% of the population with the lowest income. Narrowing the gap in term of infrastructure compared to other developing residential areas of the city.

Including 5 areas: (1) Residential area in the north Quang Trung ward; (2) Duong Am residential group, Lam Ha ward; (3) Quynh Chan residential group in Lam Ha ward; (4) Phu Van kindergarten, in Phu Van commune; and (5) Tran Quoc Toan Primary School, Hai Ba Trung ward.

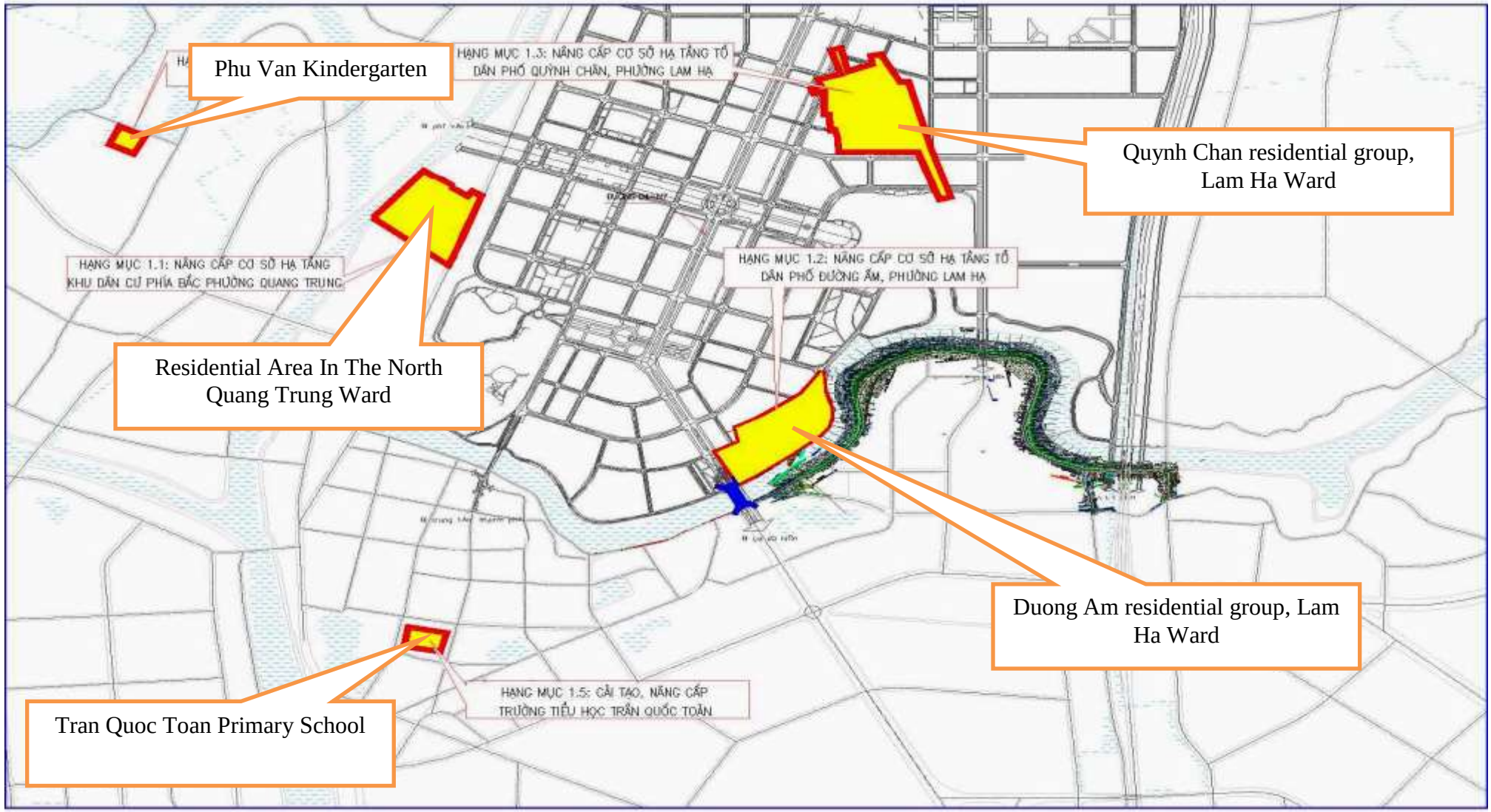


Figure 2.Layout of location of component 1 investment items.

1.1. Upgrading Infrastructure for The Residential Area in The North Quang Trung Ward

The geographical scope of this subcomponent coversthe northern part of Quang TrungWard, whihc has an area of about 55 ha and a population of about 2,868 people. The North of the subproject component is adjacent to a road to But Son Cement Plant (Ba Da Bridge); The West of it is adjacent to the Nhue River dike; The Southis adjacent to Chau Giang river dike; and The East is adjacent to Highway 1A.

The internal roads in the area are of two surface types, being crushed stone aggregate roads (about 40%), and concrete roads (about 60%). Cross-section of the internal roads of residential areas is narrow (about 1.5m – 4.0m). Besides, the surfaces of these roads mostly have been degraded so much, with some locations muddy or flooded due to lack of roadside drainage system.

The households are living along the roads. They have homegarden land so the houses are back from the road about 10 – 15 m. During pre-construction process, there are 10 graves will be relocated because of constructing a new road as planned.

Figure3.Current status infrastructure of the residential area in the North Quang Trung ward.

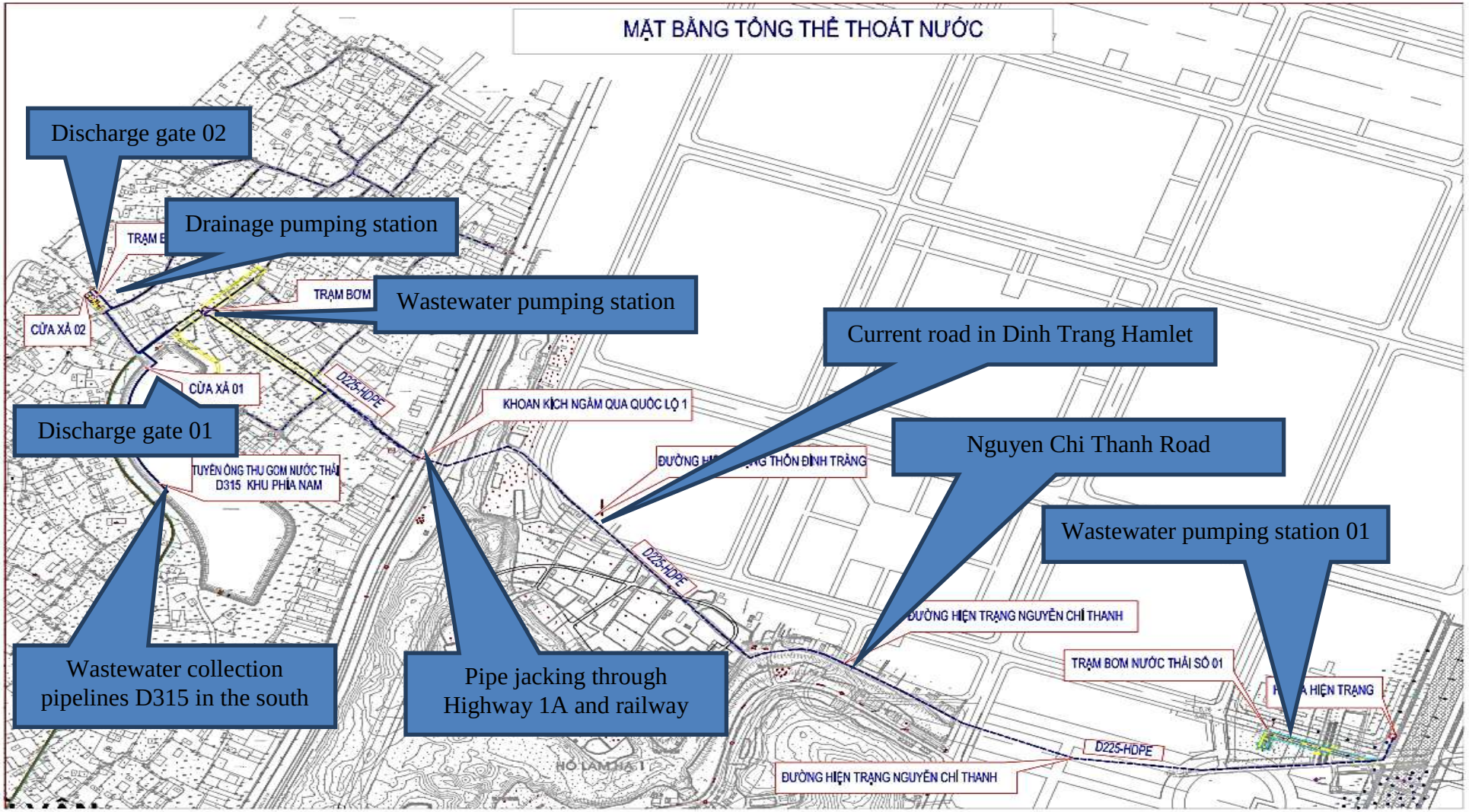


Figure 4. Current status infrastructure of the residential area in the North Quang Trung ward

The scope of work includes:

(i) Building the internal urban roads to connect the residential areas in the ward as well as to create a link with the outside. This road has a width of 11.5 m (2 + 5.5 + 2) and a length of 254 m. the road surface structure is asphalt concrete. Installing electric along the route.

(ii) Upgrading internal existing road with a total length of about 1.9 km, and within the existing width of 2m – 4.5 m; installing lighting system along the route.

(iii) Installing drainage system along the new roads and upgrading.

1.2. Upgrading Infrastructure in Duong Am Residential Group, Lam Ha Ward

The scope of this subcomponent is the central area of Lam Ha Ward with a total area of about 10.4ha and a total population of about 1,300 people.

Duong Am Hamlet's road system consists of two main-axis roads passing through the residential cluster: the road passing by community house of Duong Am Hamlet and the road passing the community house of the hamlet. Most of the internal roads of Duong Am residential area have been solidified: concrete road – 80%; soil/stone agrregate road – 20%.

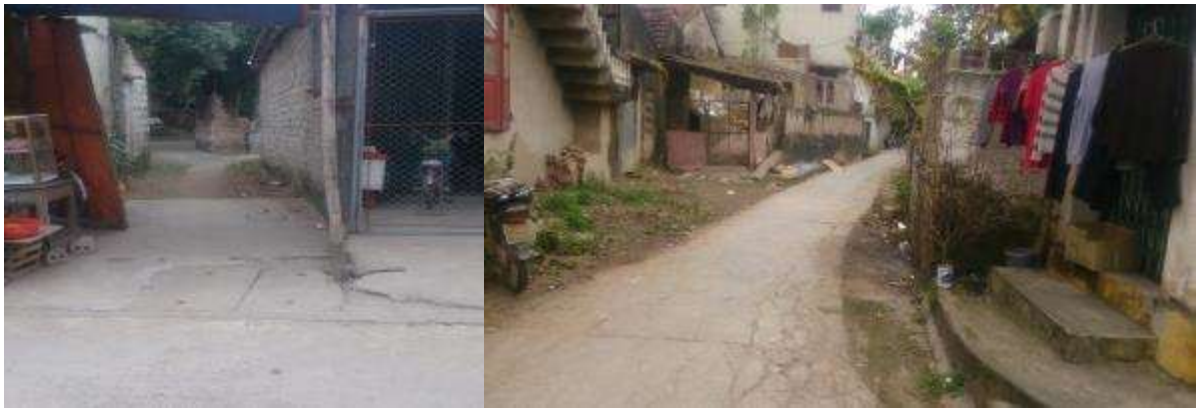


Figure5Current status infrastructure of Duong Am residential group.

The cross-sections of the internal roads of the residential area are narrow (about 1.5m – 4.0m). However, because the roads do not have complete drainage system, their surfaces are being degraded: the road surfaces are crack, rough, obstructing people's travelling convenience.

The scope of work includes:

(i) Upgrading existing the internal roads with total length of about 1.8km and width remaining the same of 1.5m – 4.0 m;

(ii) Installing a combined wastewater/storm-water pipelines with a total length of 2.1 km;

(iii) Installing a water supply network connecting with the existing main water supply system, with a total length of about 4.6km;

(iv) Lighting power supply at low-voltage poles and addition of new ones on the planned routes.

1.3. Upgrading Infrastructure in Quynh Chan Residential Group, Lam Ha Ward

This subcomponent covers the North of Lam Ha ward, an area of approx.24 ha and a population of about 200 people.

Quynh Chan Hamlet's transport road system consists of 1 main-axis road running through the residential clusterp with width B = 3.0m – 3.5m and branch routes to the sub-hamlets with width B = 1.5m – 4.5m. Most of the internal roads of Quynh Chau residential cluster have been solidified: concrete road – 50%; soil, stone aggregate road – 50%.

Figure6.Current status infrastructure of Quynh Chan residential group.

The cross-sections of the residential area's internal roads are narrow (1.5m – 4.5m).However, because the roads system doesn't have a drainage system. As the roads do not have adequate drainage systems, the rain water and wastewater run off freely causing the degradation of the road surface and thereby obstructing the traffic of local residents.

The scope of work includes:

(i) Upgrading existing the internal roads with a total length of about 3km and a width remaining the same of 1.5m – 4.5m;

(ii) Installing a combined wastewater/storm-water drainage system with a total length of 3km;

(iii) Installing a water supply network connecting with the existing water supply network, with a total length of 6.5 km;

(iv) Lighting power supply at low-voltage poles and addition of new ones on planned routes.

1.4. Upgrading Tran Quoc Toan Primary School, Hai Ba Trung Ward

Tran Quoc Toan Primary School in Hai Ba Trung ward was established in August 1994. In the school year 2016-2017, the school has over 1,200 pupils with 31 classes, each class has 36 pupils on average. However, the actual number of classrooms is 22 rooms over 31 classes, which indicate a lack of 9 classrooms and 6 functional rooms.

At the present, Tran Quoc Toan school which has 3 building blocks with 2 floors each in the South, West and North, and has 22 classrooms that can serve 1,200 pupils. The number of pupils is increasing over the years so the school needs additional classrooms.

Location:

- The North is bordered by the residential area

- The East is bordered by the Tran Quoc Toan secondary school

- The South is bordered by the residential area

- The West is bordered by small street.

Figure7.Current infrastructure of Tran Quoc Toan primary school

Tran Quoc Toan school will be invested for Construction of 1 building block with L shape in the schoolyard by the subproject.

The scope of work includes:

(i) Construction of additional school blocks in the south and the west, auxiliary items (guard house, kitchen, common toilet area of the students);

(ii) Building new L-shaped blocks (3 storeys – 31 classrooms) in the south and the east in the school yard; S=956 m^2;

(iii) Rehabilitation of, buidling more storeys for the block in the north into a management block: 3 storeys, with the 3rd floor for development of biological gardents serving teaching-learning demands.

1.5. Construction of Phu Van Kindergarten in Phu Van Commune, Phu Ly City

Phu Van commune currently does not have kindergarten. According to the educational network planning, Phu Van kindergartens will be built to meet the needs of child education of the 5 villages above on for about 480-500 children.

The total construction area is 9,935 m^2 on the agricultural land under management of the commune PC and partly of the local residents:

- Bordering rice fields in the northeast

- Bordering irrigation canals and inter-commune roads in the southeast

- Bordering Phu Van Primary School in the southwest.

Figure8.Current infrastructure of Phu Van kindergarten.

Work scope includes:

(i) Construction of the school consisting of 4 U-shaped blocks of 16 classrooms 90.28 m^2 each, 2 floors and functional rooms 19.5 – 61.2m^2 with open space design facing the planned road (13.5m);

(ii) Areas serving outdoor activities of children within kindergarten age range: bio-landscape garden, sand playground, water splash tank, greeen vegetable garden with total area of about 1,300m^2;

(iii) Construction of a road for the school connecting the inter-commune road and road passing Phu Van Primary School 170m long and 3.75m wide.

Component 2: Environmental Sanitation Improvement Investing in improving environmental sanitation in urban residential areas, including: (1) Upgrading Lam Ha 1 regulation lake; (2) Upgrading drainage and technical infrastructure system for Bien Hoa road; and (3) Construction of Chau Giang river southern embankment from Liem Chinh bridge to Cau Gie- Ninh Binh expressway;

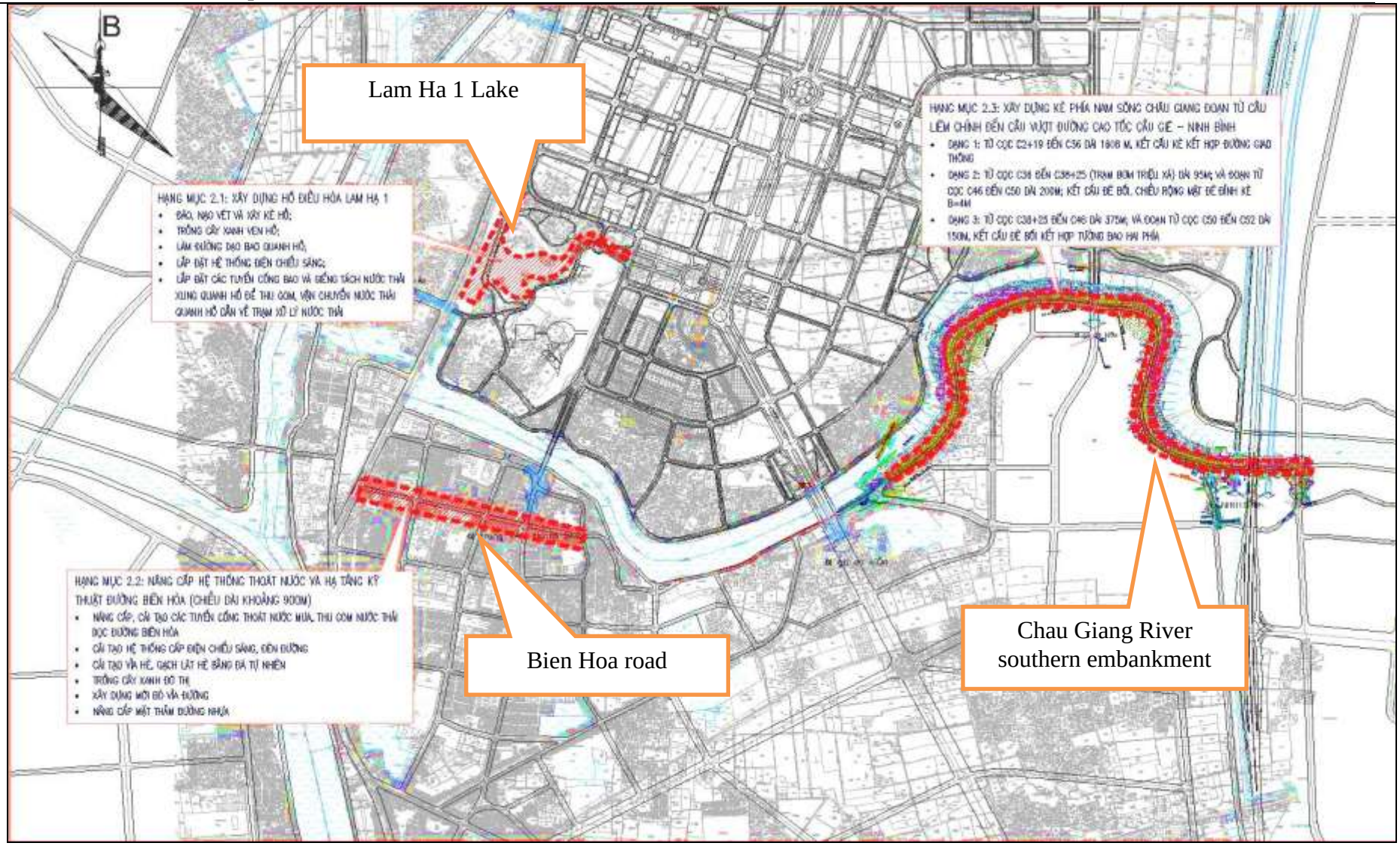


Figure 9.Layout of locations of Component 2 - items.

2.1 Upgrading Lam Ha 1 Regulation Lake, Lam Ha Ward

Lam Ha lake consists of 2 interconnected lakes formed from the low-lying land in Dinh Trang village, Lam Ha commune, Phu Ly city. The lake No.1 has an area of 7.54 ha, the West borders the north-south railway, the North borders A4-8 drainage canal, the East and the South borders provinicial road 493. The lake No.2 covers an area of 7.60 ha, the East borders Le Cong Thanh extended road, the South borders the residential area and the North is separated from the lake No.1 by the provincial road 493. It is surrounded by the residential areas, gardens and ponds, roads, and open spaces with significantly changed-elevation. The lake bank, composed of soil, has not been strengthened. Only the island in the middle of the lake has been temporarily embanked vertically with brick or stone. The bed has not been dredged leading to uneven depth. The elevation of the bank top is from +2.00m to +2.50 m, the elevation of the bottom is from -1.50 m to -2.00 m.

Currently, the entire rainwater, storm-water from the surrounding area of Lam Ha commune, part of rainwater from the area along the national highway 1A following the existing canal system are discharged to the area of lake No.1 and 2, which are connected by underground crossing pipe through road 493. When the water level in Chau Giang river is low, water from the area will self-flow into Chau Giang river via the existing sewer in the south of the lake No.2. In rainy season, water level in Chau Giang river rises, the underground sewer through the provincial road is closed; water is pumped from the existing pumping station (the North of provincial road 493) from the lake No.1 to the lake No.2 then to Chau Giang river.

Rehabilitation of both lakes were proposed in the original MCDP. However, due to the lack of fund, only Lam Ha 2 lake was rehabilitated. At present, Lam Ha 2 lake has been dredged and embanked. The investment in Lam Ha 1 lake is included in the subproject using additional financing.

Environmental assessment of the items of Lam Ha 1 and Lam Ha 2 Lake was presented in the ESIA report of the original MCDP of Phu Ly city.

The scope of work includes:

- Lam Ha 1 has 1.5 m – 5.0 m depth compared with existing road surface elevation. Dredging is to be carried out on water surface area of 7.78 ha, to minimum depth of 3.0 m compared with existing road surface, yet the part more than 3 m deep compared with existing road surface should remain intact.
- Lam Ha 1 Lake's edge is to be stone-embanked to the lake bed.
- Stone-embankment is from lake bed to +3.0 m elevation.
- The part from +2.5 m to +3.0 m will have concrete frames with cells for landscape grass growing. On embankment top, there will be galvanized steel railing for protection and landscape.
- Construction of walk road 4 m wide and 1.7 km long, with landscape greenery area 1.1 m away from the lake edge (block brick-paved).
- Lighting system

Figure10.Lam Ha 1 Lake

2.2 Upgrading Drainage and Technical Infrastructure System for Bien Hoa Road.

Bien Hoa is one of the main roads of Phu Ly city with the length of about 900 m. The start point is intersecting with the national highway 1ª at Church ramp. The end point intersects with Le Loi road. The drainage and technical infrastructure system of Bien Hoa road has been constructed through different stages with many inadequacies. The households who do business are living along the two roadsides. The drainage and technical infrastructure system of Bien Hoa road were invested to construction of through many different periods so the system is downgraded.

Figure11. Bien Hoa road

The scope of work includes :

(i) Installing the surface water and wastewater drainage system (923m long); D=1000-1600

(ii) Re-surfacing of road and intersections (906 m long)

(iii) Rehabilitation of lighting power system;

(iv) Upgrading sidewalk and greenery system.

2.3 Construction of Chau Giang River Southern Embankment from Liem Chinh Bridge to Cau Gie- Ninh Binh Expressway

Introduction on Project for urgent bank erosion treatment combinedwith urban embellishment

The investment project for urgent bank erosion prevention combined withurban gentrification at the upstream section of Phu Ly drain from Phu Ly bridge through Highway 1A to the outlet of Me Noi pumping station, Phu Ly City, was invested by Phu Ly city PPC with a total investment of VND 219,187,519,000 (about 9.75 million US dollars).

The FS report of this project was approved according to Decision 854b/QD-UBND dated July 18, 2008. The EIA report of the project was also approved according to Decision 705/QD-UBND dated July 12, 2010.

It was planned that the project would be implemented from 2008-2011. In fact, from 2010 to 2013, the South riverside embankment from 1A Highway to Liem Chinh bridge was completed. Currently, the construction of embankment segment at the North riverside is delayed because the funding source is unallocated.

Investment aims:

- To prevent inland flood, facilitate the inspection and management of dikes in the storm and flooding season.
- To prevent erosion of shore, extending riverside corridors, making the beauty of landscape and protecting ecological environment.
- To ensure the safety and advantage for navigable waterway and overland, along two sides of the ChauGiang River, developing the urban infrastructure and tourism.

The project including the main items are the embankment of North and the South of the Chau Giang River: (i) the North ofChauGiang River embankment with the length of 1,513m, rib crest level of wall +5m, reinforced concrete structures, the width of 10 m embankment bordering sidewalks , electrical lighting systems, drainage ditches; (ii) the South of Chau Giang River embankment with the length of 1,360m, rib crest level of wall + 5m, reinforced concrete structure, 3 m wide embankment bordering sidewalks, electrical lighting systems, drainage ditches.

Due to the need of extension the planning embellishment Phu Ly City, especially areas along the Chau Giang River, it is necessary for the investment in the North of Chau Giang River embankment to be carried out for the purposes of waterway traffic, tourism and recreation, recreation and the prevention of erosion phenomenon to ensure people's safety.

To solve the problem of erosion prevention for households along the North of Chau Giang River, under the original MCDP project, Phu Ly City subproject with loans from the World Bank has sponsored a part of Northern embankment segment of Chau Giang river (about 800m) from Highway 1A to Chau Giang bridge (belong to Lam Ha ward), it is an area that frequently occur erosion affecting to safety of people living along the river.

Phu Ly City AF sub-project: Embankment one section of Chau Giang River

With the subproject using this additional capital, the city proposed to undertake construction of a partial embankmentof the South of Chau Giang River, the section from the Liem Chinh bridge to overpass highway Cau Gie - Ninh Binh, whichhave 3.3 km long with the goal of preventing dangerous erosion for people living along the river and rehabilitation of the embankment road to ensure traffic safety.

Investment volume of the additional item – southern embankment of Chau Giang River:

(i) Section 1:Construction of 1.9 km stone embankment, from Me Noi pogoda to column C36 with the height of 4.2 m; construction of the road next to the embankment with 1.8 km long and 13.5 m wide.

(ii) Section 2: Construction of 1.0 km stone embankment, height of 4.2 m, from C36 to C53+40 (discharge culvert irrigation of Trieu Xa pumping station).

(iii) Section3: Construction of stone embankment of 345 m long, height of 4.2 m connecting from C53+40 (discharge culvert irrigation of Trieu Xa pumping station) to C61 (Cau Gie – Ninh Binh expressway flyover).

Component 3: Urban Roads and Bridges.

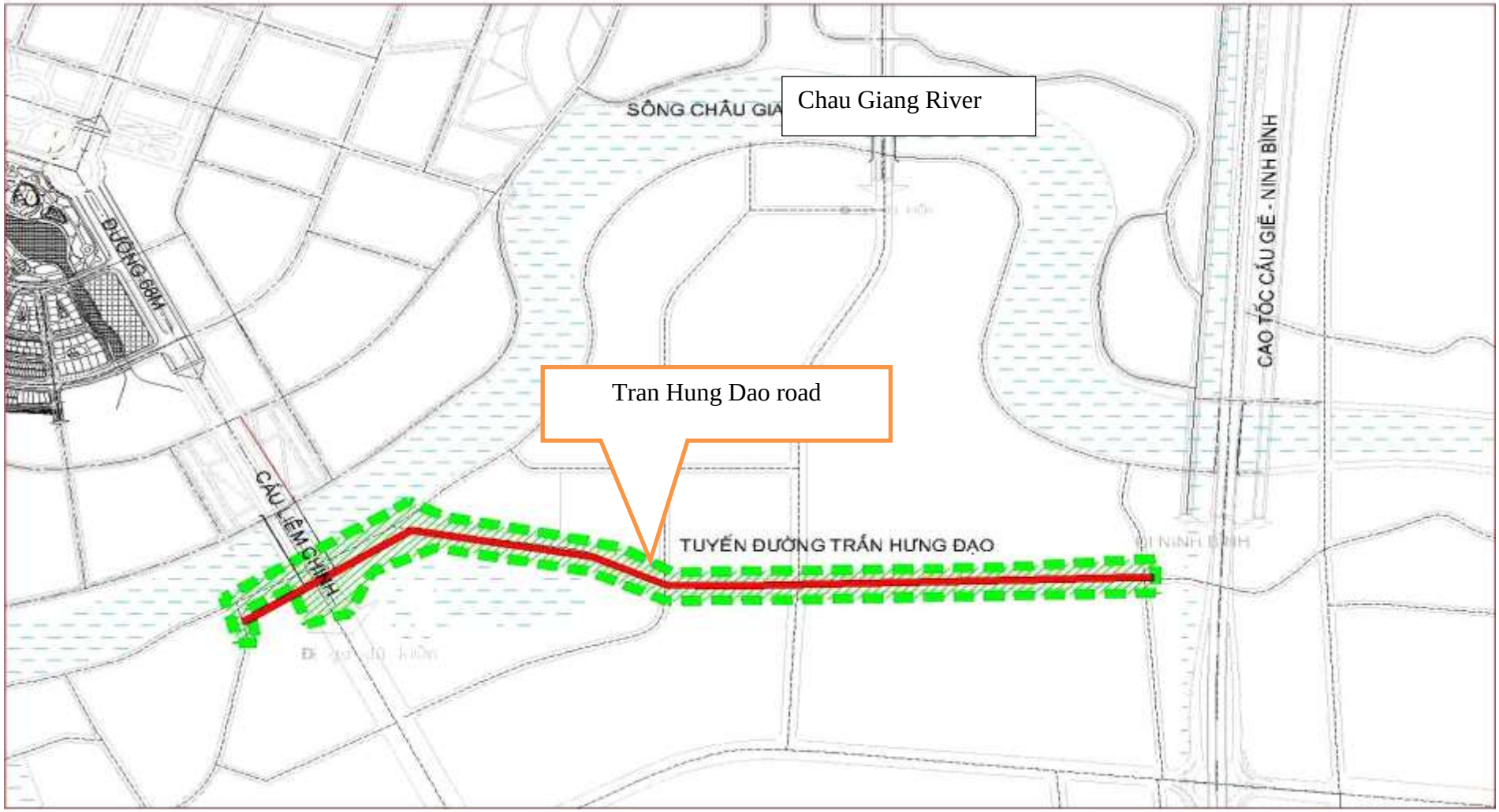


Figure12.Layout of locations of Component 3.

3.1 Upgrading Tran Hung Dao Road.

Upgrading Tran Hung Dao road from Liem Chinh bridge to Cau Gie-Ninh Binh expressway, connecting to the approved planning along 2 sides of the provincial road 491 and transport network in the region, 1.6km long, with 4 standard lanes, sidewalk, drainage, road lighting and utilities for pedestrian. (13.64 million USD).

In the past, this Tran Hung Dao Road section served as a dyke to prevent flood-water of Chau Giang River. This road section is about 500m away from Chau Giang River, with residential houses and agricultural land on two sides. Phu Ly City decides to embank Chau Giang river under the project on urgent bank erosion treatmentto mitigate erosion of agricultural land on the two sides and prevent flood-water.

Since implementation of this project, the function on flood prevention of this road section is no longer necessary. On the other hand, the elevated dyke road section is higher than surrounding ground elevation, causing difficulties for urban transport connectivity.

Therefore, besidesthe investment on Chau Giang River embankment construction, the subproject also proposes rehabilitation, lowering of this Tran Hung Dao Road section to urban road elevation to enhance connection with other urban roads.

At present, the provincial road 491 from Km0 – Km2+020 is the route of Chau Giang river dyke with the road surface of asphalt concrete Bn=9m; Bmtb=8m.

- Section from Km0 - Km0+562.30 (Km0+493.29 – Local road, from Me ramp – end of Tran Hung Dao road to Phu Dong embankment project) has a dense polulation at both sides. Ground elevation of households is about 0.1 m higher than that of the existing road. The ground elevation of a few of households is about 0.1 m lower than the existing road. Besides, about 16 households are located at about 1.2 m lower than the existing road.
- The section from Km0+562.30-Km0+980 (planned road 17.5m), has a densely populated density at both sides. The ground elevation of households are mostly equal to the existing road. There are about 6 households (2storey-3storey permanent building) are located at 1.2m lower than existing road. On the right side, Vuc Kieu lake is located behind residential housing .
- Section from Km0+980 - Km1+880 (planned road 13m), the population is scattered; the remaining space is rice field and lakes, ponds. The ground elevation of households are equal to the road surface. Some permanent houses (2-3 storey) along 2 road sides have lower elevation than road surface from 1,5m - 2m. The projects along these routes such as River City; housing area for staff, doctors of Viet Duc hospital; facility 2 – Viet Duc hospital; residential area of Vuc Kieu lake; Hana ecological restaurant have been certified following the planning to lower elevation to +3,5m, irrigation channels.
- Section from Km1+880 – Km2+020: Both sides are mainly ponds, lakes, canals and rice fields.

<u>The scope of work includes:</u>

- The roadbed elevation will be lowered from 0.1m – 2.0m depending on topographic –Upgrading and expand Tran Hung Dao road from 9.0 m width to 30 m width, with the total length is 1.5 km
- The two ends of the road with length of 0.1 km are extended only from 0.9 m to 11-16.5 m to ensure smooth connection with the adjacent roads.

- Drainage, sewer cross road, vertical ditch and surface street drainage.
- Lighting system, pavement and trees.

Component 4: Project Management And Technical Assistance

The technical assistance for PMU in preparing and implementing projects in the areas of: Preparation of Terms of Reference, bidding documents, resettlement policy framework; independent audit; Environmental SafeguardMonitoring and Resettlement; Project Evaluation, etc..

1.3.3 Subproject Area of Influence

From the environmental and social view of a subproject, the important thing is to determine the area where people pay attention on environmental and social issues.

The construction at the Tran Quoc Toan primary school is close to middle school Tran Quoc Toan, besides, there are quite high population around the school construction. Above the school is a small road. The constructed territory is the old basement of the school.

The South dike of Chau Giang river includes the dike line alongside the river directly influence on habitants who live near the river and on water environment of Chau Giang river, alongside from Liem Chinh bridge to Trieu Xa water stand, a part of the abutment is where habitants live, the rest is managed by the ward committee vegetation is primarily Pistia, grass and bamboo. There are no water passage here.

The construction area of Lam Ha 1 is close to the construction area of Lam Ha 2. Additionally, this area is closed to the Street team Dinh Trang where there are high population.

The construction area of Tran Hung Dao Street, the beginning has habitants who live on both sides, the middle has an Optic hospital and River silk city Project (invested by CEO group), the alternative is agriculture land. The end places between the field and building for staffs who work at Viet Duc and Bach Mai hospital- base 2.

Besides, the influenced areas also include the transport route alongside Chau Giang River, the internal route in Lam Ha ward, Quang Trung ward, Phu Van ward, Hai Ba Trung ward, Luong Khanh Thien ward, Minh Khai ward, the current route 491 and the makeshift camps on working site.

The environmental and social impacts will influence on some area beyond the subproject area, including:

- Materials mine serves for the construction of Tran Hung Dao and Bien Hoa routes.
- The route to transport materials to the construction sites.
- The construction waste and dredged sludge disposal site

1.3.4 AncillaryFacilities

The ancilliary facilites for MCDP in Phu Ly City - additional items include alternative roads, roads for transport of materials, camps for workers, disposal site. These facilities will be used temporarily during the construction phase of the subproject.

Access road to the site

For Component1: The access to the site in communes/villages is the main roads to the villages/communes.

For Component2:

- Rehabilitation of Lam Ha 1 Regulation Lake, the access to the side is via Le Cong Thanh road.
- Upgrading Bien Hoa road:the access to the site is via Bien Hoa, Le Loi, Le Cong Thanh, Truong Chinh, Nguyen Van Troi and National Highway 1A.
- Construction of the embankment in the south of Chau Giang rive: the access to the site is via Tran Hung Dao road

For Component 3: The access road will be Tran Hung Dao road.

The worker camps

The worker camps will be built for the workers, contractors, supervisors and engineers on the construction site. Garages are used for containing materials and equipment.

Water supply system

Surface water will be the supply source for site activities. Potable water is provided by Ha Nam Province's clean water supply system or from borewells.

Washing and construction water: Using domestic water source of the city; Water of borewells can be used, yet must be treated first.

Construction materials and transportation routes

Materials come from natural mines. Ha Nam has many natural mines, which can provide several types of construction materials for the subproject, such as: soil, rock, asphalt.Materials such as cement, iron, and steel be bought from local suppliers. The proposed material quarries are shown in Table 5.

All materials are processed in physical requirements suitable for present regulations. If it does not meet requirements, contractors have to change the suppliers. Requiring for providing material, technical go with the contraction progress.

The proposed material quarries are working under the legal permission from the Committee of Ha Nam. Their suppliers not only provide for infrastructure projects in Ha Nam, but also in Ha Noi and adjacent nearly provincse. MCDP Subproject is not related to the exploitation in large scale of sand, stones, therefore, there is no need to open any new mine. There is not any stone field which is the exclusive source of materials for the subproject.

In the future, choosing specific quarries to supply materials for the subproject will be proposed by the construction contractors, based on specific techincal requirements of technical design. The bidding documents and constractual documents have been ensured that the proposed material mines have to meet the technical requirements, and have the certification of environmental protection and operation license.

Transportation routes

For Upgrading infrastructure for the residential area in the North Quang Trung ward: The access roads to the construction site would be the existing roads where the sewers are to be installed, including Highway No.1A, Nguyen An Ninh road and Nguyen Chi Thanh road.

For Upgrading infrastructure in Duong Am and Quynh Chan residential group, Lam Ha ward: The main access to these sites are D4-N7 road, Nguyen Chi Thanh road, Vo Nguyen Giap road, Le Cong Thanh road and internal roads in the north of the city.

For Upgrading Tran Quoc Toan primary school, Hai Ba Trung ward: The main access would be Le Cong Thanh road, Nguyen Viet Xuan road, Trương Chinh road, Tran Hung Dao road and Le Duan road and internal roads in the south of the city.

For Construction of Phu Van kindergarten in Phu Van commune, Phu Ly city: The access road to the sites would be Phu Van bridge, Highway No.1A, Nguyen An Ninh road and Nguyen Chi Thanh road.

For Upgrading Lam Ha 1 regulation lake, Lam Ha ward: The access to the construction site would be Highway No.1A, Dinh Trang road, Le Cong Thanh road, Nguyen Chi Thanh road and the temporary roads on site.

For Upgrading drainage and technical infrastructure system for Bien Hoa road: The access road to the sites would be Highway No.1A, Le Loi road, Le Cong Thanh road and internal roads of the city.

For Construction of Chau Giang river southern embankment from Liem Chinh bridge to Cau Gie- Ninh Binh expressway and Upgrading Tran Hung Dao road: It can be accessible by the waterway on Chau Giang River, Tran Hung Dao road, Liem Chinh bridge and the temporary roads on site.

Disposal sites

The subproject activities will generate about325,446 m^3 of excaved soil; 60,000 m^3dredged sludge (Table 2) and 65 tons of domesstic waste and construction waste, and a very small amount of hazardous waste of about720 kg.

The amount of excavated soil is 89,540 m^3. They have all been analyzed for parameters regulated by the national standards and are within the permissible limits for agriculture or commercial purposes.These amounts could be used for land leveling at the low land area as needed. Currently, it is prposed to be used for levelling at the low land area of 1.6 ha after the health care station in Liem Chinh ward.

The amount of the generated dredged sludge is 60,000m^3. Dredged sludge is generated during the dredging of Lam Ha lake 1, Chau Giang river sides for embankment work. The analysis shows that the sludge does not meet the standards for agriculture purpose but it meets the standarard for forestry land. Therefore, it is decided that this generated sludge could be used for planting the urban trees. The garden for urban treeplanting of Phu Ly city has the overall capacity of 19 ha, which is surplus to receive this amount of sludge.

Domestic waste of MCDP AF will be collected by Ha Nam Environmental & Urban Work JSC.

Table 2. Volume of excavated materials of the Phu Ly AF subproject

Work	Dredged sludge (m^3)	Excavated soil (m^3)	Volume to be disposed (m^3)	Volume for back filling (m^3)	Volume to be transported out of construction (m^3)
Component 1					
Upgrading infrastructure for the residential area in the North Quang Trung ward	1,000	987	1,000	2,466	1,000
Upgrading infrastructure in Duong Am residential group, Lam Ha ward		10,000		2,414	8,434
Upgrading infrastructure in Quynh Chan residential group, Lam Ha ward		14,611		5,523	9,088
Construction of Phu Van kindergarten in Phu Van commune, Phu Ly city		3,969		23,858	
Upgrading Tran Quoc Toan primary school, Hai Ba Trung ward		1,493		1,054	
Component 2					
Upgrading Lam Ha 1 regulation lake, Lam Ha ward	40,000	50,214	40,000	48,299	41,915
Upgrading drainage and technical infrastructure system for Bien Hoa road		9,282		4,626	4,656
Construction of Chau Giang river southern embankment from Liem Chinh bridge to Cau Gie- Ninh Binh expressway	20,000	79,500	20,000	1,982	77,518
Component 3					
Upgrading Tran Hung Dao road		155,390		75,184	80,206

Table 3. List of material quarries

No	Supplier	Material	Exploitation location	Reserves	Transport Route	Activity	Customer
1	Mr Dang Xuan Phuong	Sand	Nguyen Ly sand quarry is located at Red River, belonged to boundary of Tran Xa village, Nguyen Ly commune, Ly Nhan district, Ha Nam province	Supplied source of sand beach is collected directly from the Red River to gather in the yard. Currently, the providing capacity of yard is around 3,000-4,000 m^3/ day. Mine reserves is large and recovered annually	From the quarry, along village road to 492 Road is about 4km, then along 492 Road to Vinh Tru Town is about 5 Km, from Vinh Tru town, along 491 Road to starting route is about 14 Km.	Legally	Supplied for many projects including MCDP AF
2	Thuy Hien Construction Material Trading Co. Ltd.	Sand	Moc Nam Commune, Duy Tien District, Ha Nam province	Large quantity with many types (including building sand, filling sand). Currently, the providing capacity of quarry is around 5,000 m^3/day. Quarry capacity is large and recovered annually	From quarry, along National Road No. 38 to National Road 1A in Dong Van town is about 11km. From Dong Van to the projects is about 13 km (total distance is about 24km)	Legally	Supplied for many projects including MCDP AF
3	Thanh Tam Co. Ltd	Stone	Cum Hill stone quarry located in right side of National Road 1A, belonged to Thanh Hai Commune, Thanh Liem District, Ha Nam Province	Supplied capacity is around 132,000 m^3/ year (included macadam stone, gravel macadam stone type 1, type 2 and ashlar stone)	Transport distance to the center is about 19km by road	Legally	Supplied for many projects including MCDP AF
4	Tranmeco Construction Stone One Member Co. Ltd	Stone	Bong Lang quarry is located in the right of National Road 1A, belonged to Thanh Thuy Commune, Thanh Liem district, Ha Nam province	Supplied capacity is around 1,000,000 m^3/year (included macadam stone, gravel macadam stone type 1, type 2 and ashlar stone)	From quarry to project area is about 12 km by road	Legally	Supplied for many projects including MCDP AF
5	Thanh Cong Co. Ltd	Filling soil	Thuong Village, Thanh Nghi Commune, Thanh Liem District. Quarry is located on the right of connected road from National Road 1A to Bong Lang, from National Road 1A to quarry is approximately 4 km.	The exploitation capacity of quarry is about 200,000 m^3	From quarry along BTN road of Bong Lang road to National Road 1A is about 4km, from National Road 1A (km244 + 100) to the center is about 15 km by road	Legally	Supplied for many projects including MCDP AF
6	Tranmeco Construction Stone One Member Co. Ltd	Filling soil	Dong Ao Quarry is located in Thanh Thuy commune, Thanh Liem district, Ha Nam province	The exploitation capacity of quarry is about 200,000 m^3	From quarry to project area is about 12 km by road	Legally	Supplied for many projects including MCDP AF

The volume of materials estimated for the subproject components is shown in the table 4below:

Table 4. Estimated amount of materials of the subproject

Material	Unit	Component 1					Component 2			Component 3
		The residential area in the North Quang Trung ward	Duong Am Residential Group	Quynh Chan Residential Group	Phu Van kindergarten	Tran Quoc Toan primary school	Lam Ha 1 Lake	The embankment in the south of Chau Giang river	Bien Hoa road	Tran Hung Dao road
Stone	m^3	1,452	2,775	5,266	3,480	532	9,000	22,590	1,325	82,607
Sand	m^3	4,394	3,006	6,568	31,486	1,397	2,570	7,831	2,704	15,781
Soil	m^3		1,477	2,291			54,414	25,626	977	1,639,211
Reinforced concrete pile	m				5,498	3,851		35,302		
Bamboo pile	m	15,811	12,268	46,352			132,278	6,836	14,743	262,925
Wire	kg	488	354	2,235	3,124	2,291	12,069	54,709	175	6,195
Nail	kg	237	273	1,648	1,387	941	1,446	32	896	264
Wooden formwork types	m^3	41	45	211	155	109	173	138	88	392
Welding rod	kg	4,028	104	526	2,195	1,555	1,821	9,531	1,106	12,750
Steel of various kinds	kg	38,857	25,440	146,513	205,702	150,655	107,398	789,895	13,192	80,345,290
Brick	Brick	84,062			243,226	88,847	48,670	712,832	22,596	243,292
Adobe brick	Brick				403,995	322,843		7,136		
Block	m^2	1,329					2,557	9,739		84
Cement	kg	626,730	583,456	1,673,920	940,102	395,700	951,983	3,921,065	282,950	24,375,179
Fine asphalt concrete	Ton								1,266	
Asphalt concrete medium course	Ton								1,674	

1.3.5 Implementation Arrangement

**** Implementation plan***

Estimated implementation period of the subproject: 3 years

Loan Agreement between GoV and WB is slated to come into force in November of 2017.

Project Implementation Plan is by the key timeline as follows:

- Investment Project, Basic Design preparation: Completed in January of 2017.
- Detailed Design, BD preparation: Each package to be completed before moving to the next one, and the last one to be complete no later than October of 2017.
- Construction contractor selection: The first package to be completed before January of 2018 andcompleted the bidding in Quater II / 2018.
- Project implementation schedule: complete before December 2020, disbursement grace April 2021.

**** Total investment***

Total investment: **USD 32.910 million**

ODA fund: **USD26.0 million** (80%)

- IDA fund: USD 6.5 million, 100% on-grant to province
- IBRD fund: USD 19.5 million: 30% on-grant and 70% on-lent to province.

Counterpart fund: **USD 6.91 million** (20%)

1.4 ESIA IMPLEMENTATION METHODOLOGY

Approach and environmental social impact assessment

Environmental approach

The subproject will be financed by the WB and the GoV. ESIA of the subproject is required for the subproject and must comply with the policies and requirements of the WB and the GoV, based on the experience of projects funded by the WB and projects implemented by the GoV.

ESIA is prepared based on the TOR with the national standards and regulations of Viet Nam and the World Bank safeguard policies..

Moreover, subproject content, scope and technical implementation are studied thoroughly in the ESIA subproject towards every component as well as overall project. Thus fieldwork conducted in and around the subproject scope is implemented for selection and assessment environmental and social issues rising when the subproject is implemented.

The evaluation process for the ESIA subproject is conducted based on a combined analysis of economy, finance, institutions, society and technology, ensuring the environmental and social issues are involved in selecting the subproject, locations and decisions related to technological measures, etc. The subproject impacts are divided into direct and indirect ways, cumulative impacts as well as medium-term and long-term impacts. It is also necessary to clarify potential impacts may happen during the construction period, unavoidable and unconverted impacts.

At the same time, conducting and proposing policies and appropriate measures for each component are required to manage and reduce to the minimum environmental and social impacts.

Besides, two consultation meetings are held in order to prepare for the ESIA subproject as other consultations are also conducted in the subproject preparation process.

Social approach

This social assessment (SA) was conducted alongside the environmental assessments of the subproject, on the basis of the feasibility study. Its main purpose was two-fold. First, it examined the potential subproject's positive and adverse impacts of planned subproject interventions. Second, its findings informed the definition of measures for addressing impacts and proposing community activities to be undertaken, relevant to reach the subproject's development goal. In doing so, the SA gathered the relevant information on the subproject's area concerning, demography, economic profile, public services provision and concerns and suggestions of the affected. For the unavoidable identified adverse impacts, and as per the local norms and the Bank's OP 4.12 consultation with stakeholders, local people, governmental agencies, and others pertinent, were carried out to ensure affected peoples will be appropriately compensated for, and supported, in a manner that their socio-economic activities will be promptly and fully restored at least to the pre-project level, and that their livelihoods will not be worsen off. Gender analysis was also carried out as part of the SA to understand underlying gender dimensions (from subproject impact perspective) to enable gender mainstreaming to promote gender equality, and enhance further the development effectiveness of the subproject, and the subproject as a whole.

1.5 SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT METHOD

1.5.1 Environmental Impact Assessment Method

Field survey and investigation method: investigating and surveying the status of environmental resources. Studying and selecting location, parameters and the monitoring and sampling method of soil, sediment, surface water, groundwater, wastewater and air within the subproject area.

Sociological survey and public consultation method: This method can evaluate the participation of the parties, the participation community in implementing the subproject. In consultation with the community, the consultant team has held public consultation meetings and group discussions in all construction areas of the subproject, ensuring sufficient components: directly or indirectly affected persons, management agencies; subproject preparation participants, organizations and other individuals, etc. There are 2 consultations:

- First time: Identifying the scope of impact, subproject introduction, preliminary assessment of environmental impacts caused by subproject activities, obtaining comments and opinions on mitigation measures; identifying environmental elements which were not known previously in the subproject area.
- Second time: Completing draft ESIA report: To report and discuss the results of ESIA and receive responses as well as agree on the results of environmental impact assessment of the subproject.

During the consultation process, the consultant informed about the negative environmental impacts that may occur during the subproject implementation, the proposed measures to mitigate those impacts. The government and people of the affected area will comment on the stated environmental issues and mitigation measures.

Statistical method: Data collection, processing and analysis: meteorological, hydrological and environmental data over years in the subproject area.

Inheritance method: Inheriting the study results of the related subprojects.

Expert method: The consultant participated and organized the meetings to obtain comments on the proposed mitigation measures to negative impacts of the subproject with environmental experts, sociological specialist, etc.

Summary, analysis and formulation method: Analyzing and summarizing the impacts of the subproject on the components of natural environment and social economy in the subproject area.

Rapid assessment method: The assessment method based on pollutant emission factor. The rapid assessment method is highly effective in determining load, pollution concentration due to gas emissions for the use of machinery and equipment and operation of materials transport vehicles; load, level of water pollution caused by wastewater discharged by workers during the construction of the subproject; Water pollution load due to the operation of works during the construction of the subproject. So, the potential environmental impacts of the pollutant sources could be forecasted. The rapid assessment method is used for rapid forecast of load for the facilities generating pollutants.

Comparison method: Assessing the impacts by comparing the results of measurement, analysis, calculation and forecast of the concentration of pollutants due to the subproject with Vietnam standards on environment issued by the Ministry of Natural Resouces and Environment on quality of soil, water, noise and air and sectoral standards of the Ministry of Health, the Ministry of Construction.

Matrix method: A matrix is made to compare each activity of the subproject with each parameter or environmental component to evaluate the relationship of causes and consequences. The matrix method is valuable for determining the impacts of the subproject and come up with summary information about impact assessment. The method is simple, easy to use and does not require a lot of environmental data but it could analyze explicitly different actions on the same factors. The environmental matrix method helps clarify the relationship between development and environment.

Baseline environment monitoring, sampling and analysis method: Based on the activities of the subproject as well as the actual survey in the subproject area, the monitoring and sampling for analysis of the status of baseline environment were conducted to create the basis for the proposing mitigation measures as well as environmental management and monitoring plan when the subproject is implemented. The environmental components are selected for monitoring and sampling including:

The monitoring of quality of soil, surface water and ground water were carried out following the guidance of the procedures/regulations below:

Air environment monitoring: Circular No.28/2011/TT-BTNMT stipulating procedures for ambient air and noise monitoring.

Surface water and sediment environment monitoring: Circular No.29/2011/TT-BTNMT stipulating procedures for monitoring inland surface water.

Ground water environment monitoring: Circular No.30/2011/TT-BTNMT stipulating procedures for groundwater environment monitoring.

Soil environment monitoring: Circular No.33/2011/TT-BTNMT stipulating procedures for soil environment monitoring.

The taken samples then preserved and delivered to VILAS standard laboratory to analyze significant environmental index. The analyzing methods are applied under Vietnam conducted criterions and standards.

1.5.2 Social Assessment Method

Survey and data collection

Regarding the process for the elaboration of the SA, the method included data gathering and analysis of secondary information, and primary qualitative and quantitative information. The latter included defining a survey approach/ frame and methodology to determine the appropriated sample size, and data collection technique/ method. Two main survey techniques selected, included the following: (i) through templates/ forms applied among authorities of the subproject wards/communes; (ii) a stratified sampling survey among the households' on their socio-economic information.

Secondary data collection

Information and data relating to the subproject were collected from the Phu Ly city Development Project Management Unit and from the other sources of socio-economic situation analysis such as Statistical Yearbook of Ha Nam Province, the socio-economic reports of province/ district/commune and poverty analysis relating to ethnic minority groups.

Quantitative method

A socio-economic survey was carried out in order to document the personal profile of the people in the subproject area, related to the affected and benefited households (or both). Socio-economic survey was conducted from August 9, 2016. There were 800 households consulting through questionnaires, including 8 wards/communes of Phu Ly city.

Qualitative method

Qualitative research was conducted as in-depth interviews with key informants, including: (a) residential group leader/village leader, (b) leaders of commune/ward PCs and (c) households in the subproject area and (d) affected and benefited households. The purposes of in-depth interviews are to gather opinions and wishes of the people in the subproject area to offer ways to address potential conflicts and identify measures to mitigate negative impacts of the subproject.

PUBLIC CONSULTATION

Development and implementation of plan for efficient participation of all the beneficies and affected people is important under the subproject, including determination of the number of affected people or beneficiaries of the subproject. Community participation should be encouraged to collect information about responses of the community about the components of the subproject proposed during subproject implementation and monitoring. At this phase, 8 consultation meetings were held in 8 wards/communes with the participation of the involved parties, including:

- Representatives of local authorieis from 8 wards/communes;
- Mass organizations: Fatherland Front, Women's Union, Youth Union, Farmer's Union, and Veteran's Union of 8 wards/communes. Representative of households in the subproject area include households with potential land to be acquired, beneficiary households, vulnerable affected such as, households with the disabled members.

Issues discussed during public consultation included: (i) introduction of the subproject and its components; (ii) overview of local socio-economic situation of subproject ward/communes;

(iii) assessment status of infrastructure of residential areas, including electricity, roads, schools and health stations; (iv) gathering of demands (suggestions and concerns) for investment in construction and renovation of the local infrastructure; and (v) screening and assessment of potential impacts that may occur during the subproject's construction phase (partial and temporary flooding in nearby area, limited access to fishing revenue) on socio-economic, and cultural practices of people in the subproject area (Details of information dissemination, consultation and participation are included in Section 7 of this document).

1.6 IMPLEMENTATION ORGANIZATION FOR ESIA PREPARATION

Name of project: Medium Cities Development Project – Phu Ly city subproject

Donor: The World Bank (WB)

Executive agency: Ha Nam Provincial People's Committee

Proposing Unit: People's Committee of Phu Ly city

Addreess: Bien Hoa street, Luong Khanh Thien ward, Phu Ly city, Ha Nam province.

Phone: (84) 0351 3851099; Fax: 0351 3851 099;

Project management agency: Phu Ly City Development Project Management Unit

Address: Resettlement area of Le Cong Thanh extended road, Dinh Trang subarea, Lam Ha ward, Phu Ly city, Ha Nam.

Phone: (+84. 351) 3 883 232; Fax: (+84. 351) 3 883 232;

Consultant: The Joint Venture of I.COM and WATERCO

Those who participate in preparation of ESIA are named in the table below:

Table 5.List of staff participating in ESIA preparation

No.	Name of experts	Expertise	Position
1	Nguyen Thi Mai Hoa	Master of Environment	Team Leader
2	Nguyen Thi Thuy	Master of Environment	Environmental Expert
3	Phung Cong Thanh	Environmental Engineer	Environmental Expert
4	Tran Thi Ngoc	Bachelor of Sociology	Social/Resettlement Expert
5	Tran Bich Hanh	Bachelor of Sociology	Social/Resettlement Expert

CHAPTER 2: NATURAL, ENVIRONMENTAL, AND SOCIO-ECONOMIC CONDITIONS.

2.1 GEOLOGICAL AND BIOLOGICAL CONDITIONS

2.1.1 Geological and Topographical Conditions

Geological conditions

Phu Ly city is the center of politics, economics, and culture of Ha Nam province, located in the center of the province, between the confluence of Day, Nhue, and Chau rivers. Its geographical coordinates are 20°30' - 20°35' north latitude and $105^0$54 - $105^0$58 East longitude. The geographical boundary and adjacent location of Phu Ly city to the neighboring districts of the province are as follows:

- The East and South are adjacent toThanh Liem district;
- The West is adjacent to Thanh Liem and Kim Bang district;
- The North is adjacent to Kim Bang, Duy Tien district.

Geotechnical and hydrogeological conditions

The regional strata consists of 4 layers: layer 1 - gray-brown clay in hard plastic state; layer 2 - gray, brown gray clay in melt plastic state; layer 3-grayish sandy mud; layer 4 – fine grain sand, sandy brown gray and blackish gray dust granules in medium tight state.

Groundwater appears in the drilling boreholes at the elevation of +0.75 to + 1.65m.The measured water levels change from +1.20 to +1.36.

2.1.2 Hydrological-climatic Conditions

Meteorological conditions

The subproject area is located in the region typical of Northern Plain's climatic features – within the monsoon tropical ring, with high volume of sunlight and rainfall and two distinctive seasons:

The Winter lastsfrom November to April of next year, with mostly cold and humid Northeast wind and relatively great number of rainy days. The weather is extremely untolerable and unfavorable for agricultural production ("drizzle and a north-easterly wind" – devastative, extreme cold and high humidity).

The Summer lasts from May to October, with sunny, hot weather of dramatic change, with many weather patterns (causing heavy rain, severe flood by polar front, storms, tropical convergence, etc.).

Below are some climatic figures observed at Phu Ly Meteorological Station:

Air temperature:

The verage air temperature is 23.1°C. The highest monthly average temperature is 32.1°C (in July). The highest absolute temperature is 41.5°C. The lowest monthly average temperature is 14.2°C (in January). The lowest absolute temperature is 4.5°C. The hottest months are June, July, and August. The coldest months are January, February, and December.

Rain:

The average rainfall in many years is 1,697mm. The rainy season lasts from May to October, with a total rainfall of the entire season being 1,442mm, accounting for 85% of the total annual average rainfall. The average rainfall of the 4 continuous months with the highest

rainfall (from June to September) is 1,085mm, accounting for 64% of the annual average rainfall. The dry season is from November to April, with a total average rainfall being 255mm, only accounting for 15% of the total annual average rainfall. The average rainfall of the three continuous driest months (from December to February) being 75mm, only accounting for 4.4% of annual average rainfall. The average number of rainy days of each year is 146.4 days, of which from March to September, averagely each month has up to 12.3 – 17.4 rainy days. For November and December, averagely each month has only 5.2 – 6.3 rainy days.

Humidity:

The monthly average humidity is 85.1%, and the average absolute lowest humidity of many years is 17 - 41%. The time with the highest humidity is from February to April (87.6% averagely).

Wind, storm:

The average wind speed of many years is 3.0m/s. The highest wind speed is typically due to storm conditions, or northeast monsoon, being 36 m/s as observed.

Sunlight:

The total average year-round number of sunny hours of many years is about 1,693 hours (averagely 4.6 hours for each day).

Hydrological conditions

Chau Giang River:Chau Giang River flows through Phu Ly City, in meandering shape and complicated flow.The mainstream follows the left bank from nearby Me prisonto the end of Bien Hoa Road. At the upstream section of Phu Ly Bridge on NR 1A, the mainstream follows the right bank, with uneven riverbed width (100-180m) and riverbed elevation from -2m to -4 m. Especially there's especially deep location (-7m), across Luong Khanh Thien Primary School. River beach of this area are currently subject to soil fall-in, threatening safety of the residential areas living nearby.

The hydrological regime of Chau Giang River (in Phu Ly City) is subject to the influence of upstream flood within Red River system.The average water level of many years for the dry season is +1.2m (water level respective to 95% frequency being +0.28m).The average water level of many years for the rainy season is +2.18m. Design flows creates the source in the dry season and irrigatesalluvial soilin the rainy season) are Qdry =36m^3/s and Qrainy =69.61m^3/s.

The surface flow from Red River, Day River, and Nhue River entering the province each year is about 87.6 billion $m^3$of water. Groundwater flowentering the area also makes Ha Nam always supplemented with groundwater from other areas. Day River has a total catchment area of 5,800$km^2$and total length of 240km. The length of the section in Ha Nam is 47 km. According to the report information of Ha Nam Hydro-Meteorological Station, the water levels of Day River observed at Phu Ly Station are as follows:

Lowest water level: - 0.14m (in dry season)

Historical flood water level: + 4.72m (1985)

Warning water levels:Level 1: +2.9m; Level 2: +3.5m; Level 3: +4.1m (as per Decision No. 632/QDTTg dated 10 May 2010 of PM, at Phu Ly Hydrological Station).

The water flow of Day River in the dry season is approx.105 m^3/s and in the rainy season is about 400m^3/s.

Nhue River is an excavated one directing water of Red River from Thuy Phuong, Tu Liem, Hanoi to Ha Nam Province, with total length of 14.5 km. The water then enters Day River in Phu Ly. Nhue River, apart from the agricultural irrigation function, it also receives most of the wastewater and storm-water of Hanoi city.

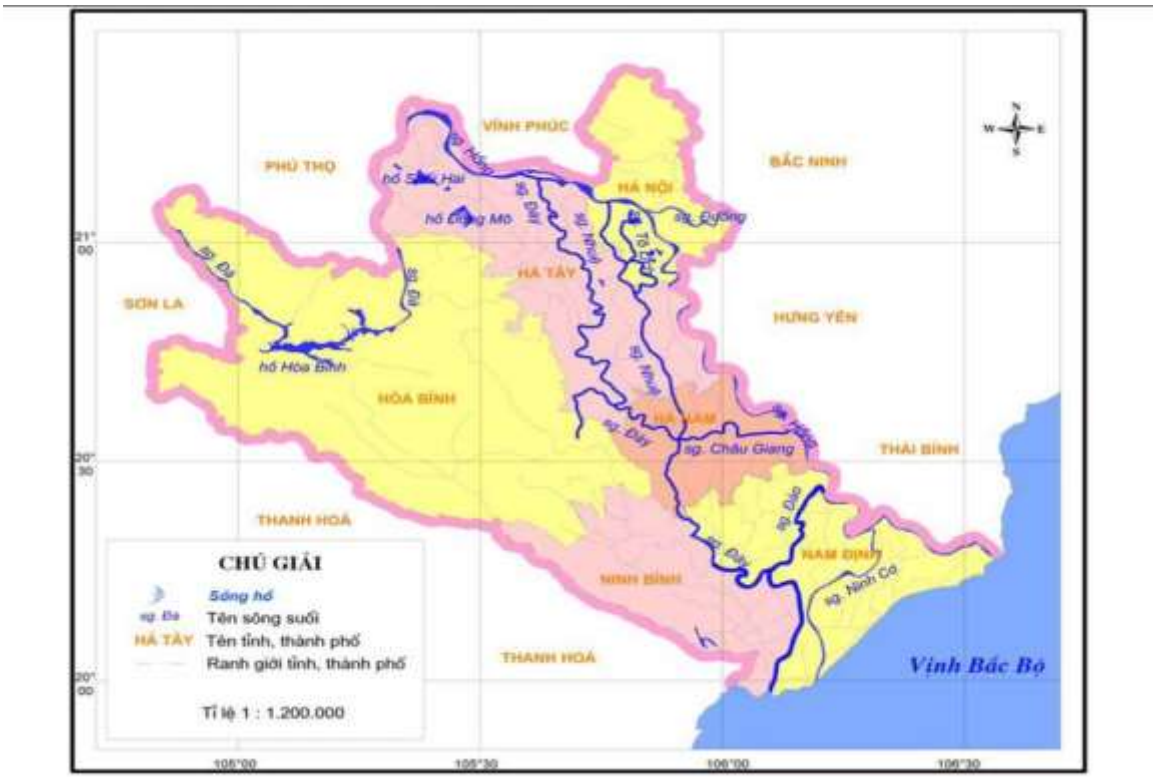


Figure 13.Basin of Chau Giang, Nhue and Day rivers in Ha Nam province

2.1.3 Biological Resources in Phu Ly Province

a. Flora

According to Vietnam National University-level key scientific research subject general report QGTĐ 0603, Ha Nam Province has 51 high-rank plant species of different ecological ranges categorized into the following groups: i) Underwater plant group: pondweed, arrow-leaf species; ii) Water surface plant group: water hyacinth, water cabbage, watermoss, giant salvinia, spinach, coriander; iii) flood-tolerant plant group: consisting the most special plant biomes in terms of both ecological and landscape roles for the area. Forest flora consists of mostly species of Poaceae; Cinamomum albiflorum Nees; Sapindus oocarpus Radlk; Pterospermum diversifolium blume; Pterospermum truncatolobatum Gagnep; Liquidambar formosana hance,

b. Fauna

According to preliminary statistics, this area has up to 40 mammal species, 113 bird species, 14 reptile and amphibian species. The forest fauna includes some animal species such as mammal (civet, bat, squirrel, mouse, etc.), reptile (snake, lizard, chameleon, etc.), bird (flower-pecker, starling), etc. At present, found organisms of wild species such as civet or chameleon are of very few numbers. Ha Nam's forests have one native animal species

currently under the risk of extinction – Delacour's langur (Trachipythecus francoisii delacourii).

Because of relatively flat terrain and eco-systems of water bodies of Northern Region plain, he aquatic animals in Ha Nam has tropical characteristics. Statistics show that Northern Region plain has about 260 freshwater invertebrate species. There's great diversity of species, being Rotatoria; Copepoda, Cladocera; Oligochaeta living in mud bed environments; Crdustacea-Macrura, Brachyura; Mollusca of small size and thin cover suitable to live in still, shallow water environments.

In the lakes, ponds of plain areas, tropical algae species develop even with more diversity, especially Microcystis, Anabaena, Merismopedia, Coelosphaerium, Scenedesmus, Pediastrum, Ankistrodesmus, Cryptomonas, Gloeocapsa, etc. Preliminary statistics show that Clorophyta (113 species) and Cyanobacteria (32 species) are those developing the most strongly. Diatoms, dinoflagellates and euglenophytas develop less strongly.

In the water bodies of Red River Delta region, the following species are found: Coilia grayi (Engraulidae), Altigena lemassoni, Megalobrama terminali, Hemiculter leucisculus, Elopichthys bambusa, Onychostoma gelarchi, Squaliobarbus curriculuss, Cirrhina molitorella, Puntius fasciolatus, Clenopharyngodon idellus, Luciobrama macrocephalus, Culter erythropterus, Toxobramis houdemeri, Rasbora lineatus, Cyprinus carpio, Carasinus auratus, Hypothalmichthys harmandi, Misgusnus anguillicaudatus (Cobitidae). Besides, there are also some fish species immigrating from the sea in, the most popular of which are Clupanodon thrissa, Hilsa reeveri, etc. They are mostly those living in water rice field environment, mostly some raise fish species such as common carp and some species able to live in changing shallow water environments.

c. Chau Giang River

Chau Giang River, aka Chau River, is a river in Red River – Thai Binh River system of Northern Region of Vietnam, completely within Ha Nam Province's area. This is an important river in terms of location of Nhue River – Day River basin.

Chau Giang River starts from Tac Giang, Duy Tien, joined by Nong Giang River, to An Nong (Tien Phong) chia than two branches: one being borderline between Ly Nhan District and Binh Luc District, then to Huu Bi irrigation PS, then to Red River; one being borderline between Duy Tien District and Phu Ly City, then to Day River at Phu Ly City. Chau River is about 69km long. Annually average water level is +2.18m; highest water level is +4m (historical flood on August 22nd, 1971).

Figure 14. Chau Giang river

Phytoplankton

65 species are found at Chau Giang River area. The genera of Euglena, Oscillatoria, Scenedesmus, Chlorella, Nitzschia are the indicators of organic pollution of water, found in most of the areas.

Zooplankton

34 zooplankton species are found for Chau Giang River area, of the groups of Cladocera, Rotatoria, Copepoda and other aquatic groups. Cladocera and Rotatoria groups have the most number of species (12 species each – 30%); then Copepoda (11 species – 27.0%), and lastly other groups (5 species – 13%). Most of the found zooplankton species are of popular, wide-distributed species. Some species can be commonly found in the northern of Vietnam, mostly those of Copepoda group such as Phyllodiaptomus tunguidus, Heliodiaptomus falxus, and Sinocalanus mystrophorus. Study results of each survey time show that the percentages of distribution of the groups are relatively uniform, with highest percentage of Copepoda group, then Cladocera group, and lowest percentage of other groups such as Ostracoda, insect larvas, crustaceans, etc. The Rotatoria group takes a relatively high percentage compared with other groups. This complies with high increase of organic nutrient contents around the surveying stations.

For Chau Giang River area, zooplankton density ranges from 4,122 to 11,204 organisms/m^3 and tends to decrease with the flow. Bio-diversity Index D ranges from 2.44 to 2.96, indicating that the water at the area is slightly polluted. Great percentages of zooplankton organisms observed at the surveying stations completely belong to those groups well adaptive to nutrient-rich water environment, such as Mesocyclops leuckarti, Thermocyclops hyalinus, Rotaria neptunia, Lecane luna, Brachionus calyciflorus.

Zoobenthos

26 zoobenthos species are found at Chau Giang River area, of 39 genuses, 26 groups, 13 orders and 6 classes. Gastropoda has 23 species (46%); Crustacea – 13 species (26%); Bivalvia has 10 species (20%); and finally Annelida - only 4 species (8%). Species commonly found at sampling locations are: Angulyagra polyzonata, Sinotaia aeruginosa, Pomacea canaliculata, Melanoides tuberculatus, Corbicula moreletiana, Stenothyra messageri. These species also can well tolerate polluted environment. Notablly, the Pomacea canaliculata species was originally an imported species for raising yet now has been under very strong natural development and currently is amongst the ivasive species as per IUCN's warning.

For Chau Giang River area, zoobenthos density ranges from 22 to 88 organisms/m^2, resepective to biomass range of 1.26 – 34.5g/m^2. Bio-diversity Index D ranges from 2.44 to 2.76, indicating that water of the area is currently slightly pollute.

(*Source: Using phytoplankton, zooplankton, zoobenthos data to evaluate water quality of Nhue-Day river joining area in Ha Nam Province; Author: Phan Van Mach, Nguyen Dinh*

Dao – Insitute of Ecology & Biological Resources, Vietnam Academy of Science and Technology).

Comments:

The biome structure and variations of the related aquatic species show that the water environment in Chau Giang has been affected by organic pollution. In the subproject area, there are no endemic species or creatures listed in the Red Book which require protection. The subproject area have no natural vegetation and no rare or typical fauna and flora.

2.2 ENVIRONMENTAL STATUS IN THE SUBPROJECT AREA

To assess the environmental status of the subproject area, the Client (Phu Ly Urban Development Project Management Unit) has cooperated with the ESIA Consultant to conduct surveying, monitoring and site sampling in the subproject area: taking totally 241 samples (including 24 air samples (12 locations x 2 times in morning and afternoon = 24 samples); 9 surfacewater samples; 9 wastewater samples; 5 groundwater samples; 4 soil samples; 4 dredged sludge samples allocated evenly for the subproject items. The location, size, and structure of the samples are described in the table and diagram of the sampling locations shown in the appendix of the ESIA.

The sampling was conducted in August 2016.

The process of sampling and preservation of samples were taken in accordance with the current regulations under the Vietnamese environmental standards.

The analysis of the monitoring results are based on the standards, current regulations of Vietnam, and compared with the annual monitoring results of the Department of Environment and Natural Resources (DONRE) of Ha Nam province to have the exact evaluations of the background environmental quality of the subproject area.

2.2.1 Air Quality

To evaluate the quality of ambient air of the subproject area, the air quality monitoring locations under the work items planned for construction are divided according to the components. Accordingly, 12 locations include:

Table 6.Air sampling location

KK1	Phu Van kindergarten
KK2	Quynh Chan residential group, Lam Ha ward
KK3	North residential area of Quang Trung ward
KK4	Lam Ha 1 Lake
KK5	Duong Am residential group, Lam Ha ward
KK6	Start point of Bien Hoa road (Gate of People's Committee)
KK7	End point of Bien Hoa interchanging with Le Loi road
KK8	Start point of the construction area of Chau Giang river embankment (Me Noi pagoda)
KK9	Start point of Tran Hung Dao road (near Liem Chinh road)
KK10	End point of Tran Hung Dao road (Trieu Xa culvert)
KK11	End point of construction area of Chau Giang river embankment (Mr. Pham Van Sy's house, Trieu Xa village)
KK12	Tran Quoc Toan primary school

Each location was monitored at two different times which were morning and afternoon. The average monitoring time wasan hour. The monitoring and analysis results of regional air quality are shown in the appendix of this report.

The analysis results showed that at all the surveyed locations the ambient air quality is still good, the parameters of dust, CO, NO_2, SO_2 and HC are much lower compared to the national standards indicated in QCVN 05:2013/BTNMT and QCVN 06:2009/BTNMT. There were not any analysis samples having sign of pollution with these toxic substances.

Compared to the noise standard QCVN 26:2010/BTNMT for common areas from 6pm to 21pm which is 70dBA, all the sampling locations have the noise levels lower than the allowable limits. The highest value of the measured noise level is only limited to 69.7 dBA. There are not any Vietnamese regulations on the parameters of temperature, humidity, and wind speed. However, based on the analysis results, it could be seen that at the time of the survey and sampling, the temperature of the subproject area is relatively high, ranging from 33 to 35^0C. The average humidity is 62%, and the wind speed is low.

The analysis and comparison results showed that the quality of air environment in the subproject area is within permissible standards.

Table 7.Air quality analysis results

No.	Aspect	Unit	Analysis method	KK1	KK2	KK3	KK4	KK5	KK6	KK7	KK8	KK9	KK10	KK11	KK12	QCVN 05, 06:2013 BTNMT
1	Temperature	^oC	*QCVN 46:2012/BTNMT*	35.2	35.3	35.1	35.2	35.3	35.5	34.8	34.3	34.2	34.7	34.6	35.4	-
2	Relative humidity	%		62.3	62.4	62.5	62.6	62.2	62.6	62.7	62.5	61.3	61.4	62.3	63.7	-
3	Wind speed	m/s	*ITA-HT-04*	0.86	1.02	0.82	0.65	0.84	1.25	0.73	0.62	0.72	1.08	0.63	0.58	-
4	Smell (*)	-	*TCVN 6492:2011*	No smell	No smell	No smell	No smell	No smell	No smell	No smell	No smell	No smell	No smell	No smell	No smell	-
5	CO	$\mu g/m^3$	*ITA-PPTN-WI32*	11.500	11.200	12.050	12.500	12.400	12.200	12.350	10.500	11.600	11.500	11.450	10.800	**30,000**
6	SO_2	$\mu g/m^3$	*TCVN 5971:1995*	126	128	132	135	129	126	138	124	126	124	137	121	**350**
7	NO_2	$\mu g/m^3$	*TCVN 6137:2009*	95.8	95.3	96.2	95.4	96.3	97.2	97.5	90.4	96..7	97.3	97.4	90.3	**200**
8	O_3(*)	$\mu g/m^3$	*TCVN 7171: 2002*	50.8	51.2	50.3	50.6	51.3	52.3	54.1	52.4	51.6	52.5	54.3	52.2	**200**
9	TSP	$\mu g/m^3$	*TCVN 5067:1995*	92.8	92.5	93.6	93.4	90.3	91.3	93.2	93.6	90.1	91.7	93.3	93.2	**300**
10	PM_{10}	$\mu g/m^3$	*TCVN 5067:1995*	8.5	8.3	8.4	8.5	8.3	8.1	8.6	8.7	8.4	7.9	8.2	8.3	-
11	$PM_{2.5.}$	$\mu g/m^3$	*TCVN 5067:1995*	1.86	1.92	1.93	1.94	1.76	1.85	1.83	1.82	1.46	1.76	1.68	1.73	-
12	Pb (lead) (*)	$\mu g/m^3$	*TCVN 6152:1996*	0.06	0.08	0.09	0.05	0.04	0.05	0.04	0.03	0.06	0.04	0.03	0.05	-
13	Leq	dBA	*TCVN 7878-2:2010*	60.8	64.2	65.1	58.2	60.3	64.3	65.3	58.3	60.8	63.2	64.2	57.2	**70**(**)
14	Lmax	dBA	*TCVN 7878-2:2010*	65.3	68.4	69.3	61.1	65.2	68.3	69.7	61.4	64.3	67.2	69.3	62.5	-
15	L50	dBA	*TCVN 7878-2:2010*	63.5	66.1	67.2	67.3	63.8	66.3	67.5	67.2	63.2	66.5	67.8	67.3	-
16	Vibration	dB	*TCVN 6193:2001*	20.3	31.2	28.6	25.1	20.6	31.4	28.3	25.3	20.3	34.5	27.4	26.7	**75**(***)

Note:

(*): These indicators are certified by subcontractors.

(**): QCVN 26: 2010/BTNTMT - National technical regulations on noise

(***): QCVN 27: 2010/BTNTMT - National technical regulations on vibration. (Applicable to Table 1 - Regional usual.)

2.2.2 Surfacewater Quality

Surface water environment in the study area is influenced mainly by agricultural, industrial activities, livestock and aquaculture. In addition, domestic wastewater from the residential areas surrounding Lam Ha 1 lake and along the south bank of Chau Giang river is also one of the major factors affecting surface water quality in the subproject area. As stated above, the sampling time was in August, which is the rainy season in the northern region, so the concentration of pollutants in water has been diluted. At other times of the year, the concentration of substances can be higher.

The monitoring, sampling, and analyzing have been undertaken for 9 surfacewater samples in the subproject areas

Table 8.Surface water sampling locations

NM1	Phu Van kindergaten
NM2	Mr. Nguyen Van Khanh's hosue, Quynh Chan village
NM3	North residential area of Quang Trung ward
NM4	Reference sample of Xi Dau culvert
NM5	Canal A48, Lam Ha 1 Lake
NM6	Mr. Nguyen Van Phuoc's house, Duong Am village
NM7	Upstream, before the construction area of Chau Giang river embankment (Mr. Pham Van Sy's house, Trieu Xa village)
NM8	Downstream, behind the construction area of Chau Giang river embankment (Me Noi pagoda)
NM9	Tran Hung Dao road (lake opposite to Eye Hospital)

The parameters of pH, DO, TSS, BOD5, COD, NH_4^+, NO_2^-, NO_3^-, PO_4^{3-} are the most basic indicators in order to assess the water quality status in chemical terms like the self-cleaning ability or pollution level of organic, inorganic matters in water. The analysis results compared to QCVN 08-MT:2015/ BTNMT: national technical regulation on surface water quality, B2 level (national technical regulation on surfacewater quality for waterway transportation and other purposes with low water quality requirements) showed the surface water quality in the subproject area as follows:

Table 9.Surface water quality analysis results

No.	Aspect	Unit	Analysis method	Result									QCVN08-MT:2015 /BTNMT (Column B1)
				NM1	NM2	NM3	NM4	NM5	NM6	NM7	NM8	NM9	
1	pH	-	*TCVN 6492:2011*	7.33	7.28	7.29	7.31	7.33	7.23	7.25	7.30	7.31	**5.5-9**
2	BOD_5 (20^oC) (*)	mg/l	*TCVN 6001-1:2008*	4	5	4	6	7	3	4	5	6	**15**
3	Temperature	^0C	*SMEWW 2550B:2012*	32.51	32.11	32.21	32.31	32.43	32.12	32.28	32.01	32.26	-
4	Dissolved oxygen (DO)	mg/l	*TCVN 7325:2004*	4.22	4.25	4.31	4.62	4.75	4.22	4.28	4.26	4.17	**≥4**
5	Electrical Conductivity(EC)	mS/cm	*SMEWW 2510B:2012*	132	135	134	135	136	132	133	135	136	-
6	Total N (*)	mg/l	*TCVN 6638:2000*	7.07	6.14	7.24	7.56	8.12	6.12	7.22	7.48	8.03	-
7	Total P (*)	mg/l	*TCVN 6202:2008*	0.74	0.62	0.86	0.96	1.02	0.61	0.82	0.93	1.03	-
8	Color	Pt-Co	*TCVN 6185:2008*	41.12	38.20	43.61	44.32	45.24	38.12	43.60	44.31	45.25	-
9	Total Suspended Solids(TSS)	mg/l	*TCVN 6625:2000*	63	62	64	65	67	60	59	62	63	**50**
10	Chemical Oxygen Demand(COD)	mg/l	*SMEWW 5220B:2012*	17	16	17	18	20	14	13	15	16	**30**
11	Clorua (Cl^-)	mg/l	*TCVN 6194:1996*	110	102	109	111	113	101	108	112	114	**350**
12	Nitrit (NO_2^-)	mg/l	*TCVN 6178:1996*	0.02	0.03	0.02	0.02	0.03	0.02	0.01	0.02	0.03	**0.05**
13	Nitrat (NO_3^-)	mg/l	*TCVN 6180:1996*	2.49	3.12	2.32	2.41	3.46	3.07	2.12	2.40	3.45	**10**
14	Iron (Fe)	mg/l	*TCVN 6177:1996*	0.12	0.13	0.14	0.15	0.19	0.11	0.12	0.13	0.14	**1.5**
15	Pb (*)	mg/l	*TCVN 6193:1996*	0.01	0.01	0.02	0.02	0.03	0.01	0.01	0.02	0.03	**0.05**
16	Zn (*)	mg/l	*TCVN 6193:1996*	0.002	0.001	0.002	0.003	0.004	0.001	0.001	0.002	0.003	**1.5**
17	As (*)	mg/l	*TCVN 6626:2000*	0.002	0.001	0.003	0.002	0.003	0.001	0.002	0.002	0.003	**0.05**
18	Detergent / surfactant(*)	mg/l	*TCVN 6336:1998*	0.23	0.19	0.22	0.25	0.29	0.18	0.21	0.24	0.32	**0.4**
19	levels of oil and grease (*).	mg/l	*TCVN 7875:2008*	0.002	0.001	0.003	0.002	0.004	0.002	0.002	0.003	0.005	**1**
20	Total Coliform (*)	MPN /100 ml	*TCVN 6187-2:1996*	560	551	571	562	585	558	563	568	595	**7500**

pH: The measured pH values ranging from 6.5 to 7.1 which are within the allowable limits (5.5 to 9.0) ensuring living activities of aquatic species;

Dissolved oxygen (DO): All the samples meet the allowable limits, which are not less than 2 mg/ l.

Biological oxygen demand (BOD5): All the samples meet the allowable limits.

COD: All the samples meet the allowable limits.

TSS: All the samples meet the allowable limits.

The parameters of NH_4^+, NO_2^-, NO_3^-, and PO_4^{3-} meet the allowable limits.

In general, the surveying results showed that the surface water in the subproject area has no sign of pollution, except for TSS contents at all locations which are not sighnificantly higher than the allowable levels, still good enough for irrigation.

Because time for preparation is short, the analysis samples are taken at the rainy season time, in August, 2016. Therefore, the contents of pollutants are diluted. At the dry season time, the contents of the pollutants may be higher. Before construction, additional surface water samples need to be taken for more comprehensive baseline data.

2.2.3 Groundwater Quality

The quality of groundwater in the subproject area was evaluated through the sampling and analysis of 5 groundwater samples.

Table 10. Groundwater sampling location

NDD1	Drilling well water at Mr. Nguyen Van Khanh's house, Quynh Chan residential group, Lam Ha ward
NDD2	Drilling well water at Mr. Pham Van Luong's house, the north residential group of Quang Trung ward
NDD3	Drilling well water at Mr. Vu Tranh Dau's house, Lam Ha 1 Lake
NDD4	Drilling well water at Mr. Nguyen Van Phuoc's house, Duong Am residential group, Lam Ha ward
NDD5	Reference sample: Drilling well water at Mr. Le Van Manh's house, Trieu Xa village

All the groundwater samples were taken mainly in the wells of the households located in or adjacent to the areas of the subproject's work items.

Table 11. Ground water quality analysis results

No.	Indicator	Unit	Analysis method	Result					QCVN 09-MT:2015 /BTNMT
				NDD1	NDD2	NDD3	NDD4	NDD5	
1	pH	-	*TCVN 6492:2011*	7.21	7.23	7.25	7.27	7.25	**5.5-8.5**
2	Total Suspended Solids (TSS)	mg/l	*TCVN 6625:2000*	98	102	103	97	104	**-**
3	Hardness	mg/l	*TCVN 6224:1996*	236	229	246	234	251	**500**
4	Chemical Oxygen Demand (COD)	mg/l	*SMEWW 5220B:2012*	2.04	2.05	1.96	1.91	2.02	**-**
5	Amoni (NH_4^+)	mg/l	*TCVN 6179-1:1996*	0.011	0.013	0.09	0.012	0.010	**1**
6	Clorua (Cl^-)	mg/l	*TCVN*	121	120	112	113	126	**250**

No.	Indicator	Unit	Analysis method	Result					QCVN 09-MT:2015 /BTNMT
				NDD1	NDD2	NDD3	NDD4	NDD5	
			6194:1996						
7	Nitrit (NO_2^-)	mg/l	*TCVN 6178:1996*	0.016	0.011	0.013	0.012	0.013	**1**
8	Nitrat (NO_3^-)	mg/l	*TCVN 6180:1996*	1.23	1.15	1.15	1.25	1.08	**15**
9	Sunphat (SO_4^{2-})	mg/l	*SMEWW 4500-SO_4^{2-} .E:2005*	232	229	233	228	227	**400**
10	Mangan (Mn)	mg/l	*SMEWW 3500 - Mn.B:2012*	0.32	0.29	0.30	0.31	0.30	**0.5**
11	Iron (Fe)	mg/l	*TCVN 6177:1996*	3.88	3.72	3.83	3.98	3.82	**5**
12	Pb (*)	mg/l	*TCVN 6193:1996*	0.006	0.005	0.007	0.006	0.005	**0.01**
13	Cd (*)	mg/l	*TCVN 6197:2008*	0.0026	0.0025	0.0023	0.0022	0.0023	**0.005**
14	Zn (*)	mg/l	*TCVN 6193:1996*	0.020	0.021	0.022	0.023	0.024	**3**
15	CN^- (*)	mg/l	*TCVN 6181:1996*	0.002	0.001	0.002	0.002	0.001	**0.01**
16	As (*)	mg/l	*TCVN 6626:2000*	0.012	0.013	0.011	0.014	0.012	**0.05**
17	Cr^{6+} (*)	mg/l	*TCVN 6658:2000*	0.002	0.003	0.002	0.001	0.002	**0.05**
18	Cu (*)	mg/l	*TCVN 6193:1996*	0.013	0.014	0.011	0.012	0.015	**1**
19	E.coli (*)	MPN /100 ml	*TCVN 6187-2:1996*	KPH	KPH	KPH	KPH	KPH	**KPHT**
20	Coliform (*)	MPN /100 ml	*TCVN 6187-2:1996*	2	1	2	1	2	**3**

Note:

(*): These indicators are certified by subcontractors.

The groundwater quality analysis results showed that, most of the groundwater sampling locations are of good quality, meeting the domestic water supply requirements for residential areas and in fact, groundwater is used for the majority of households in the subproject area.

2.2.4 Soil Quality

The excavation, backfilling, grading and transport will take place during the construction of works of the subproject, which will cause a certain impacts on the soil quality. 4 soil samples have been taken in the subproject area to determine the soil quality surrounding the subproject area as the basis for assessing the effects of construction on soil quality if any.

Table 12.Location of soil sampling

D1	Phu Van kindergaten
D2	North residential area of Quang Trung ward
D3	Lam Ha 1 lake
D4	Construction area of Chau Giang river embankment

The analysis results were compared with QCVN03 – MT: 2015/BTNMT: National technical regulations on allowable limits of some heavy metals in soil.

Table 13.Soil quality analysis result

No.	Indicator	Unit	Analysis method	D1	D2	D3	D4	QCVN 03-MT:2015 /BTNMT(Agriculture land)	QCVN 03-MT:2015 /BTNMT(Residential land)
1	Asen (*)	mg/kg	*TCVN 8467:2010*	7.2	7.5	7.8	7.4	**15**	**15**
2	Cadimi (Cd) (*)	mg/kg	*TCVN 6496:2009*	1.02	1.06	1.08	1.05	**1.5**	**2**
3	Copper (Cu) (*)	mg/kg		40.6	41.2	40.8	42.3	**100**	**100**
4	Plumbago (Pb) (*)	mg/kg		48.5	46.2	45.8	44.2	**70**	**70**
5	ZinC (Zn) (*)	mg/kg		126	131	121	119	**200**	**200**

Note:

(*): These indicators are certified by subcontractors.

Compared to the regulation, the monitoring data showed that the concentration of Pb, Zn, As, Cd in all 4 samples is lower than the allowable limits foragricultural land and residential land.

2.2.5 Sediment Sludge Quality

The sampling locations in the subproject are:

Table 14.Sludge sampling location

B1	Mr. Vu Van Thien house, Dinh Trang, Lam Ha 1 Lake
B2	Chanel A48, Lam Ha 1 Lake
B3	100m away from Mr. Le Van Manh's house, Trieu Xa, south embankment of Chau Giang river
B4	South embankment of Chau Giang river nearby Liem Chinh bridge

The analysis indicators to evaluate the quality of the sludge in the subproject area include some heavy metals (Cd, As, Zn, Hg, Cr (VI), Pb, Cu). The analysis results of the sediment sludge dredged from the subproject's work items were compared with QCVN 43:2012/BTNMT - National technical regulation on the quality of freshwater sediments and QCVN 03 national technical regulations for soil quality.

Table 15.Sludge quality analysis result

No.	Analysis indicator	Unit	Method	Result				QCVN 03-MT:2015 /BTNMT(Agriculture land)	QCVN 03-MT:2015 /BTNMT(Forestry land)	QCVN 43:2012/BTNMT
				B1	B2	B3	B4			
1	Asen (As) (*)	mg/kg	*TCVN 8467:2010*	7.26	8.18	7.89	6.22	**15**	**20**	**17**
2	Cadimi (Cd) (*)	mg/kg	*TCVN 6496:2009*	2.38	2.82	2.42	1.26	**1.5**	**3**	**3.5**
3	Copper (Cu) (*)	mg/kg	*TCVN 6496:2009*	57.5	70.3	58.4	36.4	**100**	**150**	**197**
4	Plumbago (Pb) (*)	mg/kg	*TCVN 6496:2009*	59.7	72.5	61.7	46.5	**70**	**100**	**91.3**
5	Zinc (Zn)(*)	mg/kg	*TCVN 6496:2009*	192	231	196	148	**200**	**200**	**315**
6	Mercury	mg/	*TCVN*	0.008	0.014	0.009	0.003	-		**0.5**

No.	Analysis indicator	Unit	Method	Result				QCVN 03-MT:2015 /BTNMT(Agriculture land)	QCVN 03-MT:2015 /BTNMT(Forestry land)	QCVN 43:2012/BTNMT
				B1	B2	B3	B4			
	(Hg) (*)	kg	*8882:2011*							
7	Crom (Cr) (*)	mg/ kg	*TCVN 6496:2009*	34.6	44.2	35.8	9.3	-		**90**

Note:

(*): These indicators are certified by subcontractors.

The results is compared with QCVN 43 on sludge quality for aquatic life and QCVN 03 for the agriculatural land. The results showed that the heavy metal concentrations in the analysed samples are mostly lower than the permissible thresholdsfor freshwater sediment. Only the sample B2 has the Pb content slightly higher than the threshold on agricultural land, which can be considered as allowable standard deviation.

2.3 SOCIO-ECONOMIC CONDITIONS

2.3.1 Economic Development Situation

In the first quarter of 2016, the total budget revenue in the city reached more than 1 trillion VND, which increased by 28% compared with the same period last year and reached 29% the national budget allocation, the index of industrial production reached nearly 11 trillion VND, which increased by 13% compared to the same period last year and reached 22,4% of the annual plan.

Under steering of the city, spring-crop rice and secondary crop sowing has been finished, with total sowed area of over 3,300 ha beyond as planned.

Intensive concentration has been made to completion of site clearance for Ha Nam commercial complex, Muong Thanh Hotel, Lotus steel sheet factory, residential house area on eastern bank of Day River, provincial sporting training center projects, etc.

Planning, urban management, land management, project implementation progress basically meet the setforth progress and requirements. Socio-culture is maintained, social security is guaranteed, and people's lives are stable.

The city successfully hosted the 8th National Phu Dong Sports Festival. In the first quarter, 2016, Phu Ly city has organized visits, gift giving and social relief on holidays worth nearly 5 billion VND and created new jobs and extra jobs for nearly 4 thousand people (27.9% compared to the plan). Security, politics, and social order and safety are maintained strongly.

2.3.2 Social Conditions

2.3.2.1 Liem Chinh Ward

Developing trade, service industry in a year was estimated at 70% of households in the entire ward (getting 100% compare with the proposed resolution of the ward People's Committee)

The budget revenue reached 117.3% of the assigned plan.The poverty rate felt to 30 households, corresponding to 1.54% (down 17 households compared to the assigned plan), the poor households were 27, corresponding to 1.38%.The natural population growth rate was 0.9%. Increase0.7% compared to the ward resolution.

Education: schools keep maintain national standards.

Health: medical examination and treatment, prevention get highly effective.

Security: ensuring security and order, social security.

2.3.2.2 Lam Ha Ward

Agricultural production: Total area planted in the first 6 months of 2015 was 206 ha, reach 100% area, in which: the area of spring rice was 190.6ha, crop area was 15.5 ha. The total flock of livestock and aquatic birds was 27.560 paxs.

Industry, handicraft: the value of industrial production and handicraft in the first 6 months was estimated at 4.2/ 9.7 billion VND by 43.2% year plan.

Social Culture: propaganda, carried out site clearance, agricultural work, remodeling religious relics.

Labor, Invalids and Social Affairs: The basic social policies ensure fully, timely and correct objects.

Education: 3 schools get national standard in Phase 1, a elementary school was completing procedures to request recognition of the national standards in phase 2.

Health: Good performance in disease prevention and initial health care for people.

Transportation, environmental sanitation: frequent checks traffic routes, handling households encroach roadway pavement, implement the colection of garbage, sanitation.

2.3.2.3 Luong Khanh Thien Ward

Total budget revenues in 2015 of Luong Khanh Thien ward was 6,937,037,610 VND, increase 42.86% compared to the plan.

About cadastral: coordinated with the City People's Committee to organize the successfully auction of some plots of the embankment in Chau Giang river and continued to conduct an auction of small land area

About socio-cultural: Implement propaganda regime, policies, laws and regulations of the state to people

About Labour, Invalids and Social Affairs: Improve the poor management records. Information updated survey on martyrs, relatives of martyrs. Well perform the subsidized rice to the poors.

About health and education: strengthen the communication of epidemic surveillance at the facility, there is no outbreak in the province.

The situation of security, political, social order and safety, traffic safety on the ward stabilize.

2.3.2.4 Minh Khai Ward

Total buget revenue in the first 6 months of 2016 is 3,227,325,392 VND, reach 87.8% plan of the year.

About the socio-cultural: Well organizing activities on the occasion of Tet Binh Than 2016

About Labour, Invalids and Social Affairs: Well perform the subsidized rice to the poors

About health and education Good performance in disease prevention. Achieve good results in competitions of excellent students in provincial and national.

Transportation, environmental sanitation: frequent checks traffic routes, handling households encroach roadway pavement, implement the colection of garbage, sanitation.

2.3.2.5 Phu Van Commune

Total budget revenue in the first 6 months is 1,980,900,000 VND, reach 45% of the plan.

About production and business: Continue facilitate for production households growing business.

About agriculture: Organizations rodenticides. Maintain and develop projects on organic vegetable growing in commune scale.

About construction cadastral: Good performance in land management.

About Labour, Invalids and Social Affairs: perform the subsidized rice to the poors with the total is 9,745kg rice.

About education: Mobilize 444 preschool children to class, reach 85.55% of the plan. Professional quality meets the requirements but facilities for preschool are weak and lacking.

2.3.2.6 Hai Ba Trung Ward

About construction cadastral: Good performance in land management and regularly patrolled urban restore order.

About socio-cultural: Implement propaganda regime, policies, laws and regulations of the state to people

About Labour, Invalids and Social Affairs: Improve the poor management records. Information updated survey on martyrs, relatives of martyrs.

About health and education: strengthen the communication of epidemic surveillance at the facility, there is no outbreak in the province.

The situation of security, political, social order and safety, traffic safety on the ward stabilize.

2.3.2.7 Quang Trung Ward

Total natural area: 257.36 ha.

The East meets Minh Khai ward, Luong Khanh Thien ward, Lam Ha commune;

The West meets Phu Van commune (Phu Ly city) and Kim Binh commune (Kim Bang ward);

The South meets Hai Ba Trung ward

The North meets Tien Tan commune (Duy Tien ward).

- Annual growth rate reaches 16%
- The value of the annual commercial services increases 15.6%
- Annual industry and handicraft production increases 14%
- Annual budget revenue increases 17%

2.3.2.8 Labor and Occupation

Table 16. Labor structure in Ha Nam

Index	Unit	**2015**
Population	Person	**802,705**
In which : - Urban	"	124,617
- Rural	"	678,088
Employed population	"	**473,650**
In which : - Urban	"	7

		0,280
- Rural	"	4 03,370
Labor in economy	"	
- By gender	"	
+ Urban	"	6 5,927
+ Rural	"	3 97,015
- By type of business	"	
+ State	"	2 4,215
+ Non-state	"	4 06,872
+ Foreign investment sector	"	3 3,093
Unemployment rate in urban	%	**3. 6**
Percentage of trained employed	%	**1 9.06**

2.3.2.9 Living Standards

The living standards and average incomes of the city's people are being improved significantly. According to the Social Assessment Impact (August, 2016), the average income per households in wards in the subproject area is about 53.3 millions/people/year.

2.3.3 Gender

The survey results showed that some family issues are decided by both male and female. 75.41 % of spouse decide on borrowing bank's loan or investment, business. 77.16 % of spouses decide on studying and occupation of their children.

Most of the Land Use Right Certificate (LURC) (62.44% of households) are under the name ofboth wife and husband. 18.54 % under husband name only and 19.02 % under wife name only.

The participation in community activities and local organizations show that there is gender difference. Female often participates in both activities more than male. 33.72% of respondents stated that females play main role in community activities while the proportion of males is 12.4 %. Similarly, the proportion of females participating in local organizations is 30.58% and the proportion of females is 10.19%.

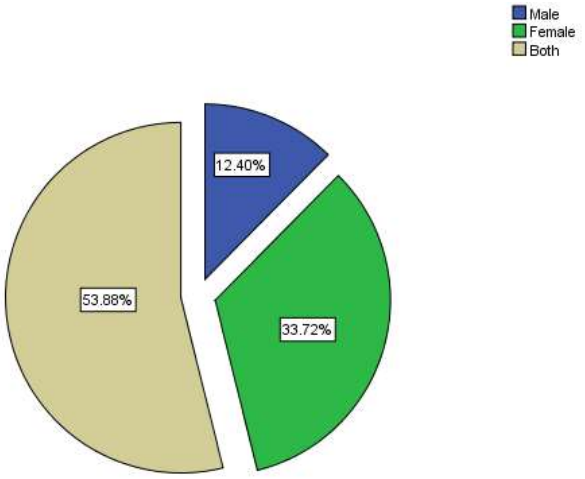


Figure 15 Gender and the participation in community activities

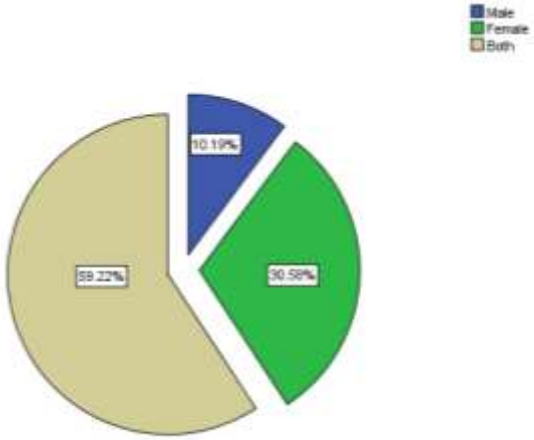


Figure 16 Gender and the participation in local organizations

The survey results by questionnaire with households and community also showed that there is no significant gap between male and female in education, income and health.

2.4 INFRASTRUCTURE CONDITIONS

2.4.1 Transportation System

Overview of transportation network in the area of Phu Ly city:

+ Railway:

- The North-South railway: runs along national highway 1A, single railway gauge 1m.
- The railway runs from Phu Ly station, passes through Thinh Chau station to But Son cement factory with the length of 5km, single railway gauge 1m.

+ Waterway

- Day river is 8 km long, meeting technical standard of grade 3 river, the minimum width is 100 m, minimum depth is 2.5 m, max water level is 4.72 m, the 200 T ships can pass through it.

- Nhue river is 3.5km long, the average width is 60 m, the average water-flow depth is 3.0 m.

+ Roadway:

- National highway 1A (Le Hoan road): runs through 3.7 km of Phu Ly city; asphalt concrete road, section 5 m+11.5 m+2 m+11.5 m+5 m+5 m.
- Cau Gie - Ninh Binh expressway to the East of the city: under construction.
- National highway 21B: The section passing through the town is 0.5 km, bituminous penetration road width 4 m, roadbed 5 m.
- National highway 21A (Dinh Tien Hoang, Tran Binh Trong, Dinh Cong Trang, Ly Thuong Kiet): the section passing through the town is 9.5 km long, asphalt concrete road, roadsurface width 9 m, roadbed 12 m.
- Provincial road 971 (Tran Hung Dao going to Ly Nhan), the section passing the city is 2.5 km long, 7 m wide.
- Urban road network has the form of waffle slab with a distance of 150-200 m, most of which have been asphalted. As to the east road network, the old roads are old and deteriorated, most of which have no sidewalk. Howver, the west road network has been newly built in good service condition.

Total length of road network: 236.5 km.

Of which:

- External exchange road: 29 km
- Urban road: 33.5 km
- Roads in communes, residential groups and accessing to fields: 174 km

2.4.2 Water Supply System

The water supply for Phu Ly city is taken from surface water of Day river, including 2 water treatment plants:

- Water plant No.1 which was built in 1997, is located in Quang Trung ward, Phu Ly city with capacity of 10,000 m^3/day.
- Water plant No. 2 which was built in 2001, is located in Thanh Son commune, Kim Bang district with capacity of 21,000 m^3/day.

The pipeline network to households includes transmission, distribution and service pipelines. Pipe materials are cast iron, plastic, galvanized iron. It covers 96% of urban residents. Total length of the main pipelines is about 25km with diameter of 100 - 300 mm.

Besides, households in the area are using rainwater and drill well water for their daily activities.

2.4.3 Solid Waste Collection and Treatment

Currently Ha Nam has 2 waste treatment areas:

- Solid waste treatment plant No. 1 at Thung Dam Gai, Thanh Thuy Commune, Thanh Liem District currently under operation with service scope being Phu Ly City and some communes, towns of Thanh Liem District. This plant is about 4.5ha, about 16km away from Phu Ly City, with current capacity of 120 tons per day under management of Ba An Environment JSC

- Solid waste treatment plant at Dong Van II Industrial Zone, Duy Minh Commune, Duy Tien District currently under operation with service scope being Duy Tien District and a part of Phu Ly City. This plant is about 1.2 ha, about 16km away from Phu Ly City, with current capacity of 100 tons/day under management of Tam Sinh Nghia JSC

Waste of the present MCDP and MCDP AF will be treated at the plant No.1 at Thung Dam Gai.

2.4.4 Power System

Status of power supply in the period of 2015 ÷ 2020:

- Upgrade capacity of 220kV Phu Ly substation up to 2x250MVA.
- Construct 110kV Tien Hiep substation (110/22kV), capacity 1x40MVA.
- Rehabilitate 110kV Thach To substation (110/35/22kV) into (110/22kV), upgrade capacity up to 40MVA.
- Keep the capacity of 110kV Phu Ly substation 2x40MVA and 110kV Chau Son substation 1x63MVA.

110Kv power grid: rehabilitate 110kV power line from single circuit to dual circuit. Gradually installing underground 110kV power line in the city center, moving the alignment of power line as planned to ensure safety and urban landscape.

35kV, 22kV, 10kV power grid: in the long run, only 22 kVpower grid will be used. In the first phase, the 35kV grid will be remained, when the 110kV substation has voltage of 22Kv, the 35kV power grid will be changed to operate 22Kv one. For the central areas and new urban areas, power supply system will be underground in technical trenches or tunnels to ensure safety and urban landscape.

0.4 kV power grid: Using three-phase 220/380V low voltage power system; for the central areas, and new urban areas, using underground cable axis; peri-urban areas and suburban areas are encouraged to use underground cables.

Power grid for lighting: Gradually completing public lighting system (roads, parks, squares, buildings, etc.) for the whole city.

2.4.5 Drainage and Wastewater Treatment

The drainage network in the old residential area of Phu Ly city is a combined system for stormwater and wastewater. In the new residential areas, the drainage systems are separated, collection sewer system, treatment plants are being built in each area under the original MCDP project. The combined sewer system in the old urban areas is relatively stable, meanwhile in the new urban areas, the system of canals and sewers is under construction.

Domestic, production, hospital and livestock wastewater is discharged directly into stormwater sewer system and water bodies in the city, Chau Giang, Nhue, and Day River.

2.4.6 Flood

At present, after prolonged heavy rains, the roads such as Bien Hoa, Nguyen Van Troi, Quang Luu, Nguyen Viet Xuan, etc. in Phu Ly city are flooded. In particular, Nguyen Van Troi and Bien Hoa roads are deeply flooded; somewhere the flood level is about 30cm.

The main reason is the low roadbed in these areas, during heavy rain, water flow is very high meanwhile the drainage capacity of existing sewer system is very poor.

2.4.7 Environmental and Social Conditions at Specific Subproject Locations

Component 1: Basic Infrastructure Upgrade and Service Improvement

(1) Upgrading Infrastructure for TheResidential Area in The North Quang Trung Ward

The internal road system of the northern residential area of Quang Trung Ward is not complete yet, so the connection of this residential area with outside areas is still limited. This residential area is like an isolated, separated one. The internal roads of the area are of two surface types: stone aggregate road – about 40%; and concrete road – about 60%. These roads have narrow cross-section (about 1.5m – 4.0m). Besides, the surfaces of these roads are mostlly seriously degrading, with many locations very muddy due to excessive use or subject to flooding due to lack of drainage system.

The existing storm-water drainage system of the northern residential area of Quang Trung Ward is the drainage ditches along main roads. These drainage ditches are constructed at different periods of time and mostly created at the times when the local government and people carry out road rehabilitation. Therefore, these ditches are of different types: concrete ditch, brick-built ditch, earth ditch, with width B = 0.4m.

The area's domestic WW collection system is a common one. According to survey results, a part of the total volume of domestic and breeding WW (of 7 HHs) is discharged to the storm-water drainage ditches, culverts of these HHs themselves before entering the storm-water drainage lines along the roads. For the rest HHs, most of the domestic WW volume is discharged directly to these HHs' gardens/ponds. Similar to the storm-water drainage system, the WW collection system of the northern residential area of Quang Trung Ward is also divided into 3 sub-areas:

Area 1 – The entire residential area along Highway 1A: WW of the HHs in this area is discharged also to the storm-water collection system along NR 1A and goes to Nhue River.

Area 2 – The bank residential area (ouside of, nearby retired embankment): WW of this area is mostly flowing to earth ditches to enter Nhue River, or penetrates diretly into garden soil in the area.

Area 3 – The central area of the residential area: WW of the HHs is discharged together to the culverts, ditches of these HHs themselves before flowing to the storm-water drainage ditches along the roads. As mentioned in the storm-water section, this area is frequently flooded after raining. WW and storm-water of flooded areas around certain roads cause environmental pollution.

Figure 17 below shows the location of the existing northern residential area of Quang Trung Ward.

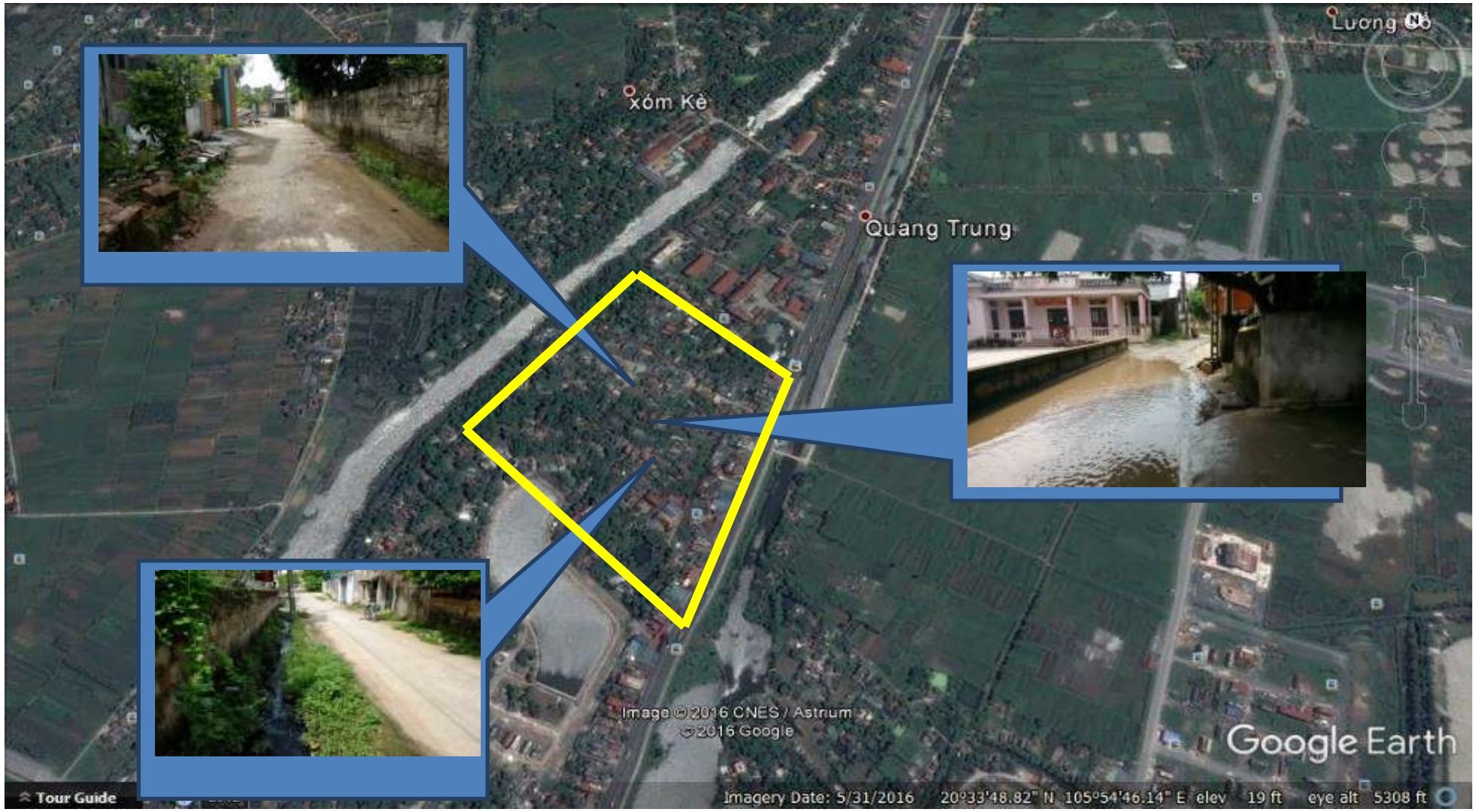


Figure 17Existing the residential area in the North Quang Trung ward

(2) Upgrading infrastructure in Duong Am residential group, Lam Ha ward

Storm-water drainage ditches are along roads. As mentioned in the storm-water section, this are is frequently subject to flooding. Roads have already been reinforced: concrete road – 80%; earth/stone-agreggate road – 20%

The internal roads of this residential group have narrow cross-section (about 1.5m – 4.0m). However, because the roads have not had complete drainage system, their surfaces are degrading: cracking, uneven surface obstructing travelling of people in the area.

The existing storm-water drainage system of the are is brick-built, concrete diches with cover slab, open drainage ditches along some main roads (road passing cultural house, road passing entrance to Communal House, etc.), with water mostly drained to Hoa Lac chasm and a small volume to the local drainage ponds, ditches of the area. These ditches have different dimensions (B = 300mm – B = 600mm). Generally, Duong Am residential group has uneven terrain, with the central area distinctively high (hamlet cultural house area +4.6m high). So, Duong Am residential area can be divided into two sub-areas with different drainage directions::

- *Area 1* – The southeastern area of Duong Am residential group: This area has elevation of +3.5m -> +3.6m, lower than average elevation of the entire area. Storm-water of this area overflows on roads to enter ponds, lakes. This is a frequently flooded sub-area of Duong Am residential group. According to consultative comments of the local people, the roads of this area are frequently 10 – 20cm flooded after raining (at branch routes of the area).
- *Area 2* – The rest area of Duong Am residential group: This area has elevation of +4.6m to +3.6m and slope from Northeast to Southwest. Storm-water is collected to B400 ditches along the roads and discharged to Hoa Lac chasm.

Figure 18 below shows location of the existing Duong Am residential group.

Figure 18Existing Duong Am residential group

(3) Upgrading infrastructure in Quynh Chan residential group, Lam Ha ward

Quynh Chan Village's road system consists of a main-axis road running though the residential group with width B = 3.0m – 3.5m and branch roads to the hamlets with width B = 1.5m – 4.5m. Most of the internal roads of Quynh Chan residential group have been solidified: concrete road – 50%; earh, stone aggregate road – 50%.

The internal roads of this residential group have narrow cross-section (about 1.5m – 4.0m). However, because the roads have not had complete drainage system, their surfaces are degrading: cracking, uneven surface obstructing travelling of people in the area.

The area's existing storm-water drainage system is brick-built, concrete ditches with cover slab, open ditches along some main roads to drain water mostly to drainage canal and a small volue to ponds, bigger drainage ditches of the area. These ditches have different dimensions (B = 200 – B = 400).

The ara's domestic WW collection system is a common one. Survey results show that a certain volume of domestic WW is dischareged to the storm-water drainage ditches, culverts of the HHs themselves before entering the storm-water drainage ditches along the roads. The rest volume (mostly) of HH domestic WW is discharged directly to the gardens/ponds of the HHs themselves.

Because the area's common culvert system is not sufficient, HH WW is mostly directed/flows to roadside ditches. However, most of these ditches are small (B = 200 – 400mm) and not dredged frequently, so there's frequently WW overflowing onto roads, causing serious pollution.

At present, Quynh Chan residential group has not been supplied with clean water from Phu Ly City's water supply system or medium/small centralized water supply stations. Most of the HHs are using borewell water, rain-water for drinking/cooking/washing.

Lighting power supply system: Lighting power systems on the roads in the residential group have not been invested.

Figure 19 below show the location of existing Quynh Chan residential group.

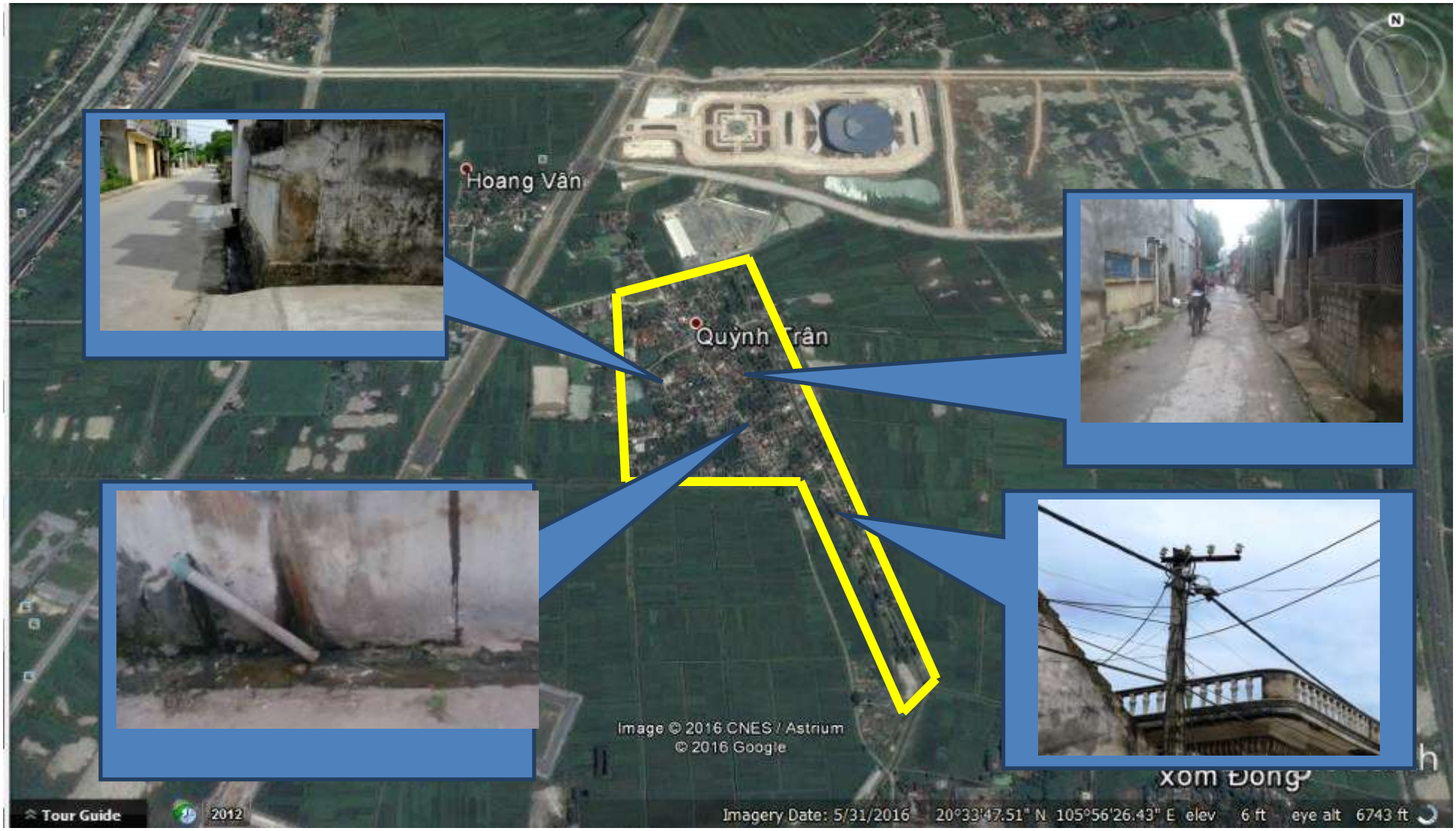


Figure 19Existing Quynh Chan residential group

(4) Upgrading Tran Quoc Toan primary school, Hai Ba Trung ward

❖ *Existing facilities*

Tran Quoc Toan Primary School currently has total area of 3,360m^2 located on Nguyen Viet Xuan Road, Minh Khai Ward, with 22 class-rooms/33 classes. The school was established in August of 1994 and has been developed in many phases, consisting of 3 blocks:

Class-room block in the south:

This is a 2-storeyed block with RC frames, built in 1994 with 12 class-rooms. After more than 20 years of operation, some class-rooms have been subject to water penetration, with humid walls and falling-off wall mortar layer. Class room floors are degrading. Some windows and doors have been rotten, unsafer for the teachers and students.

Western block

This is a 2-storeyed block with RC frame, constructed in 2008 consisting of 6 class-rooms. Although this block has been used since not very long ago, due to requirements of number of class-rooms and functional rooms, the school's leaders rehabilitated the block to add some more rooms:

- HCMYPO/equipment room underneath the stairs of the first floor;
- School office/healthcare room in the middle area of Northern and Western blocks;

Because the Western block was built using simple foundation solution (sand cushion foundation) on week soil base (according to ecologic boring data and with comparison with collected data), the rehabilitation of some blocks to create functional rooms also affected the block's structure.

Northern block

This is a 2-storeyed block with RC frame built in 2010 consisting of 8 classrooms. Like the Western block, the Northern block was also rehabiliated by the school 's leaders' decision to create more class-rooms serving teaching/learning demand by creating separating walls to divide class-rooms.

Figure 20 below show the location of existing Tran Quoc Toan Primary School.

Figure 20Existing Tran Quoc Toan Primary School

(5) Construction of Phu Van kindergarten in Phu Van commune, Phu Ly city

The existing Phu Van Kindergarten has not been centralized, but currenty by 5 points at 5 hamlets/communes: Hamlet 2, Hamlet 3, Hamlet 4, Hamlet 5 and Hamlet 6. The current classrooms are borrowed space of cultural houses, co-operatives and borrowed warehouse without investment. These classrooms are degrading, with many only steel-sheet roofed.

Construction location approved by Ha Nam PPC is of the 28, 34, 35, 44, 45, 48 and 103 lots of the map sheet No. Presenting a total area of 4 9,935 m^2 wide (Phu Van Commune cadastral map) which is currently for cultivation of corn and other crops.

The kindergarten construction location is at a planned land area near Phu Van Primary School. Figure 21 below shows existing status of the construction area.

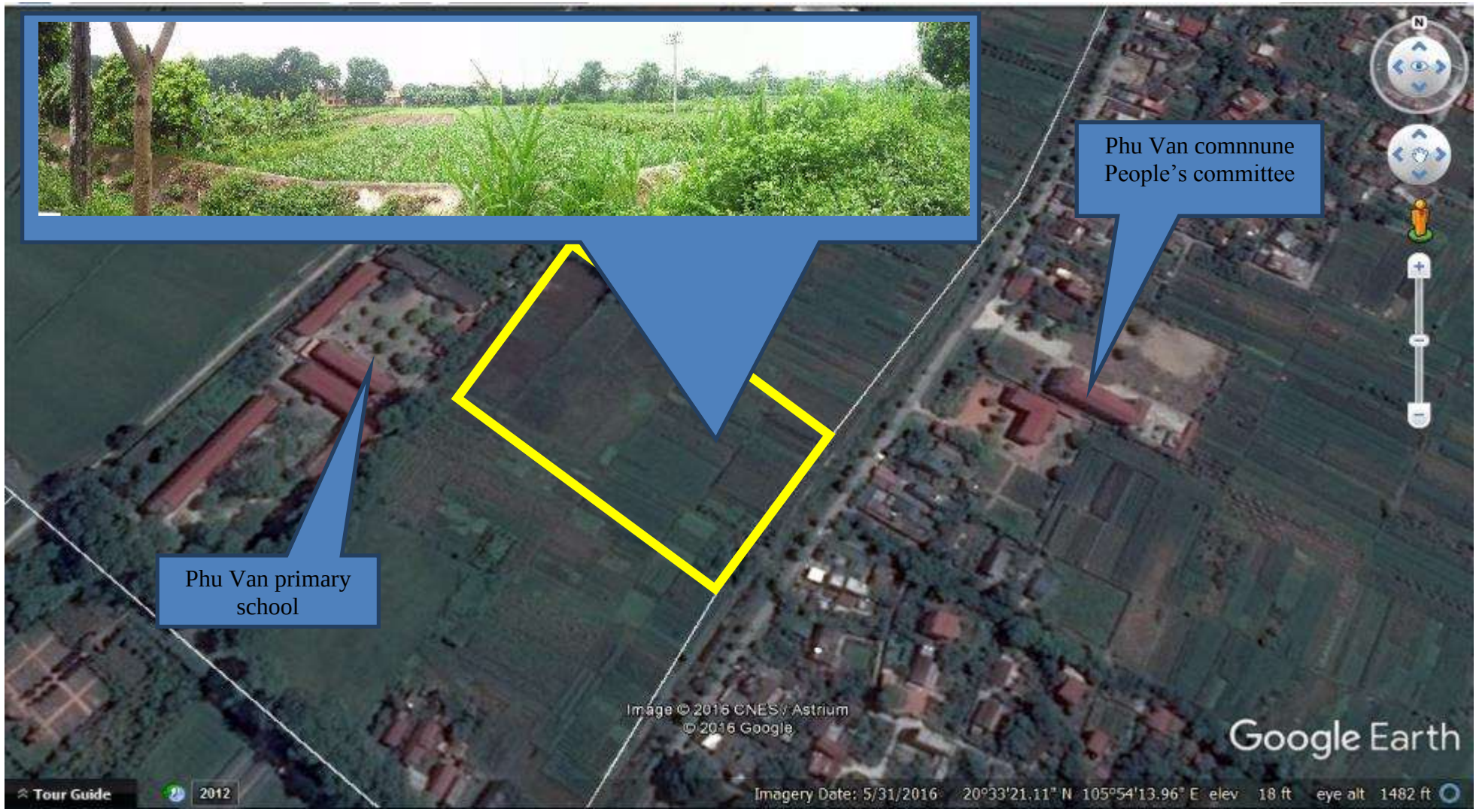


Figure 21Kindergarten construction location

Component 2: Environmental Sanitation Improvement

(1) Upgrading Lam Ha 1 regulation lake, Lam Ha ward

Lam Ha lake consists of 2 interconnected lakes formed from the low-lying land in Dinh Trang village, Lam Ha commune, Phu Ly city. The lake No.1 has an area of 7.54 ha, the West borders the north-south railway, the North borders A4-8 drainage canal, the East and the South borders provinicial road 493. The lake No.2 covers an area of 7.60 ha, the East borders Le Cong Thanh extended road, the South borders the residential area and the North is separated from the lake No.1 by the provincial road 493. It is surrounded by the residential areas, gardens and ponds, roads, and open spaces with significantly changed-elevation. The lake bank, composed of soil, has not been strengthened. Only the island in the middle of the lake has been temporarily embanked vertically with brick or stone. The bed has not been dredged leading to uneven depth. The elevation of the bank top is from +2.00m to +2.50 m, the elevation of the bottom is from -1.50 m to -2.00 m.

Currently, the entire rainwater, surfacewater from the surrounding area of Lam Ha commune, part of rainwater from the area along the national highway 1A following the existing canal system are discharged to the area of lake No.1 and 2, which are connected by underground crossing through road 493. When the water level in Chau Giang river is low, water from the area will self-flow into Chau Giang river via the existing sewer in the south of the lake No.2. In rainy season, water level in Chau Giang river rises, the underground sewer through the provincial road is closed; water is pumped from the existing pumping station (the North of provincial road 493) from the lake No.1 to the lake No.2 then to Chau Giang river.

Rehabiliation of both lakes were proposed in the original MCDP. However, due to the lack of fund, only Lam Ha 2 lake was rehabilitated. At present, Lam Ha 2 lake has been dredged and embanked. The investment in Lam Ha 1 lake is included in the subproject using additional financing.

Figure 22 below shows the location of existing Lam Ha 1 Lake .

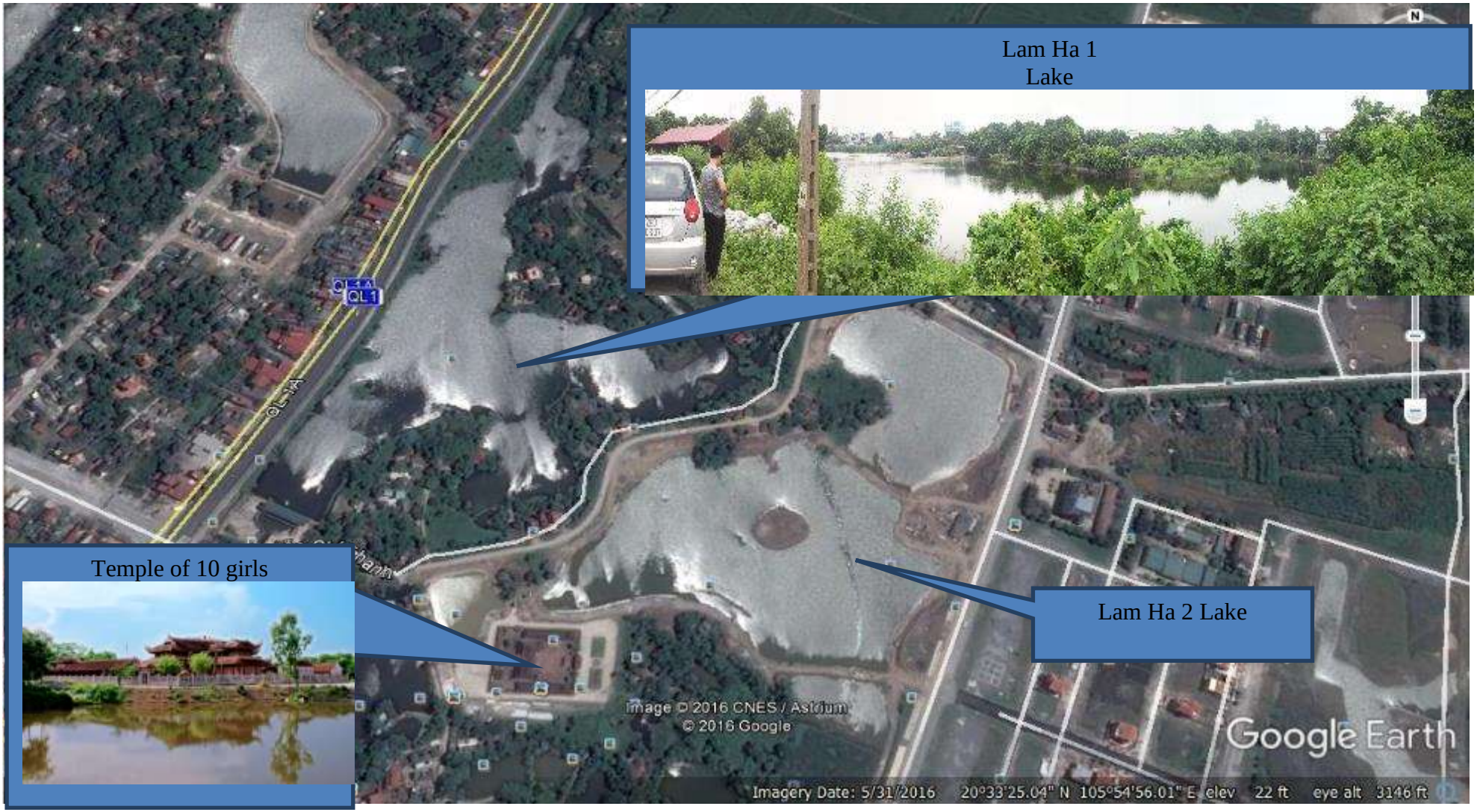


Figure 22Existing Lam Ha 1 Lake

(2) Upgrading drainage and technical infrastructure system for Bien Hoa road

Bien Hoa Road is the central axis road from the west to the east of Phu Ly City. On two sides of this road, there're headquarters of many state agencies, centers, hotels, companies, business units, and religious structures: Phu Ly City's PC, VINCOM center, Phu Ly Church. Figure 23 below shows the existing Bien Hoa Road.

a. Transport

Surfaces of the roads in the area have been degrading due to the city's on-going rapid urbanization and high volume of traffic on these roads each day. These roads have average width of 8.5m.

Sidewalks on two sides of Bien Hoa Road have ununiform width: The southern sidewalk has width of 3.0 – 6.0m, meanwhile the northern sidewalk has width of about 3.0 – 4.5m (especially some locations with width of less than 3.0m such as the road section from Truong Chinh intersection to Le Cong Thanh intersection).

b. Drainage system

The drainage system of Bien Hoa road is of common type. All storm-water and WW of the area is collected to the B400 ditches on northern side walk and the B600 ditch on southern sidewalk of the road.

WW from HHs on two sides of Bien Hoa road is already separated from the storm-water drainage system, but then is directed into the common drainage system on Bien Hoa road.

WW is collected to the common culvert system and is separated by the CSO nearby Me Lake's outlet to be directed to Me WWTP with capacity of 2,500 m^3/day.

Because of the insufficient capacity of the common culvert lines on Bien Hoa road, at hollow locations on Bien Hoa road (Bien Hoa – Truong Chinh; Bien Hoa – Nguyen Van Troi intersections, etc.), there's frequently water overflowing onto road surface at the times of highest water use rate.

c. Water supply system

On Bien Hoa road, besides the D63 – D40 service pipelines supplying water for HHs living on two sides of the road, there are also uPVC – D315 distribution pipeline on the northern sidewalk and uPVC – D225 on the southern sidewalk. As planned, Ha Nam Water Supply JSC will replae these two pipelines by D450-HDPE pipes on the northern sidewalk and D315-HDPE pipes on the southern sidewalk. The compay will replace the two pipelines in combination with relevant construction activities of this subproject.

d. Power supply

On the road, there are low-voltage, medium-voltage power lines running above electrical poles, and communication lines also run above sticking to the low-voltage electrical poles seriously affecting urban landscape. According to the schedule of "Undergrounding of power lines 472 and 474 E3.5, sections along Bien Hoa Road and pasing across HQs of Provincial Party Committee and PPC and the commercial-service area on east bank of Day River – Phu Ly City" project, the medium-voltage and low-voltage electric cable system is slated to be moved underground in December 2016. According to the information provided by this project, the moved cable lines will be 1.5 – 2.0m away from sidewalk edge.

e. Greenery

The road has trees of different species planted in different times: (i) some old trees planted a long time ago: khaya wood trees, blackboard trees, (ii) the new spanish cherry trees were planted on the road in 2013, and (iii): other tree species such as almond, flamboyant, longan, crape myrtle, etc. The trees' distances from each other are ununiform and not aligned.

Figure 23Existing Bien Hoa Road

(3) Construction of Chau Giang river southern embankment from Liem Chinh bridge to Cau Gie- Ninh Binh expressway

The southern embankment of Chau Giang River has beginning point at Phu Dong Culvert adjacent and connected to Tran Hung Dao Road (PR 491) at Km0+30 in Liem Chinh Ward and ending point connected to PR 491 at Km2+00 in Liem Tuyen Commune in Phu Ly City. Built and used since a very long time, the existing dyke line has been degrading seriously. Many dyke slop sections have been subjected to soil fall-in. Dyke top is narrow and much subject to settlement each year upon river water rise, leading to occurrence of water effervescence at the downstream section threatening the dyke's safety. Phu Dong dyke is a flood control focus point of Phu Ly City each year.

Along the dyke, there have been many densely-populated area. Economic condition of people here is still relatively poor, with many difficulties, especially travelling convenience for production development.

The existing location of the slated embankment is shown in Figure 24 below.

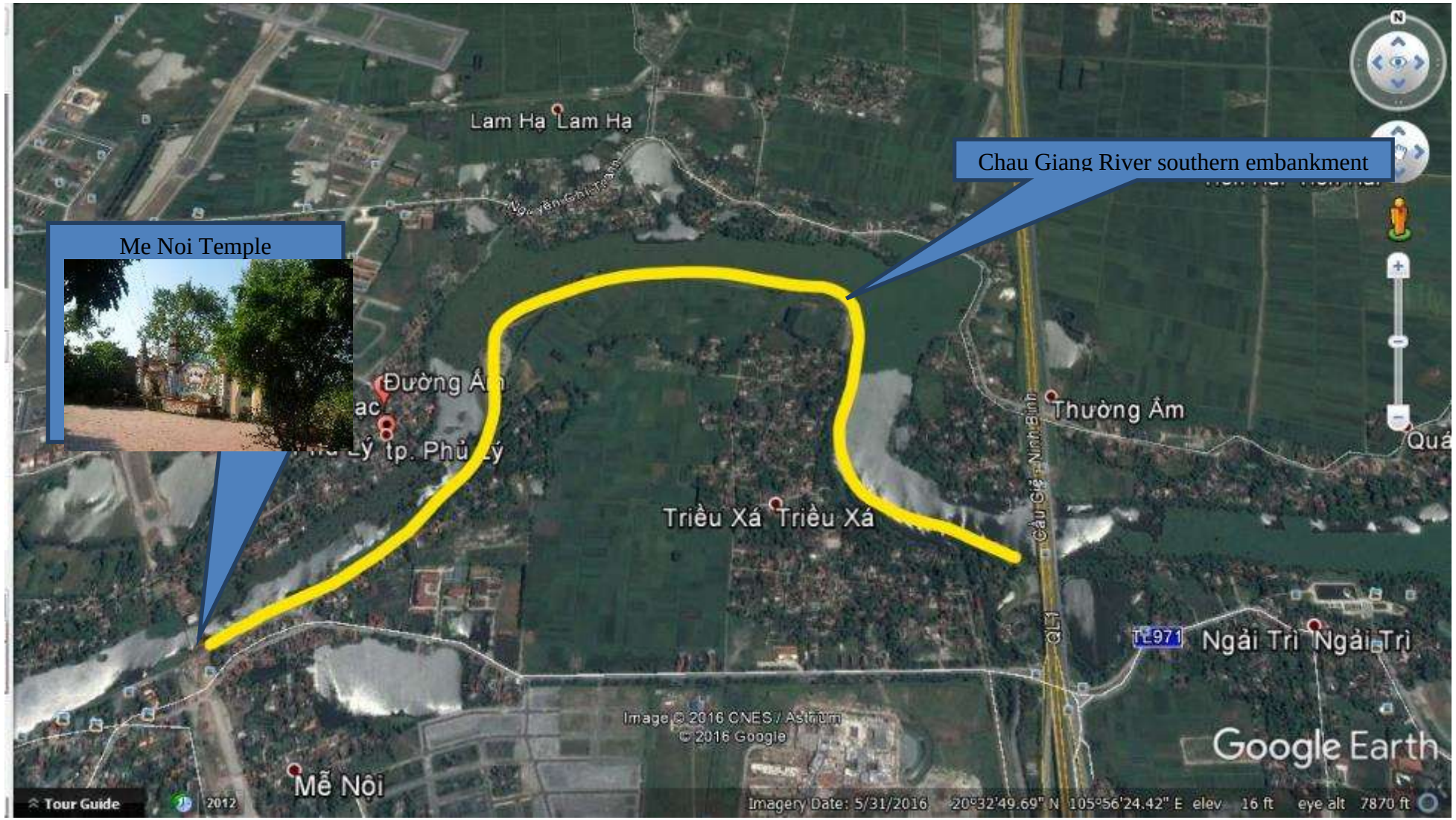


Figure 24Existing location of Chau Giang River southern embankment

(4) Upgrading Tran Hung Dao road

At present, PR 491 section from Liem Chinh Bridge (Km0) to Cau Gie – Ninh Binh Highway (Km2+020) is the common line with Chau Giang River dyke, having asphaltic concrete surface (Bn = 9m; Bmtb = 8m).

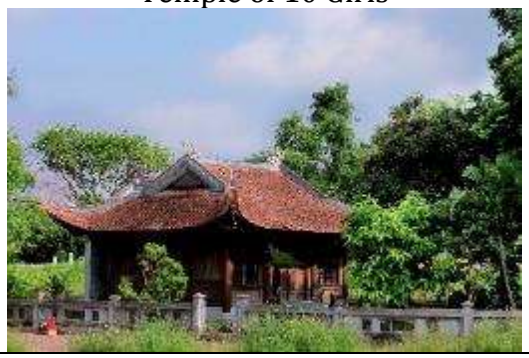
- Section from Km0 to Km0+562.30 (Km0+493.29 – internal road; from Me Slope – the end of Tran Hung Dao Road to Phu Dong embankment project): Two sides are densely populated. Houses of most of the HHs here are about 10cm higher than existing road elevation. A few number of houses are about 10cm lower than existing road elevation. About 16 houses about 1.2m lower than existing road elevation.
- Section from Km0+562.30 to Km0+980: two sides are relatively densely populated. Most of the houses here are higher than existing road elevation. About 6 houses (2T-3T solid house) about 1.2m lower than existing road elevation. There's Vuc Kieu Lake behind the houses nearby the road, on the right.
- Section from Km0+980 to Km1+880: two sides are thinly polupated, with also rice fields and ponds/lakes. Most of the houses here are of same evelevation as the road. Some solified houses (2T – 3T) along the two road sides are about 1.5m – 2m lower than the road. Project items along this section such as River Silk City urban area, Viet Duc Hospital – Unit 2; residential quarters for staff-members of Viet Duc Hospital – Unit 2; Vuc Kieu Lake residential area, HaNa eco-restaurant have been certified to have elevation lowered to +3.5m to accord with plan.
- Section from Km1+880 to Km2+020: There're mostly ponds, lakes, ditches and paddy fields on two sides.

Figure 25 below show the existing Tran Hung Dao Road.

Figure 25Existing Tran Hung Dao Road

2.5 PHYSICAL CULTURAL RESOURCES (PCR) AND SENSITIVE RECEPTORS

Table 17.PCR and sensitive receptors

	Name/Image	Describe
Component 1		
1.1	10 Graves 	- At the subproject site of residential area at Nothern of Quang Trung Ward - Will be relocated during construction. - 0 m from construction site.
1.4	Tran Quoc Toan Primary School 	- Located behind Tran Quoc Toan Primary School - 2 m from construction site.
1.5	Phu Van Primary School 	- Near the proposed Phu Van Kindergarden - 50 m from construction site.
Component 2		
2.1	Temple of 10 Girls 	- 50 m distant to Lam Ha 1 lake.

	Name/Image	Describe
2.2	Phu Ly Church 	- Located on Bien Hoa street, - This is a high-traffic density area, with religious activities taking place on every Saturday and Sunday - 10 m from construction site.
2.3	Me Noi Temple 	- Near the Chau Giang embankment - 10 m from construction site.
	Component 3	
3.1	Ha Nam Provincial Eye Hospital 	- 100 m distant to Tran Hung Dao. This is a relatively hightraffic density area.
	Vuc Kieu Lake 	- On Tran Hung Dao road - 2 m from construction site.
	02 irigation canals	- Across Tran Hung Dao road - 0 m from construction site.

	Name/Image	Describe
		

Figure 26. Location of sensitive points and physical cultural resources

CHAPTER 3: ANALYSIS OF ALTERNATIVES OF THE SUBPROJECT

The subproject has been prepared in line with: i) Development planning of Phu Ly city to become a city class II before 2020; ii) Development planning of Phu Ly city to become a city class II before 2020; iii) Decision No. 819 / QD-UBND dated 13th June 2016 on approving the adjusted master plan on construction of Phu Ly city to 2030 vision to year 2050; iv) Decision 1300 / QD-UBND dated 12th October 2009 indicating the conformity with detailed planning of the urban complex in Northen area of Chau Giang river.

During the subproject impact assessment, alternative analysis is considered a very important part of this process. The main objective of the "analysis of alternatives" is to locate/design/ technology applied to the subproject in order to mitigate the adverse impacts and maximize positive impacts. The analysis of alternatives is performed for ***individualsubproject components***. The results of the analysis are shown below.

3.1 WITHOUT SUBPROJECT CASE

In case of without this subproject, it is clearly that there would be different environmentally problems raised:

- According to the actual situation in the old urban areas, the flooding situation occurs frequently in the Quang Trung, Lam Ha, Minh Khai and Luong Khanh Thien ward. The sewage of many families is not treated and self-absorbed in family's land or flow into Lam Ha 1 lake. Thus, this causes malodorous air pollution, losing urban landscape and creating sources of infectious diseases greatly affecting the quality of people's life. In the future, with increasing population and their daily needs, the amount of wastewater will also rise over time. Therefore, the pollution level will be increasing and will affect adversely the community.
- Due to the rapid urban development, increasing population will lead to increased demand for domestic water use so that wastewater will also rise creating more pressure on the environment in the future.
- In the North Quang Trung ward and Duong Am, Quynh Chan residential areas in Lam Ha ward, the infrastructure is very poor. Drainage system does not cover the entire area resulting in flood and inundations during heavy rain. The lighting system does not serve for 100% of the roads affecting the road safety.
- If Tran Quoc Toan primary school is not upgraded, it will put pressure for schools in the surrounding areas (potentially overloaded). If Phu Van kindergarten is not constructed, the people in the commune have to take their children to study in scattered units which do not ensure the standard of nursery education and have potential risks of traffic accidents and others.

The main contents of Vietnam Medium Cities Development Project – Phu Ly City subproject are improvement of technical infrastructures, investment in water supply, construction of schools, dredging of lakes and traffic development. As mentioned in Chapter 1, the subproject is of high sustainability for urban development and environmental sanitation when it is put into operation and suitable with the master plan of Phu Ly city. The subproject will be systematic and synchronous in a relatively large scale; the effectiveness hereof will meet socio-economic development requirements and provide a sustainable environment. In case the subproject is not implemented, it may face the possible impacts as table 18 follows:

Table 18.Analysis of without subproject case

Investment item	With the subproject	Without the subproject
Inundation	- The environment of residentials area of the city will be improved. - The efficiency of the invested drainage system in Bien Hoa road and the north part of the city will be promoted.	- Inundation will increase in intensity and frequency, affecting local people's properties and business activities and causing environmental pollution. - The efficiency of the drainage system in Bien Hoa road and the northern area of the City invested in the previous stage will not be fully promoted
School works	- School children' learning environment will be improved. - More children will be go to kindergarten.	- Their safety and education quality are not ensured.
Traffic works	- Investment in these work items will facilitate local people's travel, reduce traffic jams, and speed up the development of residential areas.	- There will be great pressure on existing traffic routes.
Embankment works and regulation lake	- Southern embankments of Chau Giang river will help minimize bank erosion and stop riverbed encroachment. - Nice landscapes will be formed in the area along Chau Giang river, attracting visitors. - The regulation lake will help regulate water flow and create great landscape along Highway 1A and Nguyen Chi Thanh road. It will also improve the water quality in this area.	- The area along Chau Giang riverbank will be polluted by wastewater discharged directly into the river. - Traffic in the area will be difficult. - The existing area of the regulation lake will remain an open place with open sewerage channels with mal odors and environmental pollution and a lot wild trees and weeds, presenting a bad-looking landscape.

3.2 ALTERNATIVES OF SUBPROJECT PROPOSALS

3.2.1 Component 1: Basic Infrastructure Upgrade And Service Improvement

Under this component, the subproject has many construction items which are classified according to the different areas. For each item, the subproject offers different options. Based on that the consultant review and consult with the relevant agencies as well as public consultation in order to adjust and choose the optimal option of location, scale, and design.

3.2.1.1. Upgrading Infrastructure for The Residential Area in The North Quang Trung Ward

Characteristics of the area, in the Construction Master Plan of Phu Ly City until 2030 and vision to 2050 and detailed planning 1/500 of the area, the options for drainage and waste water treatment were not mentioned. Therefore, based on the needs and technical specifications of the residential area of the North Quang Trung ward, the subproject has given 3 options for handling the flooding situation and wastewater drainage. The ESIA has analyzed the economic, technical, environmental, and social aspects of the individual options. The results of the analysis are presented in Table 19 and 20 below:

Table 19.Comparision and selection of options for wastewater treatment (WWTP) in the North Quang Trung ward

Content	Option 1	Option 2 (selected)
Solution description	- Construct WWTPs at small scale, allocated in residential areas. - After collection, the sewage will be treated at the above WWTP. - After treatment, the sewage is discharged into Dam Da lake.	- Do not construct WWTP in residential area. - After collection, the sewage will be convey and treated in Bac Chau Giang WWTP constructed under the MCDP subproject.
Economy	- Lower cost than Option 2	- Higher cost than Option 1
Technique	- Difficult to manage because of small scale. Systems allocated in Vietnam mainly operated inefficiently.	- Manage more easily, operate more effectively due to the sufficient resources.
Environmental impact	- Because of the difficulty in management, there will be the bad impact on environment if sewage is not treated as per regulated standard	- Lower impact to environment due to better operation and management.
Social impact	- Fewer land clearance	- More land clearance because it is necessary to construct pumping station and transferring pipe routes.
Selection: Among the above two options, Option 1 has lower cost, and has more land clearance. However, this option is difficult to operate and manage, has more adverse impacts on the environment. After the comparison of the factors, Option 2 has been selected		

Table 20.Analysis of road rehabilitation options

Content	Option 1 (selected)	Option 2
Option description	Rehabilitation based on the current road road width of 1.5-4 m.	Rehabilitation with expansion of the existing road width of 1.5-4 m and 2.75 of the minimum width as per urban planning.
Economy	Lower cost than Option 2	Higher cost than Option 1
Technique	Similar	Similar
Environmental impact	Construction related impacts including dust, noise, emission are lower as the volume of work is smaller. Greater adverse impacts on the landscape.	Construction related impacts including dust, noise, emission are higher as the volume of work is bigger. Greater positive impacts on the landscape.
Social impact	No land acquisition	Land acquisition is required
Selection: During the two options, Option 2 is better regarding the landscape aspect. However, it requires more funding for construction and land acquisition. After considering all the aspects, Option 1 is selected.		

3.2.1.2. Upgrading Infrastructure in Duong Am Residential Group, Lam Ha Ward

Table 21. Comparision and selection of option for wastewater treatment in Duong Am residential group, Lam Ha ward

Content	Option 1: Combined drainage and sewer system	Option 2: Separate drainage and sewer system
Option description	Use combined drain canals and wastewater culverts in area. After collection, rain-water and wastewater will be brought to the combined sewer overflows in the final step/route. Rain-water is brought to Hoa Lac area. Sewage will be collected and brought to SH1 treatment station before discharging to the receiving water.	Use separate drain canal and culvert in area. Rain-water and wastewater are collected by 02 separate systems. Rain-water will be brought to Hoa Lac area. Sewage will be collected and brought to SH1 WWTP plant before discharging to the receiving water.
Cost	Lower cost than Option 2	Higher cost than Option 1
Environmental impact	Easily cause environmental pollution because of the smell of sewage, sewage of households directly emitted to the drainage system.	The smell of sewage will be reduced maximum because the sewage is collected by a separate sewer system.
Social impact	No land clearance and resettlement are required.	No land clearance and resettlement are required.
Conclusion	Option 1 is selected because of being more economical than Option 2 while the adverse impacts would not be significant.	

3.2.1.3. Upgrading Infrastructure in Quynh Chan Residential Group, Lam Ha Ward

Table 22. Comparision and selection of option for wastewater treatment in Quynh Chan residential group, Lam Ha ward

Content	Option 1: Combined drainage and sewer system	Option 2: Separate drainage and sewer system
Option description	Use combined drain canals and wastewater culverts in area. After collection, rain-water and wastewater will be brought to the combined sewer overflows in the final step/route. Rain-water is brought to Hoa Lac area. Sewage will be collected and brought to SH1 treatment station before discharging to the receiving water.	Use separate drain canal and culvert in area. Rain-water and wastewater are collected by 02 separate systems. Rain-water will be brought to the Eastern collecting drain. Sewage will be collected and brought to The Northern pumping station and pumped to the D600 sewer on the 32m road, to SH1 WWTP.
Cost	Lower cost than Option 2	Higher cost than Option 1
Environmental impact	Easily cause environmental pollution because of the smell of	The smell of sewage will be reduced maximum because the sewage is

Content	Option 1: Combined drainage and sewer system	Option 2: Separate drainage and sewer system
	sewage, sewage of households directly emitted to the drainage system.	collected by a separate sewer system.
Social impact	No land clearance and resettlement are required.	No land clearance and resettlement are required.
Conclusion	Option 1 is selected because of being more economical than Option 2 while the adverse impacts would not be significant.	

3.2.1.4. Construction of Phu Van Kindergarten in Phu Van Commune, Phu Ly City

Phu Van kindergarten is built on the planned area approved by Ha Nam Provincial People's Committee with an area of 9,935 m^2 (according to the red boundary line in the planning of Phu Van ecological area at scale 1/2000) so the design options given need to satisfy the criteria:

Match with Phu Van ecological urban area planning (1/2000);

Ensure transport connection with the existing roads;

Architectural space has more open space, more space for teaching and learning activities of pre-school age;

- Meet the design criteria of national standard school.

The results of the analysis are presented in Table 23 below

Table 23.Comparision and selection of option for construction Phu Van kindergarten

Content	Option 1	Option 2
Option description	- U-face design is in the Nothern Eastern direction. - Construction of the road with 240 m length connected from the school entrance gate to the communal inter-transportation road.	- U-face design is in the Southern Western direction - Construction of the road with 170 m length connected fromthe school entrance gate to the communal inter-transportation road.
Economy	- Estimated investment cost is high due to the construction of a larger road connecting to the transportation route.	- Estimated investment cost is lower than Option 1.
Environmental impact	- Bigger amount of excavated soils, generating larger amount of dust and emission than Option 2. - Colder in the winter due to influence of the northeastern wind. - The classes in the Northeastern direction are limited in the afternoon sun light.	- Smaller amount of excavated soils, generating less amount of dust and emission than Option 1. - Due to the avoidance from the wind, the classes will be warmer in the winter. - The classes in Southwestern direction would directly receive the afternoon sun light which would affect lecturing,
Social impact	- Area of land clearance is 4,803 m^2 of agricultural land of 22 households without resettlement.	- Area of land clearance is 4,803 m^2 of agricultural land of 22 households without resettlement.
Conclusion	Both of 2 options have the same impacts on the environment including advantages and disadvantages. The classes in Option 2 will be warmer in the winter, but hotter in the summer. However, investment rate of Option 2 is lower. Considering all the factors, Option 2 is selected.	

3.2.1.5. Upgrading Tran Quoc Toan Primary School, Hai Ba Trung Ward

Table 24.Comparision and selection of option for construction Tran Quoc Toan primary school

Content	Option 1	Option 2
Option description	- Remain 2 blocks of houses (1) and (2) 	- Destroy block (1) and upgrade block (2) (from 2-floor to 3-floor) 
Economy	Same investment cost	Same investment cost
Environmental impact	Low potential negative impacts such as dust, noise, and wastes during construction. Smaller yard and unbeautiful view, compared with Option 2.	Higher potential adverse impacts such as dust, noise, and wastes during construction due to the destruction of the house row (1). Larger yard and more beautiful view, compared with Option 1.
Social impact	Similar	Similar
Conclusion	Option 2 is selected because of the good view and more studying space for the students. This option gets a consensus of City Steering Board, Educational Department of the city and all school inspection committee.	

3.2.2 Component 2: Environmental Sanitation Improvement

3.2.2.1. Upgrading Lam Ha 1 regulation lake, Lam Ha ward

There is no technical alternatives for the construction of this investment.

3.2.2.2. Upgrading Drainage and Technical Infrastructure System for Bien Hoa Road

Table 25.Comparision and selection of option for construction Bien Hoa road

Content	Option 1	Option 2
Option description	Daily sewage is collected to the separate sewer system, then comes back to the combined drainage system on Bien Hoa road.	Daily sewage is collected to the separate sewer system, then brought to pumping station and then to Me WWTP.
About Economy	Construction cost and O&M cost are lower than Option 2.	Construction cost and O&M cost are higher than Option 1.
Environmental impact	Arise the smell in case that the separate chamber system is not combined with smell prevention.	Overcome the problem of the smell in the sewer system.
Social impact	Construction will impact on business activities of the	Construction will impact on business activities of the households

Content	Option 1	Option 2
	households at the two pavements of the road.	at two pavements of the road.
Selection	After above analysis, to overcome the road excavation and cutting in the future, to ensure the separate ability of the combined drainage and sewre system into the separate system in the next period with high effectiveness of the investment, Option 1 is preffered.	

3.2.2.3. Construction of Chau Giang river southern embankment from Liem Chinh bridge to Cau Gie- Ninh Binh expressway

Table 26.Comparision and selection of options for construction embankment in the South of Chau Giang river

Content	Option 1	Option 2
Option description	River revetment is implemented by vertical steel-reinforced concrete structure.	River revetment is implemented by sloped-roof steel-reinforced concrete structure with the change of the slope as per the geographic structure of the area.
Economy	Higher construction cost due to complex construction method	Lower construction cost due to simple construction method
Environmental impact	- Lower envinronmental impact due to little digging amount. - Influence on transportation in construction process.	- More envinronmental impact due to more digging amount. - Influence on transportation in construction process
Social impact	Few land clearance -> low impact on people living around	More land clearance -> more impact on people living around
Conclusion	2 option have the similar investment cost. Option 1 has the complex construction method, but construction's stability as well as synchronization of general structure of whole routes and low impact on society and environment. Thus, Option 1 is proposed.	

3.2.3 Component3: Urban Roads And Bridges

Upgrading Tran Hung Dao road. The results of the analysis are presented in Table 27 below:

Table 27.Comparision and selection of options for construction of Tran Hung Dao road

Content	Option 1	Option 2
Option description	Tran Hung Dao route is connected with 491 road to the girder of bypass of the expressway	Tran Hung Dao route will be extended more 420 m to Vinh Tru direction.
Economy	Construction cost is lower than Option 2	Construction cost and land clearance cost are higher due to the 420 m addition road passing through the soft soil foundation
Environmental impact	Construction time is shorter and the excavation amount is less than Option 2.	Construction time is longer and the excavation amount is greater than Option 1
Social impact	Land clearance is less than Option 2	More 420 m land clearance -> impact on more households than Option 1
Conclusion	Option 1 is design in accordance with the plan, based on the factor of vehicle density on existing road and construction cost, land clearance cost is lower and environmental impact is fewer. Therefore, it is the preffered Option.	

CHAPTER 4: ENVIRONMENTAL SOCIAL IMPACT ASSESSMENT

4.1 ENVIRONMENTAL IMPACT ASSESSMENT

4.1.1 Positive Impacts

In general, the proposed subproject would bring about significant positive impacts to the participating cities. Local people will be benefited from a healthier and sustainable living environment. Among others, the positive impacts include: (i) improved environmental conditions and urban landscape in many public and residential areas; (ii) increased wastewater collection and treatment; (iii) minimized discharge of untreated wastewater into the environment; (iv) reduction of public health risks associated with water-born diseases and related healthcare cost; (v) reduction of traffic jam or safety risks caused by inundation; (vi) increased the accessibility of local people to nearby areas. The specific benefits of the subproject are described in more details below:

- The subproject involves construction of the sewer and stormwater collection system. This component, together with the component of road improvemtn, would enhance traffic condition in the construction area of Bien Hoa road, Tran Hung Dao road.
- The drainage system is rehabiliated and upgraded, therefore, the flood-prone area in Bien Hoa road would be solved completely.
- Constructing stormwater drainage system would help reduce flooding in some areas such as Quang Trung and Lam Ha ward. Besides, the drainage system also helps strengthen drainage capacity; avoid, protect, and prevent outside flood from entering the city center as well as solve environmental pollution.
- The collection and treatment of domestic wastewater for subproject area would minimize the volume of wastewater discharged directly into natural water bodies such as canals, lakes, and thus reduce significantly pollutants to the water bodies in the area.
- Additional economic, social, environment and aesthetic benefits from the construction of linear parks along Chau Giang river embankment i.e. open space for recreation of local people.
- The technical assistance given to the subproject owner, management agencies and sectors' institutions would help bringing about efficiency in the operation promotion the subproject sustainability.
- The direct beneficiaries of the subproject are 39,720 people, including:
    - Residential community in the North Quang Trung ward: 5,940 people.
    - Duong Am and Quynh Chan residential groups in Lam Ha ward: 2,880 people.
    - Residential community in the West Bac Chau Giang urban area (bordering Lam Ha 1 lake): 3,200 people.
    - Residential community along Bien Hoa road: 3,500 people.
    - Residential community in Hai Ba Trung ward and Phu Van commune, Phu Ly city: 12,000 people.
    - Residential community at Tran Hung Dao street from Liem Chinh bridge to Cau Gie - Ninh Binh expressway: 10,200 people.
    - Residential community along Chau Giang river southern embankment: 2,000 people.

4.1.2 Potential Negative Impacts

4.1.2.1. Type and Scale of Subproject Impacts

Based on the analysis of baseline data, field visits, and discussion with the key stakeholders and the affected communities, the potential negative impacts on the natural and socio-economic environment of the subproject have been identified. These assessments are detailed in this chapter of the report.

The negative impacts on the environment and society are related to the civil works of the 3 Components 1, 2, and 3, of which most of these impacts are site-specific, reversible, temporary, localized and could be mitigated through the application of good engineering and construction management practices and with close supervision and monitoring of contractor performance and consultation with local communities. However, the type and nature of the impacts vary with the nature and scale of the activities, locations, and their environmental and social settings, human behaviors, and time factors.

The type and scale of the potential impacts by the subproject are identified by the subcomponents and summarized in the Table 28 below, in which:

- None (N) – No impact;
- Low (L) – Low impact: minor impacts, localized and resersible, temporary
- Medium (M) – medium impacts: moderate impacts, localized, negligible with the application of mitigation measures;
- High (H): high risk of impacts on environment and society, manageable and reducible with the application of mitigation measures.

Both levels of M and H require to carry out the mitigation measures and comply with environmental safeguard policies, monitoring and enhancing institutional capacity on appropriate safeguard policies.

Table 28. Summary of the environmental and social impacts of the subproject

Components	Physical			Biological		Socio				Others		
	Air, noise, vibration	Land, soil, water	Solid waste, Sludge	Forest, natural habitats	Fish, aquatic life	Land acquisition, resettlement	Indigenous peoples	Physical cultural resources	Livelihood, community disturbance	Local flood, traffi, safety	Off-site impacts	
Component 1: Basic Infrastructure Upgrade And Service Improvement (US$ 5.51 million)												
Upgrading infrastructure for the residential area in the North Quang Trung ward –The scope includes (i) constructing a road following the planning B=11.5m, 254 m long, (ii) upgrading internal existing road, total length of about 1.9 km, and keeping the existing width; (iii) installing a stormwater combined drainage system, 1.7 km long, (iv) power supply for lighting system on the planned road and the main roads of the residential area (1.01 million USD); activities will be carried out in the old urban areas, highly populated, limited road access] [land acquisition impacts on 12 HHs], 10 graves relocated.												
Pre-construction	N	N	N	N	N	L	N	N	N	N	N	
Construction	M	M	M	N	N	N	N	N	M	M	M	
Operation	N	L	L	N	N	N	N	N	L	N	N	
Remark	- Small and medium scale works with minor impacts (see Note (2) below) - Impacts from demolition of structures, disposal of wastes, and road safety concerns - relocation of 10 graves - road safety											
Upgrading infrastructure in Duong Am residential group, Lam Ha ward–The scope includes (i) upgrading existing internal roads, about 1.8 km long, keeping the existing width; (ii) installing a wastewater combined drainage system, about 2.1 km long, and (iii) installing water supply network connecting to the existing main supply network, total about 4.6 km long, (iv) power supply for lighting system at low-voltage power poles and adding new poles at the planned routes. (0.97 million USD). [Activities will be carried out in many areas but small works are expected] [No resettlement impacts]												
Pre-Construction	N	N	N	N	N	N	N	N	N	N	N	
Construction	M	M	L	N	N	N	N	N	M	M	L	
Operation	N	N	L	N	N	N	N	N	L	M	M	
Remark	Small and medium scale works with minor impacts (see Note (2) below) - risks of road safety; possible local drainage issues											
Upgrading infrastructure in Quynh Chan residential group, Lam Ha ward- The scope includes (i) upgrading existing internal roads, about 3 km long, keeping the existing width, (ii) installing wastewater combined drainage system, total length about 3 km, and (iii) installing a water supply network connecting to the main supply network, total length about 6.5 km, (iv) power supply for lighting at low-voltage power poles and adding new poles at the planned routes (0.89 million USD) [Activities will be carried out in many areas but small workds are expected.] [No resettlement impacts], không có thu hồi đất và tái định cư.												
Pre-construction	N	N	N	N	N	N	N	N	N	N	N	
Construction	M	M	M	N	N	N	N	N	M	M	M	
Operation	L	N	L	N	N	N	N	N	N	N	N	
Remark	Small and medium scale works with minor impacts (see Note (2) below)											

Components	Physical			Biological		Socio				Others		
	Air, noise, vibration	Land, soil, water	Solid waste, Sludge	Forest, natural habitats	Fish, aquatic life	Land acquisition, resettlement	Indigenous peoples	Physical cultural resources	Livelihood, community disturbance	Local flood, traffi, safety	Off-site impacts	
	Risks of road safety; possible local drainage issues											
Construction of Phu Van kindergarten in Phu Van commune, Phu Ly city Constructing 9,935 m^2 kindergarten for 500 pupils (i) 4 U-shaped blocks , 2 floors, consisting of 16 classrooms and functional rooms (19.5 – 90.28 m^2); (ii) Areas for outdoor activities of children within kindergarten age range: Bio-landscape garden, sand playground, water-splash tank; green vegetable garden; (iii) Concrete road 170 m long and 3.75 m wide (0.95 million USD);[land acquisition impacts on 22 HHs]												
Pre-construction	N	N	N	N	N	L	N	N	N	N	N	
Construction	M	M	M	N	N	N	N	N	L	L	L	
Operation	L	L	L	N	N	N	N	N	N	N	N	
Remark	apply good construction practice -Potential minor impacts from poor O&M of toilets											
Upgrading Tran Quoc Toan primary school, Hai Ba Trung ward– Constructing 2 class-room blocks and upgrading 1 class-room block of Tran Quoc Toan Primary School with total area of 3.221 m^2 for 1.200 pupils (i) New block 3 floors: 33 classrooms (44.53 m^2/room); 2 functional rooms (49.6 m^2/room) (ii) Upgrading 2 floors to 3 floors: 11 rooms (20.9 – 64.8 m^2/room) (0.83 million USD).												
Pre-construction	N	N	N	N	N	N	N	N	N	N	N	
Construction	M	M	M	N	N	N	N	N	N	M	L	
Operation	L	L	L	N	N	N	N	N	N	N	N	
Remark	- Application of good construction practices, avoid impacts of subsidence, wall crack on the residential area surrounding the school. -Potential minor impacts from poor O&M of toilets											
Component 2: Environmental Sanitation Improvement (US$9.37 million)												
Upgrading Lam Ha 1 regulation lake, Lam Ha ward Upgrading Lam Ha 1 Lake in Lam Ha Ward(7.78 ha) (i) Lake embankment and road (1.702 m) (ii) Tree, lighting system (1.55 million USD)), [Activities will be carried out in the old urban area][Resettlement impacts on 41 HH][Acquisition land area: 1.4 ha]												
Pre-construction	N	N	N	L	L	M	N	N	M	N	N	
Construction	M	M	M	L	L	N	N	N	M	M	L	
Operation	L	L	L	N	L	N	N	N	N	L	L	
Remark	- Small and medium scale works with minor impacts (see Note (2) below). - Disposal of about 48.000 $m^3$of dredged materials											

Components	Physical			Biological		Socio				Others		
	Air, noise, vibration	Land, soil, water	Solid waste, Sludge	Forest, natural habitats	Fish, aquatic life	Land acquisition, resettlement	Indigenous peoples	Physical cultural resources	Livelihood, community disturbance	Local flood, traffi, safety	Off-site impacts	
	- Dredged sludge sample analysis results showed that the indicators do not exceed the threshold of hazardous waste. However, before dredging, additional samples are required to reassess the nature of dredged sludge.											
Upgrading drainage and technical infrastructure system for Bien Hoa road- Constructing (i) Rehabilitating roadsurface and interchange, about 906 m long, (ii) surfacewater and wastewater drainage system, about 923 m long, (iii) rehabilitating lighting system, (iv) upgrading sidewalk and green tree system. (1.67 million USD). [Activities will be carried out in the urban area],												
Pre-construction	N	N	N	N	N	N	N	N	N	N	N	
Construction	M	L	L	N	N	N	N	N	M	M	N	
Operation	N	N	L	N	N	N	N	N	N	N	N	
Remark	- Impacts due to the construction may come from clearing of site and plants, taking and transporting about 1,000 m^3 of materials from the excavation, traffic management, impacts due to the operation of the mixing station (asphalt and concrete) - Impacts on daily life activities of the people Potential minor impacts from poor O&M											
Construction of Chau Giang river southern embankment from Liem Chinh bridge to Cau Gie- Ninh Binh expressway- Constructing Chau Giang river southern embankment from Liem Chinh bridge to Cau Gie- Ninh Binh expressway with total length of 2.4km (4,43 million USD). [Embankment wall combined with road] [Activities will be carried out in the semi-agricultural area, mainly agricultural land] [Resettlement impacts on 70HHs], Land acquisition: 0.82 ha residential land, 1.6 ha agricultural land.												
Pre-construction	N	N	N	N	N	M	N	N	N	N	N	
Construction	M	M	M	M	L	N	N	L	M	M	N	
Operation	N	N	L	N	N	N	N	N	N	N	N	
Remark	Impacts on daily life activities and transport of local people Temporary impacts on Me Noi temple nearby the subproject area. Minor impacts from O&M											
Component 3: Urban Roads and Bridges (US$9.19 million)												
Upgrading Tran Hung Dao road–Upgrading Tran Hung Dao road from Liem Chinh bridge to Cau Gie-Ninh Binh expressway, connecting to the approved planning along 2 sides of the provincial road 491 and transport network in the region, 1,6km long, with 4 standard lanes, sidewalk, drainage, road lighting and utilities for pedestrian. (13,64 million USD). [Resettlement impacts on 41HHs], Land acquisition: 5,809m^2 rresidential land, 3,112m^2 agricultural làn..												
Pre-construction	N	N	N	N	L	M	N	N	L	N	N	
Construction	M	M	M	M	L	N	N	N	M	M	M	
Operation	M	N	L	N	N	N	N	N	N	L	N	
Remark	- Impacts due to the construction may come from clearing of site and plants, taking and transporting about 83.000 m^3 of materials from the pits,											

Components	**Physical**			**Biological**		**Socio**				**Others**		
	Air, noise, vibration	Land, soil, water	Solid waste, Sludge	Forest, natural habitats	Fish, aquatic life	Land acquisition, resettlement	Indigenous peoples	Physical cultural resources	Livelihood, community disturbance	Local flood, traffi, safety	Off-site impacts	
	traffic management, impacts due to the operation of the mixing station (asphalt and concrete) - Impacts on local traffic and road safety; Local drainage problems, Impacts from air/noise											

Notes: (1) The following criteria are used for the assessment of level of impacts: None (N) –no impact; Low (L) – Small works, minor impacts, localized, reversible, temporary; Medium (M) –Small works in urban/sensitive areas, medium scale works with moderate impacts of which most are reversible, reducible and manageable, localized, temporary; High (H) –Medium scale works in small urban /sensitive area, large scale works with significant impacts (socially and/or environmentally) of which many are irreversible and require compensation; Both M and H need monitoring and implementation of the mitigation measures as well as adequate institutional capacity on safeguard
(2) Small and medium scale works, most impacts are localized, temporary, and can be mitigated through the application of good engineering and construction management practices and with close supervision and monitoring and close consultation with local communities.

4.1.3 Impacts from Infrastructure Investment of Component 1

The civil works under Component 1 include:

- (1) Construction (245m) and rehabilitation (1.9km) of urban roads and (2) Installation of combined drainage and wastewater collection system (1.7km) in the North of Quang Trung Ward;
- (1) Upgrading of internal urban road (1.8km), (2) Installation of combined drainage and wastewater collection system (2.1km), and (3) Installation of water supply distribution system (4.6km) in Duong Am, Lam Ha ward;
- (1) Upgrading of internal urban road (3km), (2) Installation of combined drainage and wastewater collection system (3km), and (3) Installation of water supply distribution system (6.5km) in Quynh Chan residential cluster, Lam Ha ward.
- (1) Construction and upgrading of school building blocks in Tran Quoc Toan primary school, Hai Ba Trung ward, and Phu Van kindergarten in Phu Van commune.

4.1.3.1. Component 1 – Impacts during Pre-construction

Impacts onland acquisition

In relation to the proposed work items: It is estimated that Component 1 will acquire 15,103m^{2}of land for the two items: Upgrading and rehabilitating infrastructure system of the residential area in the northern area of Quang Trung Ward, and constructing Phu Van Kindergarten, including 0.43ha of residential land, 0.48ha of agricultural land, and 0.6ha of public land. 12 HHs under Component 1 will be affected by acquisition of residential land and fixed assets, and 22 HHs will be affected by loss of agricultural land. In total, 7 households will be relocated. In addition, 10 graves will also be displaced. The detailed impact assessment for land acquisition and resettlement under this component is given in Section 4.2 – Social Assessment.

Remaining unexploded ordnances (UXO)

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

4.1.3.2. Component 1 – Impacts during Construction

General impact during construction

a. Impact on air environment

Air quality will be affected during construction phase by dust, exhaust gases, and noise from construction vehicles. However, these impacts are not continuous and in a short time, mostly temporary.

Air pollution caused by ground leveling, excavation and backfilling, and transportation:

Dust and exhaust gases will be dispersed from the processes of ground leveling, excavation, backfilling, and stockpiling and transportation of materials. The excavated materials will be used partly to backfill the works at the necessary locations. The rest will be resued transported out of the construction sites to the disposal site or used for other purposes such as ground levelling need of the community.

- Dust from ground leveling, excavation and backfilling: On average, dust generated from excavation or backfilling of $1m^3$ of earth would be about 0.75 kg /m^3, of which 10% is suspended dust. Based on pollution coefficient E = 0.075 kg/m^3 and compliance with the subproject work progress, the loads of dispersed dust generated by excavation, backfilling and ground leveling can be forecasted as follows (Table 29):

Table 29. Forecasts of dispersed dust from excavation, backfilling and ground leveling

	Item	*Volume of excavating and backfilling*		*Construction stage (Quarter)*	*Dust load (kg/day)*
		m3	**Ton**		
1	Upgrading infrastructure for the residential area in the North Quang Trung ward	3,453	4,834	18	0.77
2	Upgrading infrastructure in Duong Am residential group, Lam Ha ward	12,414	17,380	18	2.79
3	Upgrading infrastructure in Quynh Chan residential group, Lam Ha ward	20,134	28,188	18	4.52
4	Construction of Phu Van kindergarten in Phu Van commune, Phu Ly city	27,827	38,958	12	9.36
5	Upgrading Tran Quoc Toan primary school, Hai Ba Trung ward	2,547	3,566	12	0.86

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

Thus, the load of dispersed dust from excavation and backfilling in the subproject items varies between 0.77– 9.36 kg/day.

- Dust and exhaust gases from transportation: According to the standards established by the World Health Organization (WHO) (*Assessment of Sources of Air, Water and Land Pollution –Part 1: Rapid Inventory Techniques in Environmental Pollution, WHO, 1993)*, 15-ton diesel vehicles will generate loads of dust and exhausted CO, SO_2, NO_2, and HC as follows: dust: at 1.6 g/km/vehicle; CO gas: 3.7 g/km/vehicle; SO_2:7.43S g/km/vehicle; and HC: 3 g/km/vehicle (diesel of 3% S). The subproject will use 12-ton trucks for transporting. The average transport distance is 15km. The total passages of trucks and the generated dust loads in the process of soil transportation are calculated as follows (Table 30):

Table 30. Number of truck passages in constructing items of Component 1

No.	*Item*	*Volume of excavating and backfilling (Ton)*	*Construction stage (Month)*	*Truck passage (vehicle/day)*
1	Upgrading infrastructure for the residential area in the North Quang Trung ward	4,834	18	1
2	Upgrading infrastructure in Duong Am residential group, Lam Ha ward	17,380	18	2
3	Upgrading infrastructure in Quynh Chan residential group, Lam Ha ward	28,188	18	4
4	Construction of Phu Van	38,958	12	7

No.	*Item*	*Volume of excavating and backfilling (Ton)*	*Construction stage (Month)*	*Truck passage (vehicle/day)*
	kindergarten in Phu Van commune, Phu Ly city			
5	Upgrading Tran Quoc Toan primary school, Hai Ba Trung ward	3,566	12	1
	Total	66,375	78	15

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 2.2 m/s and south-eastern prevailing wind direction in the rainy season, a wind speed 2.6 m/s and north-eastern prevailing wind direction in the dry season, and a distance of 40-80m from generating sources, the concentration of pollutants created by transportation operations can be calculated as follows:

For Infrastructure for the area in North Quang Trung ward: Dust concentrations vary between 0.1-0.35 mg/m^3 (compared with permissible standard limits of 0.3mg/m^3); CO contents between 0.23-0.82 mg/m^3 (compared with 30 mg/m^3); SO_2 contents between 0.12-0.25 mg/m^3 (compared with 0.35 mg/m^3); and HC contents between 0.19-0.41 mg/m^3 (compared with 5 mg/m^3).

For Infrastructure in Duong Am, Lam Ha ward: Dust concentrations vary between 0.24-0.54mg/m^3; CO contents between 0.56-1.24 mg/m^3; SO_2 contents between 0.28-0.62mg/m^3; and HC contents between 0.46-0.62mg/m^3.

For Infrastructure in Quynh Chan residential cluster, Lam Ha ward: Dust concentrations vary between 0.042-0.092mg/m^3; CO contents between 0.09-0.21mg/m^3; SO_2 contents between 0.05-0.17mg/m^3; and HC contents between 0.08-0.28mg/m^3.

Dust:

In general, the loads of dust generated in the process of transporting excavated earth are forecast as being not substantial and would be distributed evenly along transportation routes, between 0.042 and 0.54mg/m^3. According to calculations, the dust concentration would not exceed the national standards on ambient air quality (QCVN 05: 2013/BTNMT) outside 60m of distance. However, it must be noted that the amount of dust generated may be significant owing to the mobilization of machinery and vehicles on the construction site. At some points of time, relatively large amounts of dust may abruptly increase when a large number of machines and vehicles are mobilized for necessary construction tasks.

The main transport routes for materials transportation would be Highway 1A, Nguyen Chi Thanh road, D4-N7 road, Tran Hung Dao road and some other internal transport routes to the South of the city. These are also main transport routes through the city. The results of air quality analysis in Chapter 2 shows that the air quality in these areas is currently fairly good. Therefore, the subproject impacts of dust would be visible. The receptors affected by dust would be the residents living along the routes. Dust pollution would hinder businesses and services located along the routes leading to a drop in the number of customers. However, these impacts can be fully controlled and minimized if all necessary mitigation measures would be carried out during construction. The impact level of dust during ground leveling, excavation, backfilling and transportation is thereby assessed as being medium.

Exhaust gases:

The CO contents in the areas are between 0.09-1.24 mg/m^3. The SO_2 contents are between 0.05-0.62 mg/m^3; and HC contents between 0.08-0.62mg/m^3. Outside 40m of the construction sites, the

results of analysis of exhaust gases compared to the national ambient air quality standards (QCVN 05: 2013/BTNMT) show that they are still within the permissible limits.

Noise pollution

Noise comes from the material transport vehicles, machines and equipment. The level of noise coming from the transportation and construction are calculated by the following formula:

$$Lp(X) = Lp(X\mathbf{0}) + 20 \log\mathbf{10}(Xfl/X)$$

In which:

$L_P(X_0)$: noise 1m far from source (dBA)

$L_P(X)$: Noise levels in the position to calculate

X: position to calculate X**0** = 1m

For each work item, the resonant noise level will be estimated from separate noise level of the machines and equipment. The resonant noise level is calculated by the following formula:

$$Ly = 10 \times Ig \quad \mathbf{1\ 0}^{\circ\,\prime 1Li}$$

In which:

- *LI: Resonant noise level*
- *Li: Source of noise i*
- *n : Number of sources of noise*

The distance for noise impact assessment on the surrounding residential area is selected from 20m-50m. The results of separate noise level assessment of individual construction and transport vehicles as well as resonant noise level are estimated and presented in the Table 31 below.

Table 31. Noise level from construction vehicles

No.	***Vehicles/Equipment***	***Noise 1m far from the source (dBA)***		***Noise level 20m far from the source***	***Noise level 50m far from the source***
		Variation	***Average***		
01	Bulldozer		93.0	67.0	59.0
02	Roller	72.0 - 74.0	73.0	47.0	39.0
03	Excavator	72.0 - 84.0	78.0	52.0	44.0
04	Land scrapers	80.0 - 93.0	86.5	60.5	52.5
05	Road pavings	87.0 - 88.5	87.7	61.7	53.7
06	Truck	82.0 - 94.0	88.0	62.0	54.0
07	Concrete mixer	75.0 - 88.0	81.5	55.5	47.5
08	Resonant noise level		84.5	58.5	50.5
	QCVN 26/2010/BTNMT, normally: 6 pm to 21 pm is 70 dBA; 21 pm to 6am is 55 dBA;				
	Ministry of Health standard: Noise at production area: contact time 8hours is 85 dBA				

The results showed that, at the distance of 20 meters from the sources of noise, the noise levels from vehicles are all within the allowable limits of QCVN 26:2010/BTNMT and the standards of the Ministry of Health and at medium level. Since the local houses in most of the construction areas are located right at the edge of the roads to be rehabilitated, they will be affected by the elevated noise level due to connstuction activities. Other subjects of the impact are mainly workers involved in the construction. However, given the type of the road rehabilitation which

mainly includes small surface concrete improvement and installation of small combined sewers, the temporary and localized nature of the activities, the impacts can be assessed as small to moderate.

The areas that may be affected by noise, dust, and exhaust gases, are listed in Table 32.

Table 32.Special subjects affected by noise, dust and exhaust gases

No	Affected subjects	Construction items	Distance to construction sites
1	Residents in North Quang Trung ward	Construction of road, drainage sewers, lighting system	Close to construction route
2	Residents in Duong Am residential group	Construction of road, drainage sewers, water supply sytem and lighting system	Close to construction route
3	Residents in Duong Am residential group	Construction of road, drainage sewers, water supply sytem and lighting system	Close to construction route
4	Phu Van primary school	Construction of kindergarten	20m
5	Tran Quoc Toan secondary school	Construction of primary school	20m

If construction work is carried out at night in these areas, the noise levels all exceed permitted limits within a radius of 200m. During the daytime, these areas will be affected by noise within a radius of 50m. Especially, due to the construction of the primary school, the pupils of Tran Quoc Toan secondary schools, would be affected by noise. Therefore, the contractors would have to carry out mitigation measures to reduce the impacts of noise on learning activities at these schools. The impact level of noise is assessed to be medium.

c. Impacts from vibration

The construction process with the use of means and equipment can give rise to vibration in the earth foundation. Such vibration is transmitted along the earth environment but is strongly reduced in proportion with distance.

The levels of vibration generated by a number of construction equipment are given in Table 33 and Table 34

Table 33.Levels of vibration caused by typical construction equipment

No.	Machine/Equipment	PPV at 7.62 m (mm/s)	Corresponding Lv at 7.62 m (VdB)
1	Compression-type piling driver		
	+ High level	**0.463**	112
	+ Normal level	**0.196**	104
2	Rammer	0.064	**94**
3	Pile driving hammer	0.027	**87**
4	Big bulldozer	0.027	**87**
5	Driller	0.027	**87**
6	Heavy truck	0.023	**86**
7	Drilling hammer	0.011	**79**
8	Small bulldozer	0.001	**58**

Source: D.J. Martin. 1980, J.F. Wiss.1974, J.F. Wiss. 1967, David A. Towers. 1995.

Table 34. Assessment of impact level caused by vibration

No.	Type of work	PPV (mm/s)	Approximate Lv (VdB)
1	Reinforced concrete, steel, wood (without plastic)	0.153	102
2	Technical concrete, normal mason works	0.092	94
3	Unprocessed wood and major mason works	0.061	98
4	Housing oversensitive to vibration	0.037	90

Source: Swiss Consultants for Road Construction Association, "Effects of Vibration on Construction," VSS-SN640-312a, Zurich, Switzerland, April 1992.

Under Component 1, construction means to be used would include pile drivers, rammers, bulldozers, and heavy trucks. Based on the results presented in Table 33 and Table 34, the safe distance for bearing strong impacts from vibration is about 10 meters from the generating source. The impact level of vibration is assessed to be low.

b. Impacts on water environment

Wastewater

It would be expected that about 200 workers would be mobilized for construction of the infrastructure, 100 workers for construction of school. Therefore, at a peak time, a total of 300 workers would be working if all the construction items would be executed at the same time. According to Vietnam Construction Standard TCXDVN 33:2006, the water use norm is 165 Liter/person.day. The contractor will prioritize hiring local workers to reduce the numer of workers staying on site as well as to reduce volume of domestic wastewater generating from workers' activities. The volume of wastewater is calculated at 90% of the amount of water consumption. Based on the mentioned number of workers and aforesaid wastewater generation coefficient, the volumes and loads of domestic wastewater can be forecasted as presented below (Table 35):

Table 35. Generated domestic wastewater

No.	*Item*	*Number of workers (person)*	*Wastewater volume generated (m^3/day)*
1	Upgrading infrastructure for the residential area in the North Quang Trung ward	80	11.88
2	Upgrading infrastructure in Duong Am residential group, Lam Ha ward	60	8.91
3	Upgrading infrastructure in Quynh Chan residential group, Lam Ha ward	60	8.91
4	Construction of Phu Van kindergarten in Phu Van commune, Phu Ly city	50	7.43
5	Upgrading Tran Quoc Toan primary school, Hai Ba Trung ward	50	7.43
Total		300	44.55

Wastewater from domestic activities would contain many suspended solids, organic matters, nutrients and microorganisms. The loads of pollutants in wastewater without collection and treatment systems are presented in Table 36 below.

Table 36.Loads of pollutants in domestic wastewater

No	Pollutants	Load (kg/day)
1	BOD_5	0.45-0.54
2	COD	0.702-1.02
3	TSS	0.7-1.45

4	T-N	0.06-0.12
5	T-P	0.008-0.04
6	Cl^-	0.04-0.08
7	E. coli	10^5-10^6

(Source: WHO, 1993)

Thus, the total volume of domestic wastewater generated from construction processes will be about 44.5 m^3/day at all the construction sites. Without proper management, domestic wastewater will deteriorate the landscape, pollute land, water, and air environment, and create favorable conditions for pathogens to proliferate. These, in turn, will adversely affect the health of communities and workers. Contractors are to work out measures to manage this volume of wastewater.

It is assessed that, for the construction of each work item, there will be a fairly small amount of generated domestic wastewater. Therefore, the impact level of wastewater is assessed to be low.

Stormwater runoff

Stormwater running through the construction sites will increase turbidity and the content of suspended solids, adversely affecting water quality and aquatic life, possibly contributing to the increase of the sedimentation level of the water-course as it brings along soil, waste, oil, etc. from the construction sites into existing drainage channels, rivers and sea catchments, or causes flooding in the area. Without proper management, runoff flowing through the worker camps could also take along domestic waste and human wastes, triggering pollution and diseases.

An assessment of the impact of stormwater runoff over the construction area on the surrounding environment can be based on the method of calculating the drainage of a hydraulic system with the following formula for intensity limits (Source: Environmental Engineering Handbook, 2005) as follows:

$$Q = C * I * A/1000$$

In which:

Q: volume of stormwater runoff (m^3/day);

C: Flow coefficient; with C = 0.6;

I: Precipitation value (mm/day). According to data on rainfall presented in Chapter 2, the precipitation in Ha Nam greatly varies through the months, with a maximum of 1,697 mm , averaging about 0.03m/day;

A: Catchment area (m^2).

Hence, the amount of stormwater runoff on the construction site can be estimated as follows:

- ***Construction of combined sewer system***

The wastewater collection and drainage system is of a total length of 15,385 m. The construction of the system would follow the successive construction method, with about of 200m of sewer each time. Given the narrow roads under the component, it is estimated that about 1m of the pavement width, depending on the width of the roads, must be occupied for the construction of the combined sewer system. Hence, the construction area for each period will be about 200 m^2. The daily amount of stormwater runoff can be estimated as follows:

$$Q_1 = 0.60 * 0.03m/day * 200\ m^2 = 3.6\ m^3/day.$$

The drainage was not good in some areas (e.g. Quang Trung ward, Duong Am residential group, Quynh Chan residential group, etc.) which could be flooded in heavy rains, impeding traffic and travelling, threatening environmental sanitation, and affecting the construction process. The area needs to receive proper attention, as this is a low land prone to flooding during construction. The impact level is assessed as medium.

According to measurements made in 2009 by the Ho Chi Minh City Institute of Hygiene and Epidemiology, the concentration of pollutants in stormwater in urban areas with no contamination sources and with construction works is as follows (Table 37).

Table 37.Concentration of pollutants in stormwater runoff

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

Source: HCM City Institute of Hygiene and Epidemiology, 2009

Thus, in stormwater runoff flowing through the construction area, the content of suspended solids often exceed the permissible limits set out in national industrial wastewater standards(QCVN 40:2011/BTNMT)- Column B, while the content of mineral grease and oil, if not properly isolated, is likely to exceed the permissible discharge limit. The impact level is assessed to be medium.

d. Solid Waste

Excavated soil during construction

Earthwork (excavation, backfilling, and dredging) will be carried out during construction of the road, collection sewers, pumping stations, water supply system. This activities would generate a volume of wastesindicated in Table 38

Table 38. Volume of excavation materials of component 1

Work	Dredged sludge (m^3)	Excavated soil (m^3)	Volume to be disposed (m^3)	Volume for back filling (m^3)	Volume to be transported out of construction (m^3)
Component 1					
Upgrading infrastructure for the residential area in the North Quang Trung ward	1,000	987	1,000	2,466	1,000
Upgrading infrastructure in Duong Am residential group, Lam Ha ward		10,000		2,414	8,434
Upgrading infrastructure in Quynh Chan residential group, Lam Ha ward		14,611		5,523	9,088
Construction of Phu Van kindergarten in Phu Van commune, Phu Ly city		3,969		23,858	
Upgrading Tran Quoc Toan primary school, Hai Ba Trung ward		1,493		1,054	

Thus, the total volume of excavated soil during construction is 31,060 m^3 (approximately 43.4 tons), with a volume of vegetation to be cleared being about 0.05 tons on a total area of approximately 4,800 m^2 of agricultural land to be cleared (generation coefficient of vegetation biomass estimated at 0.1 ton/ha). The volume of backfill is about 35,315 m^3. The balance between excavation and backfilling is thus 4,255 m^3.

The analysis of the soil quality in the area shows that the soils meet the national standards for heavy metal concentrations in soil (QCVN 03: 2015/BTNMT).

As for normal excavated soil, the subproject will coordinate with other agencies to use this excavated soil for ground leveling. Otherwise, this excavated soil will be leveling at planting area of Ha Nam Urban and Environment.,JSC. If this volume of excavated soil is gathered on site, heavy rains can sweep it away, thus increasing the turbidity of stormwater runoff and heightened the risk of sedimentation in the drainage conduit. These excavated materials can be temporarily stored in a landfill cell for later use as covering materials by leveling it out after each day. The impact is assessed as small.

Domestic waste

Since many workers would be recruited locally or they would lend houses of the local residents, the number of workers at the camps on the construction site would be about 120 if all the packages are carried out at the same time.Each worker would generate about 0.5 kg of domestic waste/day, i.e. 60 kg/day. Without proper management, such amounts of generated domestic waste would become a pollutant source, giving rise to bad smells and pathogenic factors from microorganisms. Services of waste collection are provided in the city, and Thung Dam Gai Landfill has been put into operation, so the impacts of domestic waste generated during the construction process can be controlled with low risk of pollution.The impact level is assessed to be low.

Construction wastes

Under Component 1, solid waste will be generated from the demolition of the 2 blocks of Tran Quoc Toan primary school, the fence walls of Quang Trung ward, 5 residential houses and 10

graves. The demolition volume is estimated at about 600 tons. The impact level from debris is assessed as small.

Construction wastes would include used construction materials such as cement bags, residual iron and steel scraps, wood chips, empty cartons and boxes, etc. The total amount of construction wastes generated during construction will be 4,065 m^3. Without proper collection and recycling, these would have negative on the environment and be wasteful. This type of waste is composed of inert and non-toxic substances, some of which can be recycled or re-used for other purposes. The impact level is assessed to be low.

Hazardous Waste

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

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

The average amount of grease and oil discharged from machinery and equipment is 7 liters/each change. Oil change and maintenance of machines-equipment are scheduled every 3 months at most. The number of vehicles and construction means needing oil changes is 49 (including 14 trucks and 35 construction means). The amount of waste grease and oil generated in the construction site therefore averages (49 x 7 liters/time)/3 months = 114 liters of oil/month. In addition, the subprojectwould also generate an estimated amount of 50 kg of oily rags and containers per month.

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

e. Impacts on transport infrastructure from the transport of materials

The volume of materials to be transported for the items of Component 1 is estimated about 20,000 m^3 corresponding to 1,600 trips (12 ton truck), which will cause the potential impacts on traffic safety and degraded traffic infrastructure, particularly the routes for transport of materials.

Average construction period is estimated at 12 months. Transportation time is a half of construction time.

So, number of trips per day is = 1,600/180 = 8 trips per day, which is not of a high frequency.

f. Impacts from risks and incidents

Impact on water supply and communication infrastructure

At present, the water supply pipelines mainly run along the sidewalks of the streets. Therefore, the construction of sewers under the subprojectmay potentially affect the water supply infrastructure of the area, interrupting water supply operations due to temporary shut-off of water transmission pipelines or to break water transmission pipelines.

Therefore, interruptions of water supply service would cause lots of difficulties to local residents; their daily lives would be disturbed. They would have to limit water use and spend time to get water from alternative sources for domestic use and production activities. This would be harder

for woman-headed HH or HH with elderly people.

In case of broken pipeline, the people living in the area will be greatly affected. Therefore, measures to prevent pipe breakage must be devised and carried out during the construction under this subproject.

The impact level is assessed to be medium*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.

Healt and Safety Risk to the Community:

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

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

and other sexually transmitted diseases, especially through prostitution, posing risks to the local community. However, as the work is at a small scale, and construction would not last long, this impact is low and controllable.

Impact on Aquatic Species and Terrestrial Ecology

The subproject areas under Component 1 is located in an urban environment setting dominated by high-density residential houses and paved surfaces in the five city wards. There are no any terrestrial or aquatic ecosystem present in thes areas. The only water body in the construction area for the items under this component are small ditches for collection of rainwater and wastewater which do present any aquatic habitat. Therefore, no impact on the aquatic or terrestrial species would be expected.

Impact on City Landscape

As thissubproject component covers a scope with work items scattered in places of the affected wards which is currently at the development state that does not present a landscape of value in an urban setting. However, construction activities would require excavation on some roads and road sides for the construction and rehabilitation of some roads, installation of the combined sewers and water supply system, 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 views.

The construction of school building blocks of Tran Quoc Toan primary school and Phu Van kindergarten 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 school campus. The design of the school building blocks would help enhance the overall landscape in these area.

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

Road Traffic Disturbances and Increased Traffic Risks

It is estimated that, during the construction in the city area, there would be an increase of the number of vehicles transporting raw materials and wastes for disposal at 15 times/day on average. The increase in traffic flow and the narrowed road surface on some streets and lanes densely populated by residential houses along the existing roads in residential areas of Quang Trung ward, Duong Am and Chan Quynh ward would increase the risk of traffic accidents and traffic congestion, especially during peak hours and at road intersections. The impact level is assessed to be medium.

Impact on water supply and communication infrastructure

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

Communication infrastructure**:** In the construction sites of this component the communication infrastructures such as Internet cables or telephone lines go overhead. Therefore, there will be no impact on the communication infrastructure in these areas. However, construction activities may

rupture the overhead Internet cables and telephone lines, disrupting these services. The impact level is assessed to be low.

4.1.2.4. Site-Specific Impacts on Sensitive Receptors

Most of impacts during the construction of investments under Component 1 are geneic and of small and medium scales. These impacts can be mitigated through application of the ECOP during construction.

As indicated in the Section 2.5, Table 19, there are some sensitive receptors that could be impacted during the construction under Component 1 including:

Impact Due to Relocation of Graves: Construction of the short 254m road under this component will requires relocation of 10 graves of the three households in Quang Trung ward. To the Vietnamese, grave is the religuous and spiritual matters which should be respected carefully. Household and individual graves are considered PCRs, and the Bank's OP/BP 4.11 applies for this subproject. However, the consultation with the households affected by grave relocation reveals that people are still willing to move the graves to another location to give land for construction if the subproject owner supports sufficiently to ensure the grave relocation. The level of the impact caused by this activity is only small.

Impacts on the railway traffic: One segment of the combined sewers will go under the railway. The sewer line under the railway will be constructed by using impact drills and reinforcements of load-bearing beams. This method of construction will help prevent risks of railway accidents for both passengers and construction workers, without affecting railway traffic schedules. However, proper attention must be paid to railway safety during construction. Otherwise there may be potentially high risk of damages to the trains causing human casualties (both for the railway passengers and workers), and temporary interruption of the train schedules. The impact level is assessed to be medium.

Impact on Tran Quoc Toan primary school: The health of the school children may be affected by (i) increased dust, exhaust gases, construction wastes, hazardous waste, domestic wastes, and wastewater due to construction activities; ii) Increased traffic flow and risks of traffic accidents might happen for the school children due to construction and transportation; iii) School children learning hours would be interferenced due to noise and vibration from the construction; and iv) sexual abuse and assault of school girls due to influx of workers employed by the construction company. In addition, school upgrading activities will deprive of classroom during construction. However, these impacts are temporary due to short construction time of 10-12 months and can be mitigated by apply proper construction and management measures. Therefore the impact is assessed as medium.

Impact on irrigation canal: Construction of the Phu Van kindergarten will affect an irrigation canal in this area. The execution work of the new kindergarten may block the canal, spread soil to the irrigation canal and the vegetatable fields causing sedimentation in the canal and arable agricultural land if there is no strict erosion and sedimentation management measures. However, construction activities will be completed within 12 months. Therefore, this impact is assessed as moderate and temporary.

Impact on agricultural activities: The construction activities may cause disruption of the local agricultural cultivating and havesting activities, damages to the vegetable crops. However, given that construction scale is small, at different sections, and with a limited number of workers, this impacts is considered small.

4.1.3.3. Component 1 – Impacts during Operation

Component 1 has 3 LIAs and 2 schools. When operating, most impacts will be positive that bring benefits for the local residents in the subproject area.

Wastewater:

Tran Quoc Toan has about 1,200 students and its teaching staff. Each person is estimated to use 80 liters of water perday, and wastewater volume is estimated to be 80% of supplied water volume. So, the total wastewater volume is estimated at $77m^3$.

Phu Van Kindergarten has about 477 students and its teachning staff. Each person is estimated to use 80 liters of water perday, and wastewater volume is estimated to be 80% of supplied water volume. So, the total wastewater volume is estimated at $31m^3$.

Domestic waste:

Tran Quoc Toan Primary Schoold: Averagely each person generates 0.5 kg of domestic waste perday. Total generated domestic waste volume is about 600 kg/day. However, because students do not generate as much of waste as normal residents, the total waste volume generated by them may be only about one third of total domestic waste volume generated by normal residents (about 200 kg/day).

Phu Van Kindergarten: Each person averagely generates 0.5 kg of domestic waste per day. Total domestic waste volume is about 238kg/day. However, because the kindergarten's children do not generate as much of waste as normal residents, the total waste volume generated by them may be only about one third of total domestic waste volume generated by normal residents (about 79.5 kg/day).

The impact can be considered as medium.

4.1.4 Impacts from Infrastructure Investment of Component 2

Component 2: Environmental sanitation improvement

Investment in improving environmental sanitation in urban residential areas, includes: (1) Rehabilitation of Lam Ha 1 lake (7.78ha), the detailed design of which has been completed in the original MCDP project, but due to shortage of fund, it is proposed to move to the MCDP AF; (2) Rehabilitation of the drainage and technical infrastructure system along Bien Hoa road (906m); (3) Constructing embankment (3.25km) in the south of Chau Giang river from Liem Chinh bridge to Cau Gie - Ninh Binh expressway; and (4) Installation of combined drainage and wastewater collection system (923m).

4.1.4.1. Component 2 – Impacts during Pre-construction

Impacts from land acquisition

Rehabiliation of Lam Ha 1 Lake and construction of Chau Giang river southern embankment will require land acqusition as indicated in Table 39 below:

Table 39. Impacts from land acquisition of component 2

No.	Items	Commune/ ward	Affected area					Total affected land (m^2)
			Resid. land (m^2)	Agr. land (m^2)	Aqua. land (m^2)	Organization Land	Resid. land (m^2)	
2	Component 2:		12,081	26,189	575	4,378	132,070	175,293
2.1	Rehabilitaion of Lam Ha 01 lake	Lam Ha ward	3,813	9,745	575	578	80,917	95,628
2.2	Construction of embankment in the south of Chau Giang river	Liem Chinh ward Liem Tuyen Commune	8,268	16,444	-	3,800	51,153	79,665

(Source: RP of MCDP Phu Ly AF, 2016)

67 households have residential land and fixed assets affected by this component and 87 households have affected agricultural land. The detailed impact assessment for land acquisition and resettlement under this component is given in Section 4.2 – Social Assessment.

Impacts due to UXO

Because Phu Ly City was bombed in war time, there is risk of UXOs which may be potential threats to the work items and safety of local residents and laborers. For imtes of Component 2, e.g. Chau Giang embankment, Lam Ha 1 Lake, or Bien Hoa Road (being locations near the railway which were attacked in the past): The remaining bombs need to be detected and removed carefully and thoroughly before construction commencement. Impacts of bombs, mines in the subproject areas represent significant negative impacts if impact mitigation measures are not applied, presenting high risks to human health and life quality and the infrastructure system. The risk is moderate.

4.1.4.2. Component 2 – Impacts during Construction

Generic impacts

a. Impact on air environment

Air quality will be affected during construction phase by dust, exhaust gases and noise from construction vehicles. However, these impacts are not continuous and in a short time, mostly temporary. The scope of the subproject is relatively large. However, according to the subproject schedule, the construction is expected to begin from July, 2017 to December 2018 (1.5 years), and dividing into several civil works packages to be implemented in different times and at different locations.

Air pollution caused by ground leveling, excavation and backfilling, and transportation:

Dust and exhaust gases will be dispersed from the processes of ground leveling, excavation, backfilling, and stockpiling and transportation of materials (Table 40 and 41)

Table 40.Forecasts of dispersed dust from excavation, backfilling and ground leveling

No.	*Item*	*Volume of excavating and backfilling*		*Construction stage (month)*	*Dust load (kg/day)*
		m3	*Ton*		
1	Lam Ha 1 Lake	98,513	137,918	16	24.87
2	Bien Hoa road	13,908	19,471	16	3.51
3	Chau Giang southern embankment	81,482	114,075	18	18.28

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

Thus, the load of dispersed dust from excavation and backfilling in the items under Component 2 varies between 3.51 – 24.87 kg/day.

Table 41. Number of truck passages in constructing items of Component 2

No.	*Item*	*Volume of excavating and backfilling (Ton)*	*Construction stage (Month)*	*Truck passage (vehicle/day)*
1	Lam Ha 1 Lake	137,918	16	20
2	Bien Hoa road	19,471	16	3
3	Chau Giang southern embankment	114,075	18	15
	Total	271,464	52	37

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 2.2 m/s and south-eastern prevailing wind direction in the rainy season, a wind speed 2.6 m/s and north-eastern prevailing wind direction in the dry season, and a distance of 40-80m from generating sources, the concentration of pollutants created by transportation operations can be calculated as follows:

For Lam Ha 1 Lake: Dust concentrations vary between 0.05-0.17 mg/m^3; CO contents between 0.11-0.38 mg/m^3; SO_2 contents between 0.06-0.19 mg/m^3; and HC contents between 0.27-0.95 mg/m^3

For Bien Hoa road: Dust concentrations vary between 0.24-0.54mg/m^3; CO contents between 0.56-1.24 mg/m^3; SO_2 contents between 0.28-0.62mg/m^3; and HC contents between 0.46-0.62mg/m^3.

For Chau Giang river southern embankment: Dust concentrations vary between 0.042-0.092mg/m^3; CO contents between 0.09-0.21mg/m^3; SO_2 contents between 0.05-0.17mg/m^3; and HC contents between 0.08-0.28mg/m^3.

Dust:

In general, the loads of dust generated in the process of transporting excavated earth are forecast as being not substantial and would be distributed evenly along transportation routes, between 0.005 and 0.5mg/m^3. According to calculations, the dust concentration would not exceed the national standards on ambient air quality (QCVN 05: 2013/BTNMT) outside 60m of distance. However, it must be noted that the amount of dust generated is large owing to the mobilization of machinery and vehicles on the construction site. At some points of time, relatively large amounts of dust may abruptly increase when a large number of machines and vehicles are mobilized for necessary construction tasks.

The main transport routes for materials transportation would be Highway 1A, Nguyen Chi Thanh road, D4-N7 road, Le Loi road, Tran Hung Dao road and some other internal transport routes to

the South of the city. The results of air quality analysis in Chapter 2 shows that the air quality in these areas is currently fairly good. Therefore, the impacts of dust would be visible. However, this impact is temporary and can be mitigated. The receptors affected by dust would be the residents living along the routes. Dust pollution would hinder businesses and services located along the routes leading to a drop in the number of customers, especially along Le Loi road, which are often crowded with business activities. The impact level of dust during ground leveling, excavation, backfilling and transportation is thereby assessed as being medium.

Exhaust gases:

The CO contents in the areas are between 0.012-1.2 mg/m^3. The SO_2 contents are between 0.04-0.5 mg/m^3; and HC contents between 0.01-0.6mg/m^3. Outside 40m of distance, the results of analysis of exhaust gases compared to the national ambient air quality standards (QCVN 05: 2013/BTNMT) shows that they are still within the permissible limits.

Noise pollution:

Noise comes from the material transport vehicles, machines and equipment. The level of noise coming from the transportation and construction was calculated using the same formula presented in for calculation of Component 1 noise levels.

The distance for noise impact assessment on the surrounding residential area is selected from 20m-50m. The results of separate noise level assessment of individual construction and transport vehicles as well as resonant noise level are estimated and presented in Table 42 below.

Table 42. Noise level from construction vehicles

No.	*Vehicles/Equipment*	*Noise 1m far from the source (dBA)*		*Noise level 20m far from the source*	*Noise level 50m far from the source*
		Variation	*Average*		
01	Bulldozer		93.0	67.0	59.0
02	Roller	72.0 - 74.0	73.0	47.0	39.0
03	Excavator	72.0 - 84.0	78.0	52.0	44.0
04	Land scrapers	80.0 - 93.0	86.5	60.5	52.5
05	Road pavings	87.0 - 88.5	87.7	61.7	53.7
06	Truck	82.0 - 94.0	88.0	62.0	54.0
07	Concrete mixer	75.0 - 88.0	81.5	55.5	47.5
08	Pile driving machine	95.0 - 106.0	100.5	74.5	66.5
09	Resonant noise level		84.5	58.5	50.5
	QCVN 26/2010/BTNMT, normally: 6 pm to 21 pm is 70 dBA; 21 pm to 6am is 55 dBA;				
	Ministry of Health standard: Noise at production area: contact time 8hours is 85 dBA				

The results showed that, at the distance of 20 meters from the sources of noise, the noise levels from vehicles are all within the allowable limits of QCVN 26:2010/BTNMT and the standards of the Ministry of Health and at medium level. Therefore, the noise coming from construction and transport equipment and vehicles is considered insignificant.

There are many households and local businesses located along the Bien Hoa road, the main road of the city, where the road upgrading activities will be implemented. Therefore, these receptors will be affected by noise during construction. The subjects of the impact are also the workers involved in the construction. Therefore, the contractors will have to apply the mitigation measures during construction as outlined in the ECOP.

The areas that may be affected by noise, dust, and exhaust gases, are listed in Table 43.

Table 43.Special subjects affected by noise, dust and exhaust gases

No	Affected subjects	Construction items	Distance to construction sites
1	Dinh Trang residential group activities	i) Lake embankment and road (1,702 m) ii)Tree, lighting system	100m from construction route
2	Households business activities	Upgrading road, drainage sewers, and electric system	Close to construction route
3	Households belong Chau Giang river southern embankment	Construction of road, embankment and lighting system	Close to construction route

If construction work is carried out at night in these areas, the noise levels all exceed permitted limits within a radius of 200m. During the daytime, these areas will be affected by noise within a radius of 50m. The impact level of noise is assessed to be medium.

c. Impacts from vibration

The construction process with the use of means and equipment can give rise to vibration in the earth foundation. Such vibration is transmitted along the earth environment but is strongly reduced in proportion with distance.

Under Component 2, construction means to be used would include pile drivers, rammers, bulldozers, and heavy trucks. Based on the results presented in Tables 44 and 45, the safe distance for bearing strong impacts from vibration is about 10 meters from the generating source. The area affected the most would be that of the houses located on the two road sides of Bien Hoa road. The impact level of vibration is assessed to be moderate.

Table 44. Levels of vibration caused by typical construction equipment

No.	Machine/Equipment	PPV at 7.62 m (mm/s)	Corresponding Lv at 7.62 m (VdB)
1	Compression-type piling driver		
	+ High level	**0.463**	112
	+ Normal level	**0.196**	104
2	Rammer	0.064	**94**
3	Pile driving hammer	0.027	**87**
4	Big bulldozer	0.027	**87**
5	Driller	0.027	**87**
6	Heavy truck	0.023	**86**
7	Drilling hammer	0.011	**79**
8	Small bulldozer	0.001	**58**

Source:D.J. Martin. 1980, J.F. Wiss.1974, J.F. Wiss. 1967, David A. Towers. 1995.

Table 45.Assessment of impact level caused by vibration

No.	Type of work	PPV (mm/s)	Approximate Lv (VdB)
1	Reinforced concrete, steel, wood (without plastic)	0.153	102
2	Technical concrete, normal mason works (without plastic)	0.092	94
3	Unprocessed wood and major mason works	0.061	98
4	Housing oversensitive to vibration	0.037	90

Source: Swiss Consultants for Road Construction Association, "Effects of Vibration on Construction," VSS-SN640-312a, Zurich, Switzerland, April 1992.

1. Impacts on water environment

It would be expected that about 170 workers would be mobilized for construction of the infrastructure, including 80 workers for construction of Lam Ha 1 Lake, 30 workers for rehabilitation of Bien Hoa road, and 60 workers for construction of the Chau Giang river embankment. Therefore, at a peak time, a total of 170 workers would be working if all the construction items would be executed at the same time. According to Vietnam Construction Standard TCXDVN 33:2006, the water use norm is 165 Liter/person.day. The contractor will prioritize hiring local workers to reduce the numer of workers staying on site as well as to reduce volume of domestic wastewater generating from workers' activities. The volume of wastewater is calculated at 90% of the amount of water consumption. Based on the mentioned number of workers and aforesaid wastewater generation coefficient, the volumes and loads of domestic wastewater can be forecasted as presented below (Table 46):

Table 46. Generated domestic wastewater

No.	Item	Number of workers (person)	Wastewater volume generated (m^3/day)
1	Lam Ha 1 Lake	80	11.88
2	Bien Hoa road	30	4.46
3	Chau Giang southern embankment	60	8.91
Total		170	25.25

Wastewater from domestic activities would contain many suspended solids, organic matters, nutrients and microorganisms. The loads of pollutants in wastewater without collection and treatment systems are presented in Table 47 below.

Table 47.Loads of pollutants in domestic wastewater

No	Pollutants	Load (kg/day)
1	BOD_5	0.45-0.54
2	COD	0.702-1.02
3	TSS	0.7-1.45
4	T-N	0.06-0.12
5	T-P	0.008-0.04
6	Cl^-	0.04-0.08
7	E. coli	10^5-10^6

(Source: WHO, 1993)

Thus, the total volume of domestic wastewater generated from construction processes will be about 25.25 m^3/day. Without proper management, domestic wastewater will deteriorate the landscape, pollute land, water, and air environment, and create favorable conditions for pathogens to proliferate. These, in turn, will adversely affect the health of communities and workers. Contractors are to work out measures to manage this volume of wastewater.

It is assessed that, for the construction of each work item, there will be a fairly small amount of generated domestic wastewater. Therefore, the impact level of wastewater is assessed to be low.

Stormwater runoff

Stormwater running through the construction sites will increase turbidity and the content of suspended solids, adversely affecting water quality and aquatic life, possibly contributing to the increase of the sedimentation level of the water-course as it brings along soil, waste, oil, etc. from

the construction sites into existing drainage channels, rivers and sea catchments, or causes flooding in the area. Without proper management, runoff flowing through the worker camps could also take along domestic waste and human wastes, triggering pollution and diseases.

An assessment of the impact of stormwater runoff over the construction area on the surrounding environment was based on the method of calculating the drainage of a hydraulic system with the following formula for intensity limits (Source: Environmental Engineering Handbook, 2005). The amount of stormwater runoff on the construction sites can be estimated as follows:

- ***Construction of Lam Ha 1 Lake***

The walk road and embankment is of a total length of 1,700 m. It is estimated that about 4m of the road width must be occupied for the construction of the walk road and embankment. Hence, the construction area for each period will be about 400 m^2. The daily amount of stormwater runoff can be estimated as follows:

$$Q_1 = 0.60 * 0.03m/day * 6,800\ m^2 = 122.4\ m^3/day.$$

The drainage was not good in some areas (e.g. Dinh Trang residential group) which could be flooded in heavy rains, impeding traffic and travelling, threatening environmental sanitation, and affecting the construction process. Dinh Trang residential group is to receive proper attention, as this is a low land prone to flooding during construction. The impact level is assessed as medium.

- ***Rehabilitation of Bien Hoa road***

Bien Hoa road is of a total length of 906 m. The construction of the system would follow the successive construction method, with about of 200m of sewer each time. It is estimated that about 4 m of the road width must be occupied for the construction of the wastewater collection and drainage system. Hence, the construction area for each period will be about 3,624 m^2. The daily amount of stormwater runoff can be estimated as follows:

$$Q_1 = 0.60 * 0.03m/day * 3,624\ m^2 = 65.2\ m^3/day.$$

Drainage was not good in some junction (e.g. Nguyen Van Troi Street, Truong Chinh street, etc.) which could be flooded in heavy rains, impeding traffic and travelling, threatening environmental sanitation, and affecting the construction process. The impact level is assessed as medium.

- ***Construction of Chau Giang river southern embankment***

The walk road and pavement is of a total length of 1,809.22 m. It is estimated that about 13.5 m of the road width must be occupied for the construction of the walk road and embankment. Hence, the construction area for each period will be about 22,228 m^2. The daily amount of stormwater runoff can be estimated as follows:

$$Q_1 = 0.60 * 0.03m/day * 22,228\ m^2 = 400.1\ m^3/day.$$

Chau Giang river is to receive proper attention, as this is a received all of stormwater runoff during construction. The impact level is assessed as medium.

According to measurements made in 2009 by the Ho Chi Minh City Institute of Hygiene and Epidemiology, the concentration of pollutants in stormwater in urban areas with no contamination sources and with construction works is as follows (Table 48):

Table 48. Concentration of pollutants in stormwater runoff

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

Source: HCM City Institute of Hygiene and Epidemiology, 2009

Thus, in stormwater runoff flowing through the construction areas, the content of suspended solids often exceed the permissible limits set out in the national industrial wastewater standards (QCVN 40:2011/BTNMT)- Column B, while the content of mineral grease and oil, if not properly isolated, is likely to exceed the permissible discharge limits. The impact level is assessed to be medium.

2. Solid Waste

Excavated soil during construction

Earthwork (excavation, backfilling, and dredging) will be carried out during construction of the lake, the road, and the embankment. This activities would generate a volume of wastes indicated in Table 49 below:

Table 49. Volume of excavation materials of component 2

Work	Dredged sludge (m^3)	Excavated soil (m^3)	Volume to be disposed (m^3)	Volume for back filling (m^3)	Volume to be transported out of construction (m^3)
Component 2					
Upgrading Lam Ha 1 regulation lake, Lam Ha ward	40,000	50,214	40,000	48,299	41,915
Upgrading drainage and technical infrastructure system for Bien Hoa road		9,282		4,626	4,656
Construction of Chau Giang river southern embankment from Liem Chinh bridge to Cau Gie- Ninh Binh expressway	20,000	79,500	20,000	1,982	77,518

Thus, the total volume of excavated soil during construction is 138,996 m^3 (approximately 194.6 tons), with a volume of vegetation to be cleared being about 0.26 tons on a total area of approximately 26,189 m^2 of agricultural land to be cleared (generation coefficient of vegetation biomass estimated at 0.1 ton/ha). The volume of backfill is about 54,907 m^3. The balance between excavation and backfilling is thus 84,089 m^3.

The analysis of the soil quality in the area shows that the soils meet the national standards for heavy metal concentrations in soil (QCVN 03: 2015/BTNMT).

As for normal excavated soil, the subproject will coordinate with other agencies to use this excavated soil for ground leveling. If this volume of excavated soil is gathered on site, heavy rains can sweep it away, thus increasing the turbidity of stormwater runoff and heightened the risk of sedimentation in the drainage conduit. These excavated materials can be temporarily stored in a landfill cell for later use as covering materials by leveling it out after each day.

Dredged sediment

Component 2 has 2 items to be dredged which are Lam Ha 1 Lake and Chau Giang river southern embankment. Below is the volume of the dredge materials estimated for these two items (Table 50).

Table 50. Volume of dredged materials

Dredging	Volume (m^3)
Lam Ha 1 lake (7.78 ha)	*40,000*
Chau Giang river southern embankment	*20,000*
Total	**60,000**

The transport of the dredged sedement by truck from the construction sites to the disposal site may cause leakage and scattering of the materials along the transport route. The level of sediment scattering depends on the amount of the sediment contained in the truck and the level of its saturation. Leakage and scattering of dredged sediment during transport would cause not only impacts on the environment, society and landscape, but also unsafe traffic for local residents.

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 Chau Giang river.

During the construction process, prevention of the flow may reduce the flow cross section leading to an increased flow rate, especially at the time of heavy rain, which can lead to erosion of the river bank including the downstream.

Domestic waste

Since many workers would be recruited locally or they would lend houses of the local residents, the number of workers at the camps on the construction site would be about 170 if all the packages are carried out at the same time. Each worker would generate about 0.5 kg of domestic waste/day, i.e. 85 kg/day. Without proper management, such amounts of generated domestic waste would become a pollutant source, giving rise to bad smells and pathogenic factors from microorganisms. Services of waste collection have been provided in the city, and Thung Dam Gai Landfill has been put into operation, so the impacts of domestic waste generated during the construction process can be controlled with low risk of pollution.The impact level is assessed to be low.

Construction wastes

In Component 2, contrucstion waste will be generated from the demolition of the Bien Hoa road surface. The demolition volume is estimated at about 1,400 tons. The impact level from debris is assessed as small.

Hazardous Waste

Hazardous wastes generated from subproject implementation would include waste grease and oil, oily rags, and empty oil/grease containers. The existence of grease from maintenance and repair

of transportation and construction means in the subproject areas is inevitable. The amount of waste grease and oil generated during construction depends on the following factors:

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

The average amount of grease and oil discharged from machinery and equipment is 7 liters/each change. Oil change and maintenance of machines-equipment are scheduled every 3 months at most. The number of vehicles and construction means needing oil changes is 53 (including 15 trucks and 38 construction means). The amount of waste grease and oil generated in the construction site therefore averages (53 x 7 liters/time)/3 months = 123 liters of oil/month. In addition, the subprojectwould also generate an estimated amount of 60 kg of oily rags and containers per month.

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

1. Impacts on transport infrastructure from the transport of materials

The volume of materials to be transported for the items of Component 2 is estimated about 124,089 m^3 corresponding to 10,341 trips (12 ton truck), which will cause the potential impacts on traffic safety and degraded traffic infrastructure, particularly the routes for transport of materials.

The average construction period is estimated at 16 months. Transportation time is a half of construction time.

Therefore, the number of trips per day is = 10,341/240 = 43 trips per day, which is not of a high frequency.

2. Impacts from risks and incidents

Impact on water supply and communication infrastructure

At present, the water supply pipelines mainly run along the sidewalks of the streets. Therefore, the construction of sewers under the subproject may potentially affect the water supply infrastructure of the area, interrupting water supply operations due to temporary shut-off of water transmission pipelines or to break water transmission pipelines.

Therefore, interruptions of water supply service would cause lots of difficulties to local residents; their daily lives would be disturbed. They would have to limit water use and spend time to get water from alternative sources for domestic use and production activities. This would be harder for woman-headed HH or HH with elderly people.

In case of broken pipeline, the people living in the area will be greatly affected. Therefore, measures to prevent pipe breakage must be devised and carried out during the construction under this subproject.

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.

The Subroject 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.) is the source of fire and explosion. The occurrence of such incidents can cause serious damage to people, society, economy and environment;

Temporary power supply system for machines and equipment during construction can cause problems of shortcircuit, fire, explosion, electric shock, etc leading to economic and labor accidents for workers.

The subproject owner will implement the fire prevention and strictly comply with measures to prevent leakage, fire or explosion. The fire prevention shall be done regularly to minimize the possibility of incidents and the levels of impact.

Healt and Safety Risk to the Community

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

Various and operations would generate domestic wastewater and waste giving rise to large populations of flies and mosquitoes, and possibly forming epidemic nests of diarrhea, dengue fever, and malaria. Workers coming during the construction process, etc. will result in dirty pools and pits, polluting water sources and the air, giving rise to large populations of flies and mosquitoes, and possibly forming epidemic nests of diarrhea, dengue fever, and malaria. Such impacts could only be mitigated or minimized with good prevention, treatment and sanitation measures. Concentration of workers in the area may result in increased contraction of HIV/AIDS and other sexually transmitted diseases, especially through prostitution, posing risks to the local community. However, as the work is at a small scale, and construction would not last long, this impact is low and controllable.

Impact on City Landscape

Construction activities will require excavation on Bien Hoa road, dredging of Lam Ha 1 lake, and dredging and construction activites on the Chau Giang rive abnk. These operations would temporarily change the view and 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, affecting the area landscape. The level of impact on urban beauty and landscape is temporary and assessed to be medium.

Road Traffic Disturbances and Increased Traffic Risks

It is estimated that, during the construction in the city area, there would be an increase of the number of vehicles transporting raw materials and wastes for disposal at 44 times/day on average. The increase in traffic flow and the narrowed road surface on some streets and lanes densely populated by residential houses along the existing roads in residential areas of wards in the city would increase the risk of traffic accidents and traffic congestion, especially during peak hours and at road intersections. The affected routes would be Truong Chinh street, Le Loi street, Le Cong Thanh street, Highway 1A, Nguyen Chi Thanh street, Tran Hung Dao street… The impact

level is assessed to be medium.

Impact on water supply and communication infrastructure

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

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

Site-specific Impacts on Sensitive Receptors

a. ***Site-specific Impacts during the upgrading of Lam Ha 1 Lake***

Rehabilitation of Lam Ha 1 lake will result in 48,000m^3 of the dredged materials which contain maily lake bottom sediment with organic maters. The rehabilitation will have impacts on the lake water quality, aquatic and bentic communities, offensive odor, impacts associated with transportation and treatment of the dredged sediment.

The impactson the lake water quality, aquatic and bentic communities:

Dredging activities have the potential to impact the water quality of aquatic system in the lake. In the dredging area, water turbidity will increase resulting in reduced capacity to receive light, reduced photosynthetic efficiency and reduced saturation of oxygen in water. Depending upon the nature of the dredged material, its disturbance from the lake bed may lead to changes in the chemical composition of the water, adversely affecting the water column and aquatic life. The analysis of the lake bottom sediments showed that the quality of the lake sediment is almost better than that of Nhue and Chau Giang river, and the concentration of heavy metals is still within the allowable limits. The dredging will also cause loss of habitats for the bentic communities.

The fish in the lake is mainy common freshwater aquatic species people raise such as black carp, red carp, tapila, tench, etc, some crustaceans such as shrimp, snail, oyster, etc. and some molluscous aquatic species, which are not endangered or rare species or listed in the National Red Book, and have low biodiversity value. Currently, the entire rainwater, surfacewater from the surrounding area of Lam Ha commune, part of rainwater from the area along the national highway 1A following the existing canal system are discharged to the area of Lam Ha lake 1 and 2. Therefore, the impacts on the the lake water quality, aquatic and bentic communities are assessed as moderate.

Odour from the dredge sludge:

During construction, there will be a 40,000 m^3 amount of sediment dredged from Lam Ha 1 lake and from the existing drainage system. The sediment analysis results indicate no heavy metal pollution, yet the organic contents in the sediment are high.Dredging and transporting of the organically contaminated sediments can create bad odors and unsanitary condition during transportation, storage, and/or treatment. The offensive odor will cause nuisance for the houlseholds living in proximity to the lake. However, this impact is assessed as low.

Impacts due to transportation of the dredged sediments:

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

Impacts on households raising fish in the lake: There is a household raising freshwater fish on the lake. The household has rented the 500m^2 water surface for doing this small aquaculture. The local authority has decided that the lease would be revoked forever when the construction starts. This decision, as a result of the lake rehabilitation, will adversely affect lifelihood of the household. The impact is assessed as small, but requires compensation.

Impacts on the Temple of the Ten Girls (50m from the Lam Ha Lake 1): Rehabilitation of the lake including dredging the transportation of the dredged sediments would have the potential to have adverse impacts on the temple due to: i) Hindrance to access to the Temple; ii) Increase in dust and exhaust gases, affecting visitors to the church; iii) Increased construction wastes, waste water; iv) Risks of traffic accidents and community safety due to construction; and v) Localized flooding becasue of construction during rainny days; vi) Conflicts between workers and visitors to the Temple.

b. Site-specific Impacts during the embankment of Chau Giang River

Construction of the 3.25 km of Chau Giang river southern embankment will require dredging of 20,000m^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 Chau Giang 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 Chau Giang river.

In addition, during the construction, the flow prevention can reduce the flow cross-section that increases the flow rate, especially at the time of heavy rain, which can lead to the erosion of the river bank at the downstream.

The biome structure and variations of the related aquatic species show that the water environment in Chau Giang has been affected by organic pollution. Some aquatic plant species in the river include water hiacynth, water cabbage, watermoss, water spinach, nipa palm, water ginger grass, etc. In this river section, there are no endemic or reare species listed in the Red Book which require protection, and there are no natural vegetation and no rare or typical fauna and flora.

The level of the impacts, therefore, is moderate. However, it could be completely controlled and mitigated if the contractor fully complies with regulations on traffic safety, regulations on transport routes and the proposed construction methods and implement all mitigation measures described in the ESMP.

Dredged soils and sediment:

The dredging of river bank also generates about 20,000 m^{3}of sediment.The analysis showed that the sediment are not contaminated by heavy metal and within the permissible limit for agricultural

purposes. The excavated materails therefore could be used for levelling at the low land as needed.

Risk of subsidence during construction:

The flow of Chau Giang river along the southern embankment is complicated. Therefore, the possibility of flood concentration and the flow rate during floods will be likely very high. When a major flood happens, it would potentially cause river bank erosion and landslide at the construction site. For convenience and safety, the contractor should focus the construction in dry season because there will be much less rainfall during dry season months.

In the process of constructing the embankment, if the strengthen of the bank is not done well or the execution time is extended to rainy season water, the high flow rate can cause subsidence and affect the construction process as well as the safety for workers. During the design process, the elements of hydraulics, hydrology, flow, geology were calculated in details which can limit this impact during construction.

Impacts on Me Noi Temple (10 m from Chau Giang Embankment):

Construciton activities of the embankmentincluding dredging the transportation of the dredged sediments would have the potential to have adverse impacts on the temple 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; iii) Increased construction wastes, waste water; iv) Risks of traffic accidents and safety due to construction; and v) Localized flooding becasue of construction during rainny days; vi) Conflicts between workers and visitors to the Temple.

Damage to local structures:

The increase in transport vehicles (about 16,666 vehicles for transport of materials and dredged sludge during the construction period of about 2 years, equivalent to about 22 trips/day), can cause damage to local roads in the residential areas along Chau Giang river southern embankment (Me Noi residential group and Trieu Xa village). In this case, after construction, the contractor must be responsible for reinstament of the road.

c. Upgrading drainage and technical infrastructure system for Bien Hoa road

Impacts on Phu Ly Church (10 m from Bien Hoa road): Rehabilitation of the lake including dredging the transportation of the dredged sediments would have the potential to have adverse impacts on the church due to: i) Hindrance to access to the church; ii) Increase in dust, exhaust gases, and noise affecting religious practices and visitors to the church; iii) Increased construction wastes, waste water; iv) Risks of traffic accidents and safety due to construction; and v) Localized flooding becasue of construction during rainny days; vi) Inteference with religous events and practices; and vi) Social conflicts between workers and visitors to the church such as scandal.

Traffic accidents: The risk of accidents by motor vehicles during the construction process also need to be cared about bythe contractors. For operations using transport trucks there is a need someone to guide when passing through the residential areas, signs of the construction site, speed limit, night lights.

Affect people's activities on the two side of Bien Hoa Road: As this is the main road of the city with many stores, the area is densely populated with houses and small business householders. Construction activities may cause the following impacts mostly related to traffic as construction operations will occupy one part of road surface, while the other part will be used for gathering machinery and storage of construction materials during construction. These impacts include: i) Inconveniences to locals' business activities as access to business establishments may be

obstructed; ii) Affecting drainage capability in the area; iii) Dust, waste, damagedlandscape; iv) Risks of landslides and subsidence damages to existing works along road sides from deep excavation for the construction of pipe trench; v) Safety risks to vehicles and community, especially at night when excavation is performed to depths of 1.7 -2.5 m.

4.1.4.3. Component 2 – Impacts during Operation

Like component 1, the works of component 2 during the operation period will bring many positive environmental and social benefits to the communities as well as reduce pollution for residential areasand Lam Ha 1 lake in particular and Chau Giang river basin in general. However, apart from the positive impacts, several potential impacts can occur and cause damage to the environment and society of the region if not being controlled.

a. Lam Ha 1 lake

Environmental improvements of the lake: In a research[7] studying effects of dredging on water quality and zooplankton community structure in shallow of eutrophic lakes like Lam Ha 1 lake, The results showed that a decreasing trend for levels of phosphorus, organic matter, total suspended solids, Chlorophyll a and Secchi transparency in the water column was found, while levels of water depth, electrical conductivity, total dissolved solids and NO_3^- -N concentration increased markedly post-dredging. The effects of dredging on dissolved oxygen, pH value and temperature were almost negligible. The zooplankton community structure responded rapidly to the environmental changes caused mainly by dredging. As a result, the abundance of rotifers decreased, while the density of zooplanktonic crustaceans increased markedly. Therefore, with the reduction of internal nutrient load and a shift in dominance by less eutrophic species, the sdudy inferred that dredging might be one of effective measures for environmental improvements of such lakes.

Local environment and landscape: Lam Ha 1 Lake, after dredging and embanked, together with Lam Ha 2 Lake will create an outstanding landscape area for Phy Ly City. If well managed in terms of environmental sanitation, it will well contribute to the city's overall green – clean – beautiful environment.

Odor, local flooding due to poor maintenance: During operation, overall impacts will be positive ones. However, some risks can generate negative impacts on the local environment and/or residents. The key risks include excessive generation of odor and local flooding due to inefficient operation and maintenance of the local facilities.

b. Chau Giang river southern embankment

Impacts on water environment of Chau Giang river:

River embankment operation do not basically directly affect river water quality. However, after the embankment and corridor road items have been completed, traffic and residence along the embankment line may get high, and the fact that people may discharge waste into the river may be come a frequent occurence. Therefore, in terms of management, the local government needs to develop environmental protection regulations and propaganda programs for the residents, helping raising community's environmental awareness.

Environment and landscape:

[7] Zhang S, Zhou Q, Xu D, Lin J, Cheng S, Wu Z.Effects of sediment dredging on water quality and zooplankton community structure in a shallow of eutrophic lake; J Environ Sci (China). 2010;22(2):218-24.

Construction of embankment for Chau Giang River, on one hand will help prevent soil fall-in on the river's southern bank, and on the other hand, if well managed in terms of environment, will significantly contribute to the city's overall green – clean – beautiful landscape

Embankment side fall-in, embankment falling:

For Chau Giang River embankment construction, during construction phase as well as when the embankment has been introduced into operation, there might be ríks of embankment side fall-in and embankment falling:

- Heavy raining, intensive flood combined with poor foundation reinforcement may cause embankment side fall-in, or even more seriously, embankment falling.
- Gathering of construction materials with total weight exceeding bearing capacity of embankment side may cause embankment side fall-in, too.
- Embankment settlement and cracking may happen due to disaster factor or use exceeding allowable design specs of the embankment itself.

Embankment side fall-in will directly affect the embankment's operation, affecting its flood control and disaster migitation capacity. Embankment side fall-in will also affect the area's environment and landscape.

Embankment falling will directly affect life safety of people living nearby the embankment line, and will affect durability of houses and other architectural structures within its scope of protection.

There's risk of traffic accidents at the road along southern bank embankment lien of Chau Giang River if there's no good traffic warning system.

c. Bien Hoa road

Air emission, dust

Improvement of the road makes traffic flow much higher, increasing of exhaust gas emission and dust generation is unavoidable.

Risk on traffic accident:

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 enoughb and the traffic participants' traffic regulation compliance is poor.

Bien Hoa 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.

4.1.5 Impacts from Infrastructure Investment ofComponent 3

Component 3: Upgrading of Tran Hung Dao road

Upgrading of Tran Hung Dao road from Liem Chinh bridge to Cau Gie-Ninh Binh expressway connecting to the approved planning along two sides of the provincial road 491 and regional transportation network, 1.6km long with 4 standard lanes, sidewalk, drainage, road lighting and utilities for pedestrians. Mở rộng thêm 2 làn 15m, hệ thống thaots nước, chiếu sáng.

4.1.5.1. Component 3 – Impacts during Pre-Construction

Land acquisition and resettlement

Land acquisition of component 3: .84 ha land includes: 0.31 ha agricultural land, 0.58 h residential land, 0.72 ha public land, 0.21 ha water land (pond). There will be about 41 affected households, of which 16 household will be relocated. The detailed impact assessment for land

acquisition and resettlement under this component is given in Section 4.2 – Social Assessment.

Risk due to Unexploded Ordnance

Because Phu Ly City was bombed during the war period, UXO removal is important so as to avoid any potential threat to works and safety for local people and workers. The upgrading of Tran Hung Dao road is carried out with the width expansion, outside of the the existing alignment. There will be risk on remaining UXO in this area, which represent significant negative impacts if mitigation measures are not applied, with high risk to human health, life, and also infrastructure.

UXO removal must be completed before starting civil works.

4.1.5.2. Component 3 – Impacts during Construction

Generic impacts

3. Impact on air environment

Air pollution from dust, exhaust gases, and noise mainly results from such operations as demolition of works, ground leveling, excavation and backfilling, and transportation.

Air pollution caused by ground leveling, excavation and backfilling, and transportation:

Dust and exhaust gases will be dispersed from the processes of ground leveling, excavation, backfilling, and stockpiling and transportation of materials.

Table 51. Forecasts of dispersed dust from excavation, backfilling and ground leveling

No.	Item	Volume of excavating and backfilling		Construction stage (month)	Dust load (kg/day)
		m^3	Ton		
1	Tran Hung Dao road	230,574	322,804	18	466

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

Table 52. Number of truck passages in constructing items of Component 2

No.	Item	Volume of excavating and backfilling (Ton)	Construction stage (Month)	Truck passage (vehicle/day)
1	Tran Hung Dao road	322,804	18	57
	Total	322,804	18	57

From the above pollution loads from dust and exhaust gases, by applying Sutton model with a wind speed of 2.2 m/s and south-eastern prevailing wind direction in the rainy season, a wind speed 2.6 m/s and north-eastern prevailing wind direction in the dry season, and a distance of 40-80m from generating sources, the concentration of pollutants created by transportation operations can be calculated as follows:

For Tran Hung Dao road: Dust concentrations vary between 0.3-0.74mg/m^3; CO contents between 0.6-1.34 mg/m^3; SO_2 contents between 0.3-0.71mg/m^3; and HC contents between 0.52-0.83mg/m^3.

Dust:

In general, the loads of dust generated in the process of transporting excavated earth are forecast as being not substantial and would be distributed evenly along transportation routes, between 0.005 and 0.5mg/m^3. According to calculations, the dust concentration would not exceed the

national standards on ambient air quality (QCVN 05: 2013/BTNMT) outside 60m of distance. However, it must be noted that the amount of dust generated is large owing to the mobilization of machinery and vehicles on the construction site. At some points of time, relatively large amounts of dust may abruptly increase when a large number of machines and vehicles are mobilized for necessary construction tasks.

The main transport routes for materials transportation would be Highway 1A, Nguyen Chi Thanh road, D4-N7 road, Le Loi road, Tran Hung Dao road and some other internal transport routes to the South of the city. These are also main transport routes through the city. The results of air quality analysis in Chapter 2 shows that the air quality in these areas is currently fairly good. Therefore, the subproject impacts of dust would be visible. However, this impact is temporary and can be mitigated. The receptors affected by dust would be the residents living along the routes. Dust pollution would hinder businesses and services located along the routes leading to a drop in the number of customers, especially along Le Loi road, which are often crowded with business activities.

In general, the subproject would exert impacts from dust on the residents and businesses, with dust concentrations likely to exceed the permitted limit when construction would be at its peak. However, these impacts can be fully controlled and minimized if all necessary mitigation measures would be carried out during construction. The impact level of dust during ground leveling, excavation, backfilling and transportation is thereby assessed as being medium.

Exhaust gases:

The CO contents in the areas are between 0.012-1.2 mg/m^3.The SO_2 contents are between 0.04-0.5 mg/m^3; and HC contents between 0.01-0.6mg/m^3. Outside 40m of distance, the results of analysis of exhaust gases compared to the national ambient air quality standards (QCVN 05: 2013/BTNMT) shows that they are still within the permissible limits.

Noise pollution

Tran Hung Dao road, where the construction activity will be executed, is the main road to the city. The area on Liem Chinh bridge is densely populated with many small business householders along the two sides of the road. The subjects of the impact are mainly workers involved in the construction. Therefore, the contractors will have to apply the mitigation measures during construction as outlined in the ECOP.

The areas that may be affected by noise, dust, and exhaust gases, are listed in Table 53.

Table 53.Special subjects affected by noise, dust and exhaust gases

No	Affected subjects	Construction items	Distance to construction sites
1	Residential area	Upgrading road, drainage sewers, and electric system	5 m from construction route

If construction work is carried out at night in these areas, the noise levels all exceed permitted limits within a radius of 200m. During the daytime, these areas will be affected by noise within a radius of 50m. Especially, the patient in the Ha nam Eye Hospital, would be affected by noise. Therefore, the contractors would have to carry out mitigation measures to reduce the impacts of noise on learning activities at these schools. The impact level of noise is assessed to be medium.

c. Impacts from vibration

The construction process with the use of means and equipment can give rise to vibration in the earth foundation. Such vibration is transmitted along the earth environment but is strongly reduced in proportion with distance.

The levels of vibration generated by a number of construction equipment are given in Table 54 and Table 55.

Table 54. Levels of vibration caused by typical construction equipment

No.	Machine/Equipment	PPV at 7.62 m (mm/s)	Corresponding Lv at 7.62 m (VdB)
1	Compression-type piling driver		
	+ High level	**0.463**	112
	+ Normal level	**0.196**	104
2	Rammer	0.064	**94**
3	Pile driving hammer	0.027	**87**
4	Big bulldozer	0.027	**87**
5	Driller	0.027	**87**
6	Heavy truck	0.023	**86**
7	Drilling hammer	0.011	**79**
8	Small bulldozer	0.001	**58**

Source:D.J. Martin. 1980, J.F. Wiss.1974, J.F. Wiss. 1967, David A. Towers. 1995.

Table 55.Assessment of impact level caused by vibration

No.	Type of work	PPV (mm/s)	Approximate Lv (VdB)
1	Reinforced concrete, steel, wood (without plastic)	0.153	102
2	Technical concrete, normal mason works (without plastic)	0.092	94
3	Unprocessed wood and major mason works	0.061	98
4	Housing oversensitive to vibration	0.037	90

Source: Swiss Consultants for Road Construction Association, "Effects of Vibration on Construction," VSS-SN640-312a, Zurich, Switzerland, April 1992.

Under Component 3, construction means to be used would include pile drivers, rammers, bulldozers, and heavy trucks. Based on the results presented in Tables 54 and 55, the safe distance for bearing strong impacts from vibration is about 10 meters from the generating source. The impact level of vibration is assessed to be low.

Noise pollution

Noise comes from the material transport vehicles, machines and equipment. The level of noise coming from the transportation and construction was calculated by the same formula applied for Component 1 and 2:

The distance for noise impact assessment on the surrounding residential area is selected from 20m-50m. The results of separate noise level assessment of individual construction and transport vehicles as well as resonant noise level are estimated and presented in the table 56 below.

Table 56. Noise level from construction vehicles

No.	*Vehicles/Equipment*	*Noise 1m far from the source (dBA)*		*Noise level 20m far from the source*	*Noise level 50m far from the source*
		Variation	*Average*		

No.	*Vehicles/Equipment*	*Noise 1m far from the source (dBA)*		*Noise level 20m far from the source*	*Noise level 50m far from the source*
		Variation	*Average*		
01	Bulldozer		93.0	67.0	59.0
02	Roller	72.0 - 74.0	73.0	47.0	39.0
03	Excavator	72.0 - 84.0	78.0	52.0	44.0
04	Road pavings	87.0 - 88.5	87.7	61.7	53.7
05	Truck	82.0 - 94.0	88.0	62.0	54.0
06	Concrete mixer	75.0 - 88.0	81.5	55.5	47.5
07	Pile driving machine	95.0 - 106.0	100.5	74.5	66.5
	Resonant noise level		84.5	58.5	50.5
	QCVN 26/2010/BTNMT, normally: 6 pm to 21 pm is 70 dBA; 21 pm to 6am is 55 dBA;				
	Ministry of Health standard: Noise at production area: contact time 8hours is 85 dBA				

The results showed that, at the distance of 20 meters from the sources of noise, the noise levels from vehicles are all within the allowable limits of QCVN 26:2010/BTNMT and the standards of the Ministry of Health and at medium level. Therefore, the noise coming from construction and transport equipment and vehicles is considered insignificant.

4. Impacts on water environment

It would be expected that about 50 workers for construction of Tran Hung Dao road. Therefore, at a peak time, a total of 50 workers would be working if all the construction items would be executed at the same time. According to Vietnam Construction Standard TCXDVN 33:2006, the water use norm is 165 Liter/person.day. The contractor will prioritize hiring local workers to reduce the numer of workers staying on site as well as to reduce volume of domestic wastewater generating from workers' activities. The volume of wastewater is calculated at 90% of the amount of water consumption. Based on the mentioned number of workers and aforesaid wastewater generation coefficient, the volumes and loads of domestic wastewater can be forecasted as 8.25 m^3/day

Wastewater from domestic activities would contain many suspended solids, organic matters, nutrients and microorganisms. The loads of pollutants in wastewater without collection and treatment systems are presented in Table 57 below.

Table 57. Loads of pollutants in domestic wastewater

No	Pollutants	Load (kg/day)
1	BOD_5	0.45-0.54
2	COD	0.702-1.02
3	TSS	0.7-1.45
4	T-N	0.06-0.12
5	T-P	0.008-0.04
6	Cl^-	0.04-0.08
7	E. coli	10^5-10^6

(Source: WHO, 1993)

Thus, the total volume of domestic wastewater generated from construction processes will be about 8.25 m^3/day. Without proper management, domestic wastewater will deteriorate the landscape, pollute land, water, and air environment, and create favorable conditions for pathogens to proliferate. These, in turn, will adversely affect the health of communities and workers. Contractors are to work out measures to manage this volume of wastewater.

It is assessed that, for the construction of each work item, there will be a fairly small amount of generated domestic wastewater. Therefore, the impact level of wastewater is assessed to be low

Stormwater runoff

An assessment of the impact of stormwater runoff over the construction area on the surrounding environment was based on the method of calculating the drainage of a hydraulic system with the following formula for intensity limits (Source: Environmental Engineering Handbook, 2005). The amount of stormwater runoff on the construction site can be estimated as follows:

- ***Construction of Tran Hung Dao road***

Tran Hung Dao road is of a total length of 1,600 m. The construction of the system would follow the successive construction method, with about of 200m of sewer each time. It is estimated that about 30 m of the road width must be occupied for the construction of the wastewater collection and drainage system. Hence, the construction area for each period will be about 48,000 m^2. The daily amount of stormwater runoff can be estimated as follows:

$$Q_1 = 0.60 * 0.03m/day * 48,000\ m^2 = 864\ m^3/day.$$

The impact level is assessed as medium.

According to measurements made in 2009 by the Ho Chi Minh City Institute of Hygiene and Epidemiology, the concentration of pollutants in stormwater in urban areas with no contamination sources and with construction works is as follows (Table 58):

Table 58.Concentration of pollutants in stormwater runoff

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

Source: HCM City Institute of Hygiene and Epidemiology, 2009

Thus, in stormwater runoff flowing through the construction area, the content of suspended solids often exceed the permissible limits set out in national industrial wastewater standards(QCVN 40:2011/BTNMT)- Column B, while the content of mineral grease and oil, if not properly isolated, is likely to exceed the permissible discharge limit. The impact level is assessed to be medium.

5. Solid Waste

Excavated soil during construction

Earthwork (excavation, backfilling, and dredging) will be carried out during construction of the road, collection sewers. This activities would generate a volume of wastes indicated is 80,00 m^3.

Thus, the total volume of excavated soil during construction is 230,574 m^3 (approximately 322,804 tons), with a volume of vegetation to be cleared being about 0.03 tons on a total area of

approximately 3,112 m^2 of agricultural land to be cleared (generation coefficient of vegetation biomass estimated at 0.1 ton/ha). The volume of backfill is about 75,184 m^3. The balance between excavation and backfilling is thus 80,206 m^3.

The analysis of the soil quality in the area shows that the soils meet the national standards for heavy metal concentrations in soil (QCVN 03: 2015/BTNMT).

As for normal excavated soil, the subproject will coordinate with other agencies to use this excavated soil for ground leveling. If this volume of excavated soil is gathered on site, heavy rains can sweep it away, thus increasing the turbidity of stormwater runoff and heightened the risk of sedimentation in the drainage conduit. These excavated materials can be temporarily stored in a landfill cell for later use as covering materials by leveling it out after each day.

Domestic waste

Since many workers would be recruited locally or they would lend houses of the local residents, the number of workers at the camps on the construction site would be about 50 if all the packages are carried out at the same time.Each worker would generate about 0.5 kg of domestic waste/day, i.e. 25 kg/day. Without proper management, such amounts of generated domestic waste would become a pollutant source, giving rise to bad smells and pathogenic factors from microorganisms.Services of waste collection have been provided in the city, and Thung Dam Gai Landfill has been put into operation, so the impacts of domestic waste generated during the construction process can be controlled with low risk of pollution.The impact level is assessed to be low.

Construction wastes

In Component 3, contrucstion waste will be generated from the demolition of the Tran Hung Dao road surface. The demolition volume is estimated at about 112,000 tons. The impact level from debris is assessed as medium.

Hazardous Waste

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

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

The average amount of grease and oil discharged from machinery and equipment is 7 liters/each change. Oil change and maintenance of machines-equipment are scheduled every 3 months at most. The number of vehicles and construction means needing oil changes is 45 (including 15 trucks and 30 construction means). The amount of waste grease and oil generated in the construction site therefore averages (45 x 7 liters/time)/3 months = 105 liters of oil/month. In addition, the subproject would also generate an estimated amount of 40 kg of oily rags and containers per month.

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

3. Impacts on transport infrastructure from the transport of materials

The volume of materials to be transported for the items of Component 3 is estimated about 80,206 m^3 corresponding to 6,684 trips (12 ton truck), which will cause the potential impacts on traffic safety and degraded traffic infrastructure, particularly the routes for transport of materials.

Average construction period is estimated at 18 months. Transportation time is a half of construction time.

So, number of trips per day is = 6,684/270 = 25 trips per day, which is not of a high frequency.

4. 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.

The Project 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.) is the source of fire and explosion. The occurrence of such incidents can cause serious damage to people, society, economy and environment;

Temporary power supply system for machines and equipment during construction can cause problems of shortcircuit, fire, explosion, electric shock, etc leading to economic and labor accidents for workers.

The subproject owner will implement the fire prevention and strictly comply with measures to prevent leakage, fire or explosion. The fire prevention shall be done regularly to minimize the possibility of incidents and the levels of impact.

Healt and Safety Risk to the Community

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

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

and other sexually transmitted diseases, especially through prostitution, posing risks to the local community. However, as the work is at a small scale, and construction would not last long, this impact is low and controllable.

Impact on Aquatic Species and Terrestrial Ecology

Impacts on aquatic species: There is a water bodies in the construction area for the items of Vuc Kieu Lake (beside Tran Hung Dao road). According to surveys on the current status, there have been no records on living creatures to be conserved or migrating fishes in this lake. Therefore, the impact level on fish species is assessed to be low.

Impacts on terrestrial ecology:

The construction of the road is carried out mainly on urban land with main drainage pipes will be laid mostly in the curbs, sidewalks, and therefore will exert no impact on the ecosystem.

Impact on City Landscape

However, construction activities would require excavation on Tran Hung Dao road 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 of Tran Hung Dao road 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.

Road Traffic Disturbances and Increased Traffic Risks

It is estimated that, during the construction in the city area, there would be an increase of the number of vehicles transporting raw materials and wastes for disposal at 35 times/day on average. The increase in traffic flow and the narrowed road surface on some streets and lanes densely populated by residential houses along the existing roads in residential areas of wards in the city would increase the risk of traffic accidents and traffic congestion, especially during peak hours and at road intersections. The impact level is assessed to be medium.

Impact on water supply and communication infrastructure

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

Site-Specific Impacts on Sensitive Receptors

Impacts on the Vuc Kieu lake: The construction process will involve the earth work which would generate a moderate amount of dust, stock pile of construction materials. If the materials and excavated soils are not properly stored and placed near the lake, they will be run off into the lake, especially during the rainy season, causing excessive sedimentation in the lake affecting the water

quality. This impact would be moderate, temporary, and occur during construction period and can be mitigated by applying good construction and management practice.

Impacts on the irrigation canals: In addition, upgrading of Tran Hung Dao road could affect functioning of the two irrigation canals acrossing this road. Construction may require temporary blockage of the canals or cause unwanted discharge of construction wastes into the canals seriously affecting their functionality and subsequent water supply to the crops. However, this impact is temproraty and moderate. The technical design has confirmed that this aspect has been considered.

Access of the local resident to the Ha Nam Eye Hospital: During the construction, the access of the construction machines and transportation vehicles to the Ha Nam Eye Hospital, which is being constructed,will be temporarily impacted. In addition, if traffic is not properly managed accidents may happen due to the elevated flow of vehicles and people in this area. This aspect should be considered carefully during construction period. The impact is assessed as moderate.

Affect people's activities on the two sides of Tran Hung Dao Road: Tran Hung Dao road, where the construction activity will be executed, is the main road to the city. The area on Liem Chinh bridge is densely populated with many small business householders along the two sides of the road. Construction activities may cause the following impacts mostly related to traffic as construction operations will occupy one part of road surface, while the other part will be used for gathering machinery and storage of construction materials during construction. These impacts include: i) Inconveniences to locals' business activities as access to business establishments may be obstructed; ii) Affecting drainage capability in the area; iii) Dust, waste, damagedlandscape; iv) Risks of landslides and subsidence damages to existing works along road sides from deep excavation for the construction of pipe trench; v) Safety risks to vehicles and community, especially at night when excavation is performed to depths of 1.7 -2.5 m.

Tran Hung Dao road, where the construction activity will be executed, is the main road to the city. The area on Liem Chinh bridge is densely populated with many small business householders along the two sides of the road.

4.1.5.3. Component 3 – Impacts during Operation

Road Safety, Air, Noise, and Vibration

Road safety is likely to be the key impacts during operation of Tran Hung Dao during the first few years with transportation of 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 relative high, generation of dust, exhausted gases, noise, and vibration could be an additional issue but this could be mitigated through a long term planning.

Inadequate operation and management of infrastructure as road drainage, sewerage collection system cause odor, flooding. Operation and maintenance program should be integrated in to the city's overall operations and maintenance program.

4.2 SOCIAL ASSESSMENT

4.2.1 Potential Positive Social Impacts

The project has improved remarkably the living condition of all residents by providing currently unavailable services and improving people's health. The health will be improved because the environmental sanitation is improved with new drainage systems, dykes, regulation lakes, separated wastewater collection and treatment system. These will decrease diseases related to water sanitation and increase productivity of people. Work leaves and illness due to flood or poor drainage system will cause bad impacts on the poor and increase poverty and hungry. Clean and fresh environment will attract and maintain the number of visitors to the area, and create a new vision for investors.

Improvements on infrastructures and transportation will enhance the demands for construction materials and staffs, more convenient and decrease the transport cost. The benefits for the poor (both man and woman) are many jobs for unskilled labor.

The technical support programs will encourage developing the relationship between the poor and organizations, public works and bodies of the city as well as setup community spirit in many poor areas. This program will build and enhance the skills of staff, local management authorities, People's Committee at all levels.

4.2.2 Potential Negative Social Impacts

Component 1: Basic Infrastructure Upgrade And Service Improvement

In relation to the proposed work items: It is estimated that Component 1 will acquire 15,103 m^2 of land for the two items: Upgrading and rehabilitating infrastructure system of the residential area in the northern area of Quang Trung Ward, and constructing Phu Van Kindergarten, including 0.43ha of residential land, 0.48ha of agricultural land, and 0.6ha of public land. 12 HHs under Component 1 will be affected by acquisition of residential land and fixed assets, and 22 HHs will be affected by loss of agricultural land. In total, 7 households will be relocated. In addition, 10 graves will also be displaced.

Component 2: Environmental Sanitation Improvement

Table 59. Impacts from land acquisition of component 2

No.	Items	Commune/ ward	Affected area					Total affected land (m^2)
			Resid. land (m^2)	Agr. land (m^2)	Aqua. land (m^2)	Organization Land	Resid. land (m^2)	
2	Component 2:		12,081	26,189	575	4,378	132,070	175,293
2.1	Rehabilitaion of Lam Ha 01 lake	Lam Ha ward	3,813	9,745	575	578	80,917	95,628
2.2	Construction of embankment in the south of Chau Giang river	Liem Chinh ward Liem Tuyen Commune	8,268	16,444	-	3,800	51,153	79,665

67 households have residential land and fixed assets affected by this component and 87 households have affected agricultural land.

Component 3: Urban Roads And Bridges

Land acquisition includes: 0.31 ha agricultural land, 0.58 h residential land, 0.72 ha public land, 0.21 ha water land (pond). There will be about 41 affected households, of which 16 household will be relocated.

Adverse Impacts on Involuntary Resettlement

In the subproject preparation stage, a close collaboration with Phu Ly PMU and the Consultant with the local authorities concerned at the villages /commune, the technical consultant to consider the choices of building design. Each option has tried to minimize the impact of resettlement especially those who are vulnerable.

The number of the affected households and organizations are synthesized in the Table60 below:

Table 60. Summary on the magnitude of impacts of sub-project

Contents		Unit	Affected volume
1. Affected households		HHs	**278**
Household members		People	1,140
A. Households are affected directly by land acquisition		HHs	**230**
Of which:	+ Households impacted with residential land	HHs	162
	+ Households impacted with agricultural land	HHs	118
	+ Households impacted with aquacultural land	HHs	2
B. Households affected indirectly by land acquisition		**HHs**	**48**
2. Affected agencies and organizations		**Units**	**6**
3. Households impacted with houses and structures		**HHs**	**159**
Of which:			
a, Households impacted with houses and structures		HHs	156
	+ Partial	HHs	103
	+ Entire (have to be dismantle primary house)	HHs	53
b, Households impacted with graves		HHs	3
4. Households impacted with trees and crops		**HHs**	**278**
5. Physical Relocated households		**HHs**	**53**
6. Vulnerable households		**HHs**	**35**
Of which:			
	+ Poor households	*HHs*	*13*
	+ Social Policy households	*HHs*	*11*
	+ Elderly households	*HHs*	*6*
	+ Women-headed households with dependents	*HHs*	*5*
7. Households losing 20% or more of total agricultural landholdings or 10% or more for vulnerable households		**HHs**	**45**
8. Affected business households		HHs	28

The survey results showed that the implementation of sub-project will affect 278 households, including 230 households affected directly by land acquisition activities and 48 households affected indirectly by cultivation on the land area managed by the Commune/ward PCs. Also, the project implementation also affects the land owned by 4 commune/ward PCs and 2 organizations (Trieu Xa pumping station in Liem Tuyen commune and Dinh Trang pumping station in Lam Ha ward). A large number of affected households lost more than one type of property such as residential land, annual crops land, structures, trees and crops. Out of 156 households affected on housing and structures, there are 53 households entirely affected on housing and structures and need to relocate and resettle.

There is a linked activity which is a resettlement site in Me Thuong village, Liem Chinh ward to provide land plots for the relocated households to move in. A due diligence review of land acquisition activities has been conducted and included in the subproject RP. Most of the land acquisition activities and site clearance were completed in 2005 (about 80.5% of the total site area with 32 PAHs) and the remaining land has been acquired in April-June, 2016 (with 23 PAHs). All 55 PAHs were marginally affected. The site clearance and compensation activities have been reviewed to assess compliance with the Gov. regulations for 32 PAHs who received compensation in 2005 and with the project policies (OP4.12) for 23 PAHs receiving compensation in 2016. The reviews showed that all the compensation were done in line with the Gov regulations, hence, there are some gaps in compensation for 23 PAHs receiving compensation in 2016 compared with those stipulated in the policies of the MCDP project. Therefore, the Phu Ly city will re-consider the compensation plans for these households to ensure compliance with the project's policies.

Impacts on Non-land Assets (Local livelihood and Quality of Life)

Apart from land acquisition, the project interventions will have some impacts, both positive impacts (e.g. reduction of pollution; improvement of urban landscape and aesthetic impacts) and adverse impacts (e.g. reduced sources of income due to loss of agricultural land, land use for animal breeding, and temporary loss of income (estimated to be minor) from doing business along transportation routes and roads to be resurfaced and limited access to several social and religious structures during construction phase.

Other Potential Impacts and Risks

Sexually Transmitted Infections: increased risks of exposure to HIV/AIDS during construction and post construction phase due to large volumes of transit traffic along the road. Women have higher risks of exposure to HIV/AIDS and road accidents than men.

Negative Impacts on Subproject Area's Economic Activity

The construction associated activities also will cause direct and indirect impacts on the economic activities within the subproject area, particularly, road construction, as for the case of the road in wards; (ii) changing temporary alignment of existing drainage and sewerage that may cause temporary flooding and water cuts, requiring traffic to take different routes or/ and reducing the number of lanes that can be used; (iii) reducing sales volume for local businesses along the roads; (iv) impeding the traffic and goods flow in and outside the Subproject area.

Effect of worker camps

It is estimated that the subproject would mobilize about 420 workers, many of whom would be hired locally in the subproject local communities. Therefore, worker camps would be required for only about 300 workers, contractors, and engineers at the different construction sites. It is expected that the biggest worker camps would be for about 50 workers during peak construction periods. Due to limited construction activities and areas, worker camps may not be required for construction of the storm water pump station, stormwater and wastewater sewers, tertiary sewer lines. The main potential social problems associated with worker camps could be: (i) potential impact of spreading infectious disease from employees to local communities and vice versa; (ii) potential impact of prostitution, drugs and gambling; (iii) potential conflict between workers and local communities because of differences of culture, behavior; and iv) sexual abuse and assault of girls due to influx of workers employed by the construction company in the area. However, with

the shortage of labor for the construction, local workers in the city will have the opportunity to participate in the construction. Therefore, the impact is assessed as moderate.

Gender related issues

Gender gaps often happen in the water and sanitation sectors. Although in the city most of the households have access to tap water, in Duong Am and Quynh Chan resesidenial group, most of the people are using traditional wells and other sources of water , so women and girls are typically responsible for obtaining and treating water (SDC). The water component is likely to bring greater benefits to women. The same can be said about sanitation. Improved access to sanitation leads to better health and less illness. This would reduce work burden for women to take care of sick family members.

The survey results showed that some family issues are decided by both male and female. 75.41 % of spouse decide on borrowing bank's loan or investment, business. 77.16 % of spouses decide on studying and occupation of their children.

Most of the Land Use Right Certificate (LURC) (62.44 % of households) are under the name ofboth wife and husband. 18.54 % under husband name only and 19.02 % under wife name only.

The participation in community activities and local organizations show that there is gender difference. Female often participates in both activities more than male. 33.72% of respondents stated that females play main role in community activities while the proportion of males is 12.4 %. Similarly, the proportion of females participating in local organizations is 30.58% and the proportion of females is 10.19%.

The survey results by questionnaire with households and community also showed that there is no significant gap between male and female in education, income and health

Meaningful consultation with both of men and women during project preparation and implementation would ensure the project design and implementation be more successful. In addition, it is necessary to ensure that women and female-headed households have equal access to project benefits. So the project will have some results indicators with sex-disaggregated data to ensure both man and women are benefited from the project.

4.3 INDUCED IMPACT

The proposed subproject is limited to rehabilitation of the small to moderate urban roads with associate drainage and sewer systems, construction of a new 254m road, rehabilitation of a regulation lake, embankment, and upgrading of schools. The subproject would not involve construction of housing or commercial development areas that would directly affect the number of residents or employees within the area, neither would it directly contribute to the creation of additional housing or jobs in the subproject areas and thus would not result in direct or indirect growth inducement. Given the scale of the subproject interventions, their locations, and planning of the city, it is not anticipated that there would be potential induced social impacts of land use changes as a result of the subproject such as increase in land prices, triggering significant land speculation and potential dislocation of poor people leaving along the subproject roads, and development of big businesses or industrial zones.

CHAPTER 5: ENVIRONMENTAL AND SOCIAL MITIGATION MEASURES

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 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.

(i) Lam Ha 1 Lake

- Green tree cells will be positioned around the lake between distances of 10 meters. The lakeshore will be protected by both soft and solid structures: stone and macadam structures at the elevation of -1m to +1m and grass cells at the elevation of +1m and above. Surrounding the lake will be lighting systems with steps and handrails for convenient operation and maintenance. These enhancements along the lake will consist of a complete landscape renovation. The idea is also to transition this area into a beautiful functional piece of public property adding landscape value to the city and creating an open beautiful area for leasures and enjointment.

(ii) Bien Hoa road

- The surface of the road will be desgned not to raise it elevation to avoid possible water run off to the households along the two sides of the roads.

- The electrical boxes should be designed to be located between each two households as recommended by the local people during the consultation.
- Green trees will be positioned at the two sides of the roads between distances of 10 meters.

(iii) Chau Giang river southern embankment

- Green trees will be planted along the sidewalks and median strips to create landscapes for the Southern road and embankment of Cha Giang river. Flower beds and lawns shall be planted to create landscapes. Areas of lawn will be regrading to provide functionality. All damaged and graded areas will be seeded upon completion. Grass areas of the embankment will be converted to lawn that can be mowed and maintained. Upon completion the slope erosion problem and environment around the lake will be converted into the showpiece of public property.
- 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 design of the embankment 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 embankment.

5.2 MITIGATION MEASURES DURING PREPARATION PHASE

5.2.1 Mitigation Measures for Land Acquisition

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

As presented in Chapter 2, the subproject is expected to affect on **208,848m^2** land owned by **230** households and 6 units as the People's Committees/ management organizations, including **22,190 m^2** of residential land; **34,104 m^2** of agricultural land; **2,675 m^2** of aquacultural land; **4,543 m^2** of land managed by the organization; **145,336 m^2** of public land owned by the Commune/ward PCs as specialized land, rivers and streams, and transport land. There are 162 households impacted with land and fixed assets by the subproject, of which 109 households are partly affected and 53 households are totally affected and have to relocate. Among the affected households, there are 73 severely affected households and 35 vulnerable households as well as 28 affected business households. 03 resettlement sites have been built for site clearance for Phu Ly city projects, including the resettlement site in Me Thuong village of Liem Chinh ward, the resettlement site in Lam Ha ward and the resettlement site in Quang Trung ward.

The estimated cost for the Resettlement Action Plan of the subproject is approximately 126,696,075,352 VND (equivalent to 5,726,635USD at the exchange rate of 22,124 VND = 1 USD).

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

5.2.2 Mitigation of UXO Risks

The subproject owner (the subproject PMU) will sign a contract with the military civil engineering agency or Ha Nam 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 compeletd.

5.3 MITIGATION MEASURES DURING CONSTRUCTION PHASE

5.3.1 Mitigation Measures for General Impacts

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

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

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

The measures identify typical mitigation measures for the following aspects:

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

5.3.2 Site-Specific Mitigation Measures during Construction Phase

Table 61.Site-specific mitigation measures on key sensitive receptors

No	Sensitive receptors and their relation to subproject activity	Site-specific mitigation measures
CONSTRUCTION PHASE		
	Component 1	
1	**Upgrading infrastructure for the residential area in the North Quang Trung ward** ***1) Relocation of 10 Graves***	- There are 10 household graves which will need to be relocated for construction of Road in Infrastructure for the residential area in the North Quang Trung ward under Component 1 of the subproject. - Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation, reburial and other related costs which are necessary to satisfy customary religious requirements. Compensation in cash will be paid to each affected family or to the affected group as a whole as is determined through a process of consultation with the affected community. The level of compensation will be decided in consultation with the affected families/communities. All costs of excavation, relocation and reburial (5,765,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways. - During implementation the Subproject Owner will make early announce to the households whose graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to the affected household as required in the subproject RP and ESMP.

No	Sensitive receptors and their relation to subproject activity	Site-specific mitigation measures
	2) The railway traffic	- Inform the railway management company of the construction activities and their potential impacts such the risks of interference with the railway train schedule and railway traffic safety, and the detail construction work schedule at least 01 month before construction starts. - Set up construction and traffic warning signs at the construction site. - Set up barriers around the construction area to separate working area with the railway (fence 2.5 m tall). - Construct the sewer under passing the railway using safe tunneling method. - Deploy a qualified technical staff to supervise construction activities near the railway. - Only execute construction activities when there is no train schedule. - Prohibit scattering of construction material and wastes near and on the railway. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes, and during transporting materials crossing the railway. - Immediately collect any domestic wastes and construction spoils around and near the railway and dispose in a designated site.
2	**Upgrading Tran Quoc Toan primary school, Hai Ba Trung ward** ***1) Tran Quoc Toan secondary school*** ***2) Located right begind the Tran Quoc primary school***	- 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. - Sprey 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
	3) Phu Van primary school, 50 m from the costruction of Phu Van	

No	Sensitive receptors and their relation to subproject activity	Site-specific mitigation measures
	kindergarten	every working session. - Cover the incomplete trenches under construction at end of the working day. - Immediately addess any issue/problem caused by the construction activities and raised by the schools. *Continuity of lessons for Tran Quoc Toan primary school* During consultation the following locations have been suggested for delivery of school classes during construction: - Broadcast & Television College No. 1: Because (1) it has campus and all necessary equipment to meet the school's teaching/learning requirements; (2) It is not very far from Tran Quoc Toan Primary School (about 400m, on Quynh Luu Road). This will help minimize impacts due to change of teaching/learning location for the school's teachers and students
3	***4) Irrigation canal near construction of Phu Van kindergarten area*** ***5) Agriculture activities at Phu Van kindergarten area***	- Informing the community of the construction schedule at least one week before the construction. - Arrange drainage around the construction sites to ensure no soil erosion and sedimentation to the rice fields and irrigation canals. - Provide alternative water diversion from canals to the locations the local people requested, if they are affected. - Regularly check the affected on-field irrigation canals to ensure they are not blocked by construction spoils and wastes. - Immediately rehabilitate irrigation canals if they are damaged by construction activities to ensure that water supply for the rice fields inside ring dike is maintained. - Closely consult with the local community to ensure that suitable sollutions to problems are taken and communities concerns related to construction activities are addressed.
	Component 2	
1	***1) Temple of 10 girls, 50 m from the construction of Lam Ha 1 Lake.***	- Inform the temple of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction.

No	Sensitive receptors and their relation to subproject activity	Site-specific mitigation measures
2	***2) Me Noi Temple. -Near the Chau Giang embankment. 10 m from construction site.***	- Prohibit gathering of construction materials within 100m in front of the temple. - Pile driving activities will not be carried out before 7 am or after 6 pm, or at days and hours advised by the local management. - Environmental training for the workers includes codes of conducts when working in pubic areas and sensitive receptors such as temple. - Sprey sufficient water to suppress dust during dry and windy days at least three times a day at the area of the temple. - Clean the construction area after each working. - Sett up construction and traffic warning signs at the construction site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes. - Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session. - Cover the incomplete trenches under construction at end of the working day. - Provide night lighting system with luminously painted fence and night lamp. - Avoid construction activities during religious events every first and 15th days of the lunar month and during festival days if possible. - Immediately addess any issue/problem caused by the construction activities and raised by the temple.
3	***3) Households raising fish in the Lam Ha 1 Lake***	- Inform the households of the construction activities andconstruction schedule at least 03 month before start of the construction so that the household can plan well ahead for the havesting of the fish. - The project will provide adequate compensation at the market prices for the affected fish, and support and allowances for occupational transition, employment for aquaculture farming households.
4	***4) Phu Ly Church located on Bien Hoa road.***	- Inform the church of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction. - Prohibit gathering of construction materials within 100m in front of the church.

No	Sensitive receptors and their relation to subproject activity	Site-specific mitigation measures
		- Pile driving activities will not be carried out before 7 am or after 6 pm, or at days and hours advised by the monks. - Environmental training for the workers includes codes of conducts when working in pubic areas and sensitive receptors such as churches. - Sprey sufficient water to suppress dust during dry and windy days at least three times a day at the area of the church. - Clean the construction area after each working. - Sett up construction and traffic warning signs at the construction site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes. - Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session. - Cover the incomplete trenches under construction at end of the working day. - Provide night lighting system with luminously painted fence and night lamp. - Avoid construction activities during religious events every first and 15th days of the lunar month and during festival days if possible. - Immediately addess any issue/problem caused by the construction activities and raised by the church.
5	***5) Street small business householders on Bien Hoa road***	Mitigation measures for access to street household businesses: - Inform the street household businesses of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 02 weeks before start of the construction. - Set up construction and traffic warning signs at the construction site. - Provide safe and easy acces to the household businesses putting clean and strong thick wood panels or steel plates over the open ditches. - Do not gather materials and wastes within 20m from household businesses and shops. - Do not use machines generating loud noise and high vibration levels near the businesses.

No	Sensitive receptors and their relation to subproject activity	Site-specific mitigation measures
		- 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.
	Component 3	
1	***1) Ha Nam Provincial Eye Hospital*** ***100 m distant to Tran Hung Dao***	- Inform the hospital of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 01 month before start of the construction. - Construction area to be fenced and marked with warning signs to prevent unauthorized people from entering. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Set up construction and traffic warning signs at the construction 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. - Immediately address any issue/problem caused by the construction activities and raised by the hospital. - Arrange traffic guide for the vehicles go in/go out the hospital.
2	***2) Vuc Kieu Lake. On Tran Hung Dao road. 2 m from construction***	- Arrange drainage around the construction sites to ensure no soil erosion and sedimentation to the lake. - Prohibit stroring construction spoils and wastes within 200m from the lake. - Prohibit illegal dumping of construction spoils and wastes to the lake.

No	Sensitive receptors and their relation to subproject activity	Site-specific mitigation measures
	site	- Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session. - Clean the construction area after each working.
3	***3) Two irrigation canals. Across Tran Hung Dao road. 0 m from construction site***	- Informing the community of the construction schedule at least one week before the construction. - Arrange drainage around the construction sites to ensure no soil erosion and sedimentation to the rice fields and irrigation canals. - Provide alternative water diversion from canals to the locations the local people requested. - Regularly check the affected on-field irrigation canals to ensure they are not blocked by construction spoils and wastes. - Immediately rehabilitate irrigation canals if they are damaged by construction activities to ensure that water supply for the rice fields inside ring dike is maintained. - Closely consult with the local community to ensure that suitable sollutions to problems are taken and communities concerns related to construction activities are addressed.

5.4 SPECIFIC MITIGATION MEASURES DURING OPERATION

a) Leaks and overflow of stormwater drainage and wastewater collection systems

Operations of stormwater drainage and wastewater collection systems under the subproject would have impacts on the areas: (i) the probability of flooding due to congestion of drainage sewer section; (ii) affected by odors from sludge which is collected periodically from the swers; (iii) impacts from disposal of the sewer sludge; (iv) impacts on the soil environment due unwanted breakage of the sewers; and iv) impacts due on people health due to breakage of the water supply pipelines with subsequent intrusion of harmful parthogen into the water supply system. Mitigation measures are as follows:

- Consider the installation of separate sewer systems for domestic wastewater and storm water runoff in the overall planning and design of new sewerage systems.
- When on-site sanitation systems where excreta are mixed with water predominate, consider use of small-diameter sewerage system to collect water effluent from septic systems or interceptor tanks.
- Limit the sewer depth where possible (e.g., by avoiding routes under streets with heavy traffic). For shallower sewers, small inspection chambers can be used in lieu of manholes.
- Use appropriate locally available materials for sewer construction. Spun concrete pipes can be appropriate in some circumstances but can suffer corrosion from hydrogen sulfide if there are blockages and/or insufficient slope.
- Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope in gravity mains to prevent buildup of solids and hydrogen sulfide generation.
- Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replace if broken to minimize entry of garbage and silt into the system.
- Equip pumping stations with a backup power supply, such as a diesel generator, to ensure uninterrupted operation during power outages, and conduct regular maintenance to minimize service interruptions. Consider redundant pump capacity in critical areas.
- Establish routine maintenance program, including:
    - Development of an inventory of system components, with information including age, construction materials, drainage areas served, elevations, etc.
    - Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas. Cleaning activities may require removal of tree roots and other identified obstructions.
    - Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration.
    - Monitoring of sewer flow to identify potential inflows and outflows.
- Conduct repairs prioritized based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for

urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages);

- Review previous sewer maintenance records to help identify "hot spots" or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed;
- When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system.

b) Toilets of schools

Control of odors:

- The area for the construction of school sanitation blocks must be appropriately distant from classrooms and located at the end of wind direction.
- Ventilation systems would be designed and installed.
- The toilets must be supplied with adequate water.
- Pupils/students should be reminded to flush after using toilets.
- Toilets would be regularly cleaned.

Control the amount of sludge, septic tanks:

- Dredge periodically.
- The dredged sludge would be transported to Thung Dam Gai landfill by specialized tank trucks to avoid the odor emission and spillage during transportation.

Domestic wastewater:

Domestic wastewater would be treated preliminarily by 3-compartment septic tanks before being discharged into common sewers and then be directed to treatment stations

b) Traffic

Traffic safety measures on the routes:

- Warning, instruction and speed limit signs would be designed on the roads.
- Periodically check the quality of the road to avoid the risk of potential accidents
- Install barriers, separators, road markings, traffic signs according to the charter of road sign 22TCN 237-01 of Vietnam Road Administration.
- The lighting system in the sections crossing the bridge would be designed following the standards TCXDVN 259-2001 of the Ministry of Construction.

Minimize the impacts of traffic congestion:

- Streamline and redirect traffic, consult with the ward authorities and communities in advance
- Implement the necessary measures such as placing signals, signs... to ensure traffic order and safety.

5.5 MEASURES TO MANAGE, PREVENT AND RESPOND TO RISKS AND INCIDENTS IN THE SUBPROJECT

5.5.1 Preparation Phase

Safety regulations on construction and labor safety must be complied with during demolition for site clearance.

During the site clearance, when conflicts arise leading to complaints and disputes, the Subproject Management Board would receive grievance and complaints of citizens and propose specific guidelines and explanations:

- Disclose the subproject information and grievance redress procedure to the affected people.
- Provide guidance to affected households how to submit the grievance request starting from People's Committee of Commune/Ward. If the affected household do not agree with the resolution of People's Committee of Commune/Ward, they can further request to People Committee of District and/or Province and and ultimately the People's Courts.

5.5.2 Construction Phase

- ***Measures to prevent fire, electric shock:***

The most important incident for the whole area would be fire incidents. To prevent these incidents, investors would implement the following measures :

- Power lines in offices and construction sites must be safely installed. Power connectors must not be left on the ground and must have plugs and sockets. Outdoor electrical panels must be securely placed in protective boxes/cabinets.
- Safety rules must be posted at construction sites.
- Warning signs on areas prone to fire and explosion must be installed.
- Construction sites must be equipped with fire extinguishers.
- Install appropriate lighting system.
- Install automatic fire equipment for the whole area..
- Install fire extinguishing system inside the wall.
- Arrange fire and explosive rescue system.
- Inspect the fire and explosive prevention on a regular basis .
- Regularly communicate, train officials, workers on fire protection methods .
- Design and construct water supply systems with a sufficient storage capacity to ensure the fire prevention and protection in the entire subproject area.
- Fully comply with fire protection and prevention regulations, such as fire protection and prevention Act, TCVN 2622-1995 on fire protection and prevention for houses and buildings - design requirements; TCVN 5738-2000: automatic fire alarm systems - technical requirements, TCVN 5760-1993: Fire prevention system - General requirements for the design, installation and usage. TCVN 5040-1990: group fire protection and prevention equipment - symbols on the diagram of fire prevention - technical requirements.

- Regularly check the equipment on the probability of fire and explosives such as electrical appliances for daily activities.
- Manage the use of electrical equipment in the offices and operating rooms of wastewater treatment plant properly. Avoid using overloaded electrical equipment that may affect the electrical system of whole works.

Measures to prevent Subsidence:

- Prior to construction, survey and investigation must be carried on the geology of relevant areas to work out appropriate construction plans.
- Reinforcements must be performed with piles and steel piles at the construction sites for large-size pipelines and with great depths.
- In case of incident, construction must be immediately suspended, and repairs and compensation must be made for local people.

- ***Safety measures during transportation***
  - When automobiles are mobilized, brake and safe navigation system must be inspected, transportation vehicles must have wide lights and signboard
  - When it is foggy or smoky affecting visibility less than 30m, turn yellow lights or taillights. When the visibility is less than 30m or it is rainy or has thunderstorms which are dangerous, automobiles must be stopped running.
  - Transportation vehicles to/from the construction sites must not generate dust and mud on the routes.

5.5.3 Operational Phase

- **Stormwater drainage sewer sections, collection of wastewater on the (Component 1, 2, 3)**

Congestion of drainage sewers

- The management of stormwater drainage and wastewater collection systems should be focused and examined regularly to detect the congested drainage sewer sections and carry out dredging.
- Develop plan and periodic dredging the sewer sections and manholes in order to minimize the flow congestion.

Fuel leakage during the operation of pumping stations::

+ Do not store fuel used for pumping operations at the pumping stations to minimize fuel leakage leading to the pollution of the receiving source.

+ Feeding the fuel into the pumps need to be done carefully to avoid fuel spillage.

+ Lubricant, greasy rags from maintenance operations of the pumps need to be entirely collected and transported to appropriate treatment areas.

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 Phu Ly Subproject. The Environmental Management Program will identify the activities/actions to be implemented in the city of Phu Ly Subproject, 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).

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

ESMP's mitigation measures are divided into 3 basic parts: (1) ECOP, (2) Specific mitigation measures for the specific types of works, and (3) Site-specific mitigation measures for each sensitive location to be affected by the subproject's works items.

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

(2) In addtion to adopting the ECOPS, specific mitigation measures have been identified (Section 6.2) for addressing the impacts associated with the specific types of works under the subproject such as sewers, drainage systems. These measures will be included in the contracts for corresponding packages.

(3) All the impacts specific for each sensitive receptor of which mitigation measures could not be addressed through implementation of the ECOPs, site-specific mitigation measures will need to be implemented (Section 6.3).

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

6.1 MITIGATION MEASURES FOR GENERAL CONSTRUCTION IMPACTS

Typical common impacts which will be minimized by mitigation measures defined in ECOP (Table 67) include: (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 62. 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 25oC, 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 20m3within barriers or covered so as to avoid dust dispersion. - Transport wastes out of construction sites to the designated locations for reuse	- 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
	or to the disposal sites in the soonest possible time. - Do not put vehicles and machines to run idle in more than 5 minutes. - Avoid preparations of construction materials such as mixing concrete near local people's houses or other sensitive works like pagodas, school gates, or offices. - Locate vehicle washing stations at the exit/entrance of big construction sites. - Periodically wash the trucks used for transporting materials and construction wastes. - Avoid construction operations generating great vibration and loud noise within the time between 6pm and 7am when construction takes place near residential areas. Night construction must be informed to the community at least 2 days in advance. - Perform the method of successive construction for each sewer section in construction sites of long sewer lines. - Observe and secure construction progress correctly. - Set up 2.5m-high fences of corrugated iron around the construction sites. - When needed, measures to reduce noise to acceptable levels must be implemented and could include silencers, mufflers, acoustically dampened panels or placement of noisy machines in acoustically protected areas - Avoiding or minimizing transportation through community areas and avoiding as well as material processing areas (such as cement mixing).			
2) Wastewater management	- The Contractor must be responsible for compliance with Vietnamese legislation relevant to wastewater discharges into watercourses. - Employ local workers to limit the amount of generated domestic wastes and wastewater. - Provide septic tanks for toilets for treating wastewater before it can be discharged into the environment. On-site mobile toilets with 3-compartment septic tanks can be used in areas for major work items as traffic roads. Wastewater from toilets as well as kitchens, showers, sinks, etc. shall be discharged into a conservancy tank for removal from the site or discharged into municipal sewerage systems; there should be no direct discharges to any	- 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
	waterbody - Wastewater containing pollutants over standards set by relevant Vietnamese technical standards/regulations must be collected in a conservancy tank and removed from site by licensed waste collectors. - Clear ditches around the workers' camps every week. - Build sedimentation ponds and ditches to receive stormwater runoff at the construction sites such as the areas for Lam Ha 1 Lake, stormwater and wastewater pumping stations. - 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 Supervision Consultant and relevant local authorities prior to collection and disposal through a licensed waste collector. - Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof. - No burning, on-site burying or dumping of solid waste shall occur. - If not removed off site, solid waste or construction debris shall be disposed of only at sites identified and approved by the Construction Supervision Consultant and included in the solid waste plan. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas, such	- 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
	as in areas of natural habitat or in watercourses. - Limit waste pollution from litter and drop of materials. Place dustbins at the workers' camps. - Temporarily collect and separate domestic wastes. Provide watertight dustbins for domestic waste and tightly cover them to avoid giving rise to bad odors and leachate leakage, attracting flies, mice and other pathogenic species. Periodically collect and transport the waste to the dispose. - Perform concrete mixing on impermeable ground. Collect waste and wastewater containing cement through drainage ditches with sedimentation pits in construction sites before being discharged into receiving waters. - Separate the components and parts which can be reused or recycled in the construction wastes before transporting the waste to Thung Dam Gai landfill in accordance with design documents acceptable to the supervision engineer. - Weathered soil, wood and bricks can be reused for useful purposes such as ground leveling. Wood scraps may be used for cooking. Corrugated iron, iron, steel, packing materials and other materials which can be recycled can be delivered and sold to scrap traders. - Collect waste and tidy up construction sites at the end of a working day/shift and the transport waste out of the construction sites in the soonest possible time. If dredged materials are to be temporarily stored, necessary measures must be applied to control pollution such as gathering them within enclosures, under coverings, within fenced areas, etc. with warning signs. - The Contractor will sign a contract with URENCO Ha Nam to collect solid waste, conforming to Decree No. 59/2007/ND-CP dated 09 April 2007 on solid waste management and Decree No. 38/2015/ND-CP dated 24 April 2015 on management of waste and waste materials.			
4) Hazardous waste management	- Temporarily collect, store, and transported for treatment all hazardous wastes (road asphalt, waste oil and grease, organic solvents, chemicals, oil paints, etc.) in accordance with Circular No. 36/2015/TT-BTNMT on management of hazardous waste. - Collect and temporarily store used oil and grease separately in specialized	- Circular No. 36/2015/TT-BTNMT on hazardous waste management; - Decision No.	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	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 - Appropriate communication and training programs should be put in place to prepare workers to recognize and respond to workplace chemical hazards - Prepare and initiate a remedial action following any spill or incident. In this case, the contractor shall provide a report explaining the reasons for the spill or incident, remedial action taken, consequences/damage from the spill, and proposed corrective actions.	38/2015/NĐ-CP dated 24/04/2015 on waste and scrap management		

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
5) Water pollution	- The Contractor is responsible for controlling the surface water quality when discharging it out of the construction site, in accordance with QCVN 08-MT:2015/BTNMT – National Technical Regulation on surface water quality and QCVN 14:2008/BTNMT – National Technical Regulation on domestic wastewater quality. - Provide preliminary sedimentation ponds and ditches of stormwater runoff at the construction sites such as the areas for roads, regulation lake. - Provide construction workers on site with mobile toilets. - Avoid excavation and backfilling during rains. - Gather materials and wastes generated during excavation and backfilling, collect and transport them out of the construction site to the approved disposal sites within the soonest possible time. - Do not allow temporary gathering of bulk materials and mixing of concrete within 50m from ponds, lakes, rivers, streams, or other water sources. Maintain maximum distances possible between the gathering points to water sources in the construction of Chau Giang river southern embankment. - Store used and unused oil and petrol in closed containers on impermeable ground covered with roofs and contained within surrounding banks for easy control and collection in case of leakage. Do not locate oil and petrol storages within 25m from ponds, lakes, rivers, and streams. - Collect and transport excavated soils from the construction of sewers and ditches out of the construction site within 24 hours. - Only perform maintenance work of motored vehicles and equipment, including oil replacement or lubrication in designated areas, without allowing chemicals, petrol, oil, or grease to leak onto soil or into the drainage system or water sources. Trays are to be used to hold rags and materials used in maintenance. Collect and discard wastes in accordance with hazardous waste management regulation.	- QCVN 09:2008/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
6) Impacts on plants and aquatic species	- The Contractor shall prepare a Clearance, Re-vegetation and Restoration Management - Plan for prior approval by the Construction Engineer, following relevant regulations. The Clearance Plan shall be approved by the Construction Supervision Consultant and followed strictly by the contractor. Areas to be cleared should be minimized as much as possible. - Limit disturbances to areas with construction operations, especially in locations covered with green trees or vegetation. Do not use chemicals to clear vegetation. - Do not gather materials and wastes at places covered with vegetation or with green trees, but on vacant land instead. - Use sheet pile driving method using Larsen piles to limit impacts on the water quality. - If possible, green trees should be moved and replanted in other places if the trees are in the way of the pipelines to be constructed. - The contractor shall remove topsoil from all areas where topsoil will be impacted by construction activities, including temporary activities such as storage and stockpiling, etc; the stripped topsoil shall be stockpiled in areas agreed to by the Construction Supervision Consultant for later use in re-vegetation and shall be adequately protected. - Trees cannot be cut down unless explicitly authorized in the vegetation clearing plan. - When needed, temporary protective fencing will be erected to efficiently protect the preserved trees before commencement of any works within the site. - No area of potential importance as an ecological resource should be disturbed unless there is prior authorization from CSC, who should consult with PMU, IEMC and the relevant local authorities. This could include areas of breeding or feeding for birds or animals, fish spawning areas, or any area that is protected as a green space. - The Contractor shall ensure that no hunting, trapping, shooting, poisoning of	- Law on environmental protection No. 55/2014/QH13	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	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. - Materials and waste around the construction site must be regularly collected and construction sites are to be neatly tidied up.	- Law on environmental protection No. 55/2014/QH13 - TCVN 4447:1987: Construction regulation - Circular No. 22/2010/TT-BXD on requirements on safety	Contractor	PMU, CSC, IEMC
8) Sedimentation,erosion, flooding, subsidence and slides	- Avoid disturbances and damage to the existing vegetation and green trees. - Periodically and thoroughly remove soils, stones and wastes from drainage sewers and ditches inside and around the construction site. - Neatly gather materials and wastes so as to limit them being swept away 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

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
9) Traffic management	- Before construction, carry out consultations with local government and community and with traffic police. - Arrange and provide separate passageway with safe and easy access for pedestrian and for people with disability and mobility issues especially the areas in proximity of schools, including easy wheel chair access and hand rail. Make staff available any time for helping people with disability if needed. - 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. - 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	- 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
	areas should be segregated and provide for easy, safe, and appropriate access. Signposts shall be installed appropriately in both water-ways and roads where necessary.			
10) Influence to existing infrastructure and services	- Provide information to affected households on working schedules as well as planned disruptions (at least 2 days in advance). - The Contractor must only use vehicles of sizes and loads within permissible limits for the roads along such vehicles' route. - During the construction under power lines, deploy qualified staff to observe and give instructions to the drivers of cranes and excavators so as to avoid causing damages to power lines, telecommunications lines, etc. - Stop construction when existing works are damaged. Identify causes of related incidents and work out solutions. In case the damages are due to the Contractors' faults, the Contractors have to repair, recover, and compensate for all damages at their own expenses. The results of handling such damages must be approved by the Supervisor Engineer. - Reinstall the road surface and sidewalks at construction sites after the construction of sewer lines has been completed. - The contractor should ensure alternative water supply to affected residents in the event of disruptions lasting more than one day. - Any damages to existing cable utility systems shall be reported to the authorities and repaired as soon as possible.	- Decree No. 73/2010/ND-CP on administrative penalization of violations related to security and social affairs	Contractor	PMU, CSC, IEMC
11) Social mitigation measures through worker management	- Inform the community at least 2 weeks before commencement of the construction. In case electricity and water supplies are to be disrupted, the PMU must inform PAHs of the same at least 2 days in advance. - Employ local laborers for simple tasks. Instruct workers on environmental issues, safety and health before construction tasks are assigned. It is advisable to communicate to migrant workers on local customs, practices and habits in order to avoid conflicts with local people. - The subproject owner and contractor are to cooperate closely with the local government in performing effective community sanitation in case of epidemic symptoms breaking out in the area.	- 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
	- The subproject owner and contractor are to cooperate with local authorities in preventing and fighting against social evils. Conduct sensitization campaigns with both workers and communities on these issues, liaison with local organizations to ensure monitoring, and a grievance redress system to which the community can refer to. - The subproject will cooperate with the local health agency in developing and implementing plans for control of diseases among workers. - Workers temporarily residing at the camps and rented houses must be registered with the local authorities for temporary residence. - Train workers on issues related to social security, social evils, diseases and epidemics, prostitution and drug use, environment, safety and health, HIV/AIDS and infectious diseases within 2 weeks prior to the commencement of packages with construction items lasting at least 6 months. - Prohibit workers from: - Consuming alcoholic drinks during working time - Quarreling and fighting - Gambling and indulging in social evils such as drug use and prostitution - Disposing of garbage indiscriminately			
12) Control of impacts on physical cultural resources	- 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;	- 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
	+ Strictly protect the area of the discovery so as not to damage or lose moveable objects. In case the unearthed objects are moveable or sensitive ruins, provide night protection until the local authorities, the Department of Culture, Sports and Tourism or the Institute of Archaeology takes over these unearthed objects; + Inform the Supervision Engineer of the event and who in turn will immediately inform the subproject owner, the local authorities in charge of the case and the Institute of Archaeology (within 24 hours or less); + Local relevant agencies and the Vietnam National Administration of Tourism will be responsible for protecting and preserving such archaeological relics before making decisions on the next suitable formalities. The Institute of Archaeology may be needed in the preliminarily assessment of the unearthed objects. The significance and importance of such discovered objects will be assessed by different criteria related to the nature of cultural heritages; such criteria would include aesthetic, historical, scientific, social or economic values; + Decisions on handling such discovered objects will be made by competent levels. Such decisions can result in changes in site arrangements (e.g. when the discovered item is a cultural relic which cannot be displaced or is archaeologically important, it is necessary to preserve, recover and excavate it); + The implementation of such decision by competent agencies related to the management of discovered objects will be communicated in writing by local competent agencies; and + Only resume construction activities at the site after being permitted by the local competent agencies and the PMU in relation to safeguarding such relics			

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
13) Community's safety and health	- The Contractor will have to conform to regulations in Circular No. 22/2010/TT-BXD by the Ministry of Construction on safety in construction. - The subproject owner and contractor are to cooperate closely with the local government in performing effective community sanitation in case of epidemic symptoms breaking out in the area. - The subproject owner and contractor are to cooperate with local authorities in preventing and fighting against social evils. - Fence of excavation pits and open channels and make off with luminous cordon and warning signs. Provide sufficient lighting when carry out construction at night. - Limit the speed of transport means to 20km/h within 200m from the construction site so as to minimize dust and noise. - Keep noise-generating machines and vehicles at such suitable distances that noise transmitted to residential areas will not be higher than 70dBA. - Use static compacting when the road base is constructed near areas with many households and weak temporary works to restrict vibration. - The subproject will cooperate with the local health agency in developing and implementing plans for control of diseases among workers.	- Circular No. 22/2010/TT-BXD regulation on construction safety - Directive No. 02/2008/CT-BXD on safety and sanitation issues in construction units - TCVN 5308-91: Technical regulation on construction safety - Decision No. 96/2008/QD-TTg on clearance of UXOs	Contractor	PMU, CSC, IEMC
14) Workers' health safety	- Train workers on issues related to environment, safety and health, thus enhancing their awareness of HIV/AIDS and infectious diseases within 2 weeks prior to the commencement of packages with construction items lasting at least 6 months. - Provide workers with and request them to use adequate safety gear such as masks, helmets, shoes/boots, goggles, etc. depending on job characteristics. - Safely install power lines at offices and in construction sites and do not lay connectors on the ground or water surface. Electric wires must be with plugs. Place outdoor electric panels in protection cabinets. - 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	- 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.	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	To be supervised by
	construction sites. - Safely store fuels and chemicals in areas with impermeable ground with roofs and surrounding banks, equipped with safety warning signs located at least 20m from the camps and at the end of prevailing winds. - In case of chemical and fuel leakage, the following steps will have to be taken: - Immediate check must be carried out to detect any possible case of injury. In case of injury, first-aid must be given and the injured person must be rushed to the nearest medical station for healthcare, and at the same time the case must be informed to the Supervision Engineer and the PMU; - Carry assessment to determine the kind of leaking/overflowing fuel/chemical; - Do not flush overflowing chemicals into drainage systems. Send staff with suitable safety gear to the site to handle the leakage by scattering sawdust (in case of small volumes of leaks/overflow) or sand (for high volumes of leaks/overflow). Use shovels to remove the surface soil layer if the leakage/overflow takes place on vacant land; and - Subsequent to the occurrence of such incident or accident, the Contractor will have to prepare a detailed report describing the incident and performed activities and submit the same to the Supervision Engineer and the PMU for consideration and filing. Such report will also be presented to the Department of Natural Resources and Environment or functional agencies at their request.. - Set up the camps with sufficient supplies of clean water, power, and sanitation facilities. There must be at least one toilet compartment for every 25 workers, with separate toilets for males and females. Workers' beds must be provided with mosquito nets so as to prevent dengue fever. Temporary tents will be unacceptable. - 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.	96/2008/QD-TTg on clearance of UXOs.		

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. - PMU's Environment Officer should conduct due diligence to make sure that borrow pits and quarries are legally operating by undertaking a rapid review of quarry sites to assess if operations are in compliance with Vietnamese laws and Bank requirements prior to construction. - Include the requirement that the contractors shall be required to buy materials from licensed borrow pit and quarry operators into the civil work contractual documents.		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. - Subproject information will be disseminated to affected parties (e.g. local authorities, enterprises and affected households, etc.) through community	- 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
	meetings before construction commencement. - A contact address will be provided to the community. - The community will be provided with all information, especially technical findings, in a language that is understandable to the general public and in a form convenient to interested citizens and elected officials through the preparation of fact sheets and news releases, when major findings become available during subproject phase. - Community concerns and requested information are to be monitored as the subproject 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 subproject, as well as contact information about the site managers, environmental staff, health and safety staff, telephone numbers and other contact information so that affected people could have a channel to voice their concerns and suggestions.			

6.2 SITE-SPECIFIC IMPACTS AND MITIGATION MEASURES

Table 63.Specific Mitigation Measures for the Specific Types of Works

No	Sensitive receptors and their relation to subproject activity	Site-specific impacts	Specific mitigation measures	Responsibility	To be supervised by
	Component 1				
1	**Upgrading infrastructure for the residential area in the North Quang Trung ward**				
1	 Relocation of 10 Graves	Construction of the short 254m road under this component will requires relocation of 10 graves of the three households in Quang Trung ward. The level of the impact caused by this activity is only small	- There are 10 household graves which will need to be relocated for construction of Road in Infrastructure for the residential area in the North Quang Trung ward under Component 1 of the subproject. - Compensation for the removal of these graves is included in the RP of the subproject and will include the cost for buying of land for re-burial, excavation, relocation, reburial and other related costs which are necessary to satisfy customary religious requirements. Compensation in cash will be paid to each affected family or to the affected group as a whole as is determined through a process of consultation with the affected community. The level of compensation will be decided in consultation with the affected families/communities. All costs of excavation, relocation and reburial (5,765,000 VND/grave) will be reimbursed in cash. Graves to be exhumed and relocated in culturally sensitive and appropriate ways. - During implementation the Subproject Owner will make early announce to the households whose	- PMU	- PMU, CSC, IEMC

No	Sensitive receptors and their relation to subproject activity	Site-specific impacts	Specific mitigation measures	Responsibility	To be supervised by
			graves are affected so that they can arrange their embodiment in consistence with the spiritual practices of the people and compensate to the affected household as required in the subproject RP and ESMP.		
	 The railway traffic	One segment of the combined sewers will go under the railway. Main impacts include: - Potentially high risk of damages to the trains causing human casualties (both for the railway passengers and workers). - Safety risks for the workers. - Possible temporary interruption of the train schedules. - The impact level is assessed to be medium	- Inform the railway management company of the construction activities and their potential impacts such the risks of interference with the railway train schedule and railway traffic safety, and the detail construction work schedule at least 02 months before construction starts. - Set up construction and traffic warning signs at the construction site. - Set up barriers around the construction area to separate working area with the railway (fence 2.5 m tall). - Construct the sewer under passing the railway using safe tunneling method. - Deploy a qualified technical staff to supervise construction activities near the railway. - Only execute construction activities when there is no train schedule. - Prohibit scattering of construction material and wastes near and on the railway. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes, and during transporting materials crossing the railway. - Immediately collect any domestic wastes and	- Contractor	- PMU, CSC, IEMC

No	Sensitive receptors and their relation to subproject activity	Site-specific impacts	Specific mitigation measures	Responsibility	To be supervised by
			construction spoils around and near the railway and dispose in a designated site.		
2	**Upgrading Tran Quoc Toan primary school, Hai Ba Trung ward**  Tran Quoc Toan secondary school	The health of the school children may be affected by - increased dust, exhaust gases, construction wastes, hazardous waste, domestic wastes, and wastewater due to construction activities; - Increased traffic flow and risks of traffic accidents might happen for the school children due to construction and transportation; - iii) School children learning hours would be interferenced due to noise and vibration from the construction. - Temporary lack of classroom during construction. - The impact is assessed as medium	- Inform the school management of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 02 months 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. - Sprey 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 addess any issue/problem caused by the construction activities and raised by the	- Contractor	- PMU, CSC, IEMC
	 Phu Van primary school, 50 m from the costruction of Phu Van kindergarten			- Contractor	- PMU, CSC, IEMC

No	Sensitive receptors and their relation to subproject activity	Site-specific impacts	Specific mitigation measures	Responsibility	To be supervised by
			schools. *Continuity of lessons for Tran Quoc Toan primary school* During consultation the following locations have been suggested for delivery of school classes during construction: - Broadcast & Television College No. 1: Because (1) it has campus and all necessary equipment to meet the school's teaching/learning requirements; (2) It is not very far from Tran Quoc Toan Primary School (about 400m, on Quynh Luu Road). This will help minimize impacts due to change of teaching/learning location for the school's teachers and students		
	 Irrigation canal near construction of Phu Van kindergarten area	- Construction of the Phu Van kindergarten will affect an irrigation canal in this area. - The execution work of the new kindergarten may block the canal, spread soil to the irrigation canal and the vegetatable fields causing sedimentation in the canal and arable agricultural land. - This impact is assessed as moderate and temporary	- Informing the community of the construction schedule at least one week before the construction. - Arrange drainage around the construction sites to ensure no soil erosion and sedimentation to the rice fields and irrigation canals. - Provide alternative water diversion from canals to the locations the local people requested, if they are affected. - Regularly check the affected on-field irrigation canals to ensure they are not blocked by construction spoils and wastes. - Immediately rehabilitate irrigation canals if they are damaged by construction activities to ensure	- Contractor	- PMU, CSC, IEMC

No	Sensitive receptors and their relation to subproject activity	Site-specific impacts	Specific mitigation measures	Responsibility	To be supervised by
	 Agriculture activities at Phu Van kindergarten area	- The construction activities may cause disruption of the local agricultural cultivating and havesting activities, damages to the vegetable crops. - This impacts is considered small	that water supply for the rice fields inside ring dike is maintained. - Closely consult with the local community to ensure that suitable sollutions to problems are taken and communities concerns related to construction activities are addressed.	- Contractor	- PMU, CSC, IEMC
	Component 2				
	 Temple of 10 girls, 50 m from the construction of Lam Ha 1 Lake.	- Rehabilitation of the lake including dredging the transportation of the dredged sediments would have the potential to have adverse impacts on the temple due to: - Hindrance to access to the Temple; - Increase in dust and exhaust gases, affecting visitors to the church; - Increased construction wastes, waste water; - Risks of traffic accidents and community safety due to construction; and - Localized flooding becasue of construction	- Inform the temple of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 02 months before start of the construction. - Prohibit gathering of construction materials within 100m in front of the temple. - Pile driving activities will not be carried out before 7 am or after 6 pm, or at days and hours advised by the local management. - Environmental training for the workers includes codes of conducts when working in pubic areas and sensitive receptors such as temple. - Sprey sufficient water to suppress dust during dry and windy days at least three times a day at the area of the temple. - Clean the construction area after each working. - Sett up construction and traffic warning signs at the construction site.	- Contractor	- PMU, CSC, IEMC

No	Sensitive receptors and their relation to subproject activity	Site-specific impacts	Specific mitigation measures	Responsibility	To be supervised by
		during rainny days; - Conflicts between workers and visitors to the Temple	- Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes. - Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session. - Cover the incomplete trenches under construction at end of the working day. - Provide night lighting system with luminously painted fence and night lamp. - Avoid construction activities during religious events every first and 15th days of the lunar month and during festival days if possible. - Immediately addess any issue/problem caused by the construction activities and raised by the temple.		
	 Me Noi Temple. - Near the Chau Giang embankment. 10 m from construction site.	- Hindrance to access to the temple; - Increase in dust, exhaust gases, and noise affecting religious practices and visitors to the Temple; - Increased construction wastes, waste water; - Risks of traffic accidents and safety due to construction; and - Localized flooding becasue of construction during rainny days; - Conflicts between workers and visitors to the Temple		- Contractor	- PMU, CSC, IEMC
	Households raising fish in the Lam Ha 1 Lake	- Affect livelihood of the household. - Annual income from fish farming around 9 million VND	- Inform the households of the construction activities and construction schedule at least 03 months before start of the construction so that the household can plan well ahead for the havesting of the fish. - The project will provide adequate compensation at the market prices for the affected fish, and support and allowances for occupational transition, employment for aquaculture farming households	- PMU	- PMU, CSC, IEMC

No	Sensitive receptors and their relation to subproject activity	Site-specific impacts	Specific mitigation measures	Responsibility	To be supervised by
	 Phu Ly Church located on Bien Hoa road.	- Hindrance to access to the church - Increase in dust and exhaust gases, affecting visitors to the church - Increased construction wastes, waste water - Temporary degradation of the landscape - Risks of traffic accidents and community safety due to construction - Localized flooding becasue of construction during rainny days - Conflicts between workers and visitors to the church	- Inform the church of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 02 months before start of the construction. - Prohibit gathering of construction materials within 100m in front of the church. - Pile driving activities will not be carried out before 7 am or after 6 pm, or at days and hours advised by the monks. - Environmental training for the workers includes codes of conducts when working in pubic areas and sensitive receptors such as churches. - Sprey sufficient water to suppress dust during dry and windy days at least three times a day at the area of the church. - Clean the construction area after each working. - Sett up construction and traffic warning signs at the construction site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes. - Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session. - Cover the incomplete trenches under construction at end of the working day. - Provide night lighting system with luminously painted fence and night lamp. - Avoid construction activities during religious	- Contractor	- PMU, CSC, IEMC

No	Sensitive receptors and their relation to subproject activity	Site-specific impacts	Specific mitigation measures	Responsibility	To be supervised by
			events every first and 15th days of the lunar month and during festival days if possible. - Immediately addess any issue/problem caused by the construction activities and raised by the church.		
	 Street small business householders on Bien Hoa road	- Inconveniences to locals' business activities as access to business establishments may be obstructed - Affecting drainage capability in the area - Dust, waste, damaged landscape; iv) Risks of landslides and subsidence damages to existing works along road sides from deep excavation for the construction of pipe trench - Safety risks to vehicles and community, especially at night when excavation is performed to depths of 1.7 -2.5 m	Mitigation measures for access to street household businesses: - Inform the street household businesses of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 02 months before start of the construction. - Set up construction and traffic warning signs at the construction site. - Provide safe and easy acces to the household businesses putting clean and strong thick wood panels or steel plates over the open ditches. - Do not gather materials and wastes within 20m from household businesses and shops. - Do not use machines generating loud noise and high vibration levels near the businesses. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Deploy staff to guide the traffic during construction during transportation, loading and unloading of construction materials and wastes, and to guard high risk operations. - Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session.	- Contractor	- PMU, CSC, IEMC

No	Sensitive receptors and their relation to subproject activity	Site-specific impacts	Specific mitigation measures	Responsibility	To be supervised by
			- 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.		
	Component 3				
	 Ha Nam Provincial Eye Hospital *100 m distant to Tran Hung Dao*	- During the construction, the access of the construction machines and transportation vehicles to the Ha Nam Eye Hospital, which is being constructed, will be temporarily impacted - If traffic is not properly managed accidents may happen due to the elevated flow of vehicles and people in this area.	- Inform the hospital of the construction activities and their potential impacts such, waste, dust, and noise, traffic, and construction schedule at least 02 months before start of the construction. - Construction area to be fenced and marked with warning signs to prevent unauthorized people from entering. - Spray sufficient water to suppress dust during dry and windy days at least three times a day at site. - Set up construction and traffic warning signs at the construction 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. - Immediately address any issue/problem caused by	- Contractor	- PMU, CSC, IEMC

No	Sensitive receptors and their relation to subproject activity	Site-specific impacts	Specific mitigation measures	Responsibility	To be supervised by
			the construction activities and raised by the hospital. - Arrange traffic guide for the vehicles go in/go out the hospital.		
	 Vuc Kieu Lake. *On Tran Hung Dao road.* 2 m from construction site	- The construction process will involve the earth work which would generate a moderate amount of dust, stock pile of construction materials. - If the materials and excavated soils are not properly stored and placed near the lake, they will be run off into the lake, especially during the rainy season, causing excessive sedimentation in the lake affecting the water quality. - This impact would be moderate, temporary, and occur during construction period and can be mitigated by applying good construction and management practice.	- Arrange drainage around the construction sites to ensure no soil erosion and sedimentation to the lake. - Prohibit stroring construction spoils and wastes within 200m from the lake. - Prohibit illegal dumping of construction spoils and wastes to the lake. - Ensure successive supply of materials according to construction schedule, and tidy construction materials and stockpiles every working session. - Clean the construction area after each working.	- Contractor	- PMU, CSC, IEMC

No	Sensitive receptors and their relation to subproject activity	Site-specific impacts	Specific mitigation measures	Responsibility	To be supervised by
	 02 irrigation canals. *Across Tran Hung Dao road.* 0 m from construction site	- Construction may require temporary blockage of the canals or cause unwanted discharge of construction wastes into the canals seriously affecting their functionality and subsequent water supply to the crops. - This impact is temproraty and moderate. The technical design has confirmed that this aspect has been considered	- Informing the community of the construction schedule at least 02 months before the construction. - Arrange drainage around the construction sites to ensure no soil erosion and sedimentation to the rice fields and irrigation canals. - Provide alternative water diversion from canals to the locations the local people requested. - Regularly check the affected on-field irrigation canals to ensure they are not blocked by construction spoils and wastes. - Immediately rehabilitate irrigation canals if they are damaged by construction activities to ensure that water supply for the rice fields inside ring dike is maintained. - Closely consult with the local community to ensure that suitable sollutions to problems are taken and communities concerns related to construction activities are addressed.	- Contractor	- PMU, CSC, IEMC

<u>The details on the DMMP (Lam Ha 1 Lake and the southern embankment of Chau Giang river) and Disposal Site:</u>

The contractors are requested to prepare a specific dredging material management plan (DMMP) and submit the same to the Supervision Consultant for approval before starting the work. The dredging plan will indicate volumes, physical-chemical-biological properties of dredged material, dredging procedures, temporary gathering of dredged materials, control of polluting material during temporary gathering and transportation, pollution control, and risks at disposal sites. The detailed guidelines on DMMP are provided in Appendix 1.

6.3 SPECIFIC IMPACTS AND MITIGATION MEASURES DURING OPERATION

a) Stormwater drainage and wastewater collection systems

Operations of stormwater drainage and wastewater collection systems under subproject would have impacts on the areas: (i) by the operation of the pumping stations (noise, vibration); (ii) the probability of flooding due to congestion of drainage sewer section; (iii) affected by odors from sludge which is dredged periodically; (iv) impacts from disposal of dredged septage; (v) impacts on the aquatic environment due to temporary receiving wastewater discharged from untreated sewer section (this ends when wastewater treatment plants commence stable operations). Mitigation measures are as follows :

➢ *Minimize the pollution caused by the operation of the pumping stations:*

The pumping stations with the large capacity often cause vibration and noise at high levels. Pump sets would be placed in a separate room. The pumps would be installed with equipment to prevent vibration and noise. Specifically:

Technical measures when installing:

- Construct proper machine room for pump sets
- Foundation to put the machine would be built with high-quality concrete
- Install anti-vibration buffer made from rubber
- Install silencers equipment

Management and maintenance measures:

- The pumps would be examined the balance and adjusted if necessary.
- Periodic maintenance and lubrication to minimize noise.

Measures to minimize environmental pollution caused by fuel leakage during the operation of pumping stations:

- Do not store fuel at the pumping stations to minimize the possibility of fuel leakage to the receiving source.
- Feeding the fuel into the pumps would be done in careful manner to avoid fuel spillage.
- Lubricant, greasy rags from maintenance and operations of the pumps must be entirely collected and transported to appropriate treatment areas.

➢ *Minimize pollution due to congestion of drainage sewers:*

- The management of stormwater drainage and wastewater collection systems should be focused and examined regularly to detect the congested drainage sewer sections and carry out dredging.
- Conduct periodic planning decentralization and dredging sewer sections and manholes in order to minimize the flow congestion (every 6 months).

➢*Control disposal of sludge:*

- Similar to the construction phase, those who manage the water drainage systems would have contracts with relevant authorities of sludge dredging from the sewer sections and manholes and then transport to landfill by specialized tank trucks to avoid odor emission and spillage during transportation.

b) Toilets of schools

Control of odors:

- The area for the construction of school sanitation blocks must be appropriately distant from classrooms and located at the end of wind direction.
- Ventilation systems would be designed and installed.
- The toilets must be supplied with adequate water.
- Pupils/students should be reminded to flush after using toilets.
- Toilets would be regularly cleaned.

Control the amount of sludge, septic tanks:

- Dredge periodically.
- The dredged sludge would be transported to landfill by specialized tank trucks to avoid the odor emission and spillage during transportation.

Domestic wastewater:

Domestic wastewater would be treated preliminarily by 3-compartment septic tanks before being discharged into common sewers and then be directed to treatment stations

c) Traffic

Traffic safety measures on the routes:

- Warning, instruction and speed limit signs would be designed on the roads.
- Periodically check the quality of the bridge to avoid the risk of potential accidents
- Install barriers, separators, road markings, traffic signs according to the charter of road sign 22TCN 237-01 of Vietnam Road Administration.
- The lighting system in the sections crossing the bridge would be designed following the standards TCXDVN 259-2001 of the Ministry of Construction.

Minimize the impacts of traffic congestion:

- Streamline and redirect traffic, consult with the ward authorities and communities in advance
- Implement the necessary measures such as placing signals, signs... to ensure traffic order and safety

Responsibilities for the implementation

The operating unit has responsible for implementing environmental mitigation measures during operation of the subproject. Responsibilities for the implementation areshown in the table 69 below.

Table 64. Responsibilities for implementation of mitigation measures in operation phase

No	Items	Subproject owner	Representative of subproject owner	Operator
1	Pipelines	Phu Ly CPC	Phu Ly PMU	URENCO
2	Pumping stations			
3	Sewers			
4	Tran Quoc Toan primary school			Ha Nam Department Education and Training
5	Phu Van kindergarten			

No	Items	Subproject owner	Representative of subproject owner	Operator
6	Lam Ha 1 Lake			Ha Nam Agriculture and rural development
7	Chau Giang river embankment			

6.4 ROLE AND RESPONSIBILITIES FOR ESMP IMPLEMENTATION

6.4.1 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 (Table 70).

- Contractors will beresponsible for implementing mitigation measures. These measures will be included in bidding documents and their costs are to be included in construction bid packages;
- CSC will be responsible for monitoring the day-to-day implementation of mitigation measures. Related costsare included in the CSC service contract;
- IEMC will be responsible for overall environmental monitoring which includes support to the PMU in implementing environmentalsupervision and monitoring, and responsible for reporting on the implementation through monitoring reports.

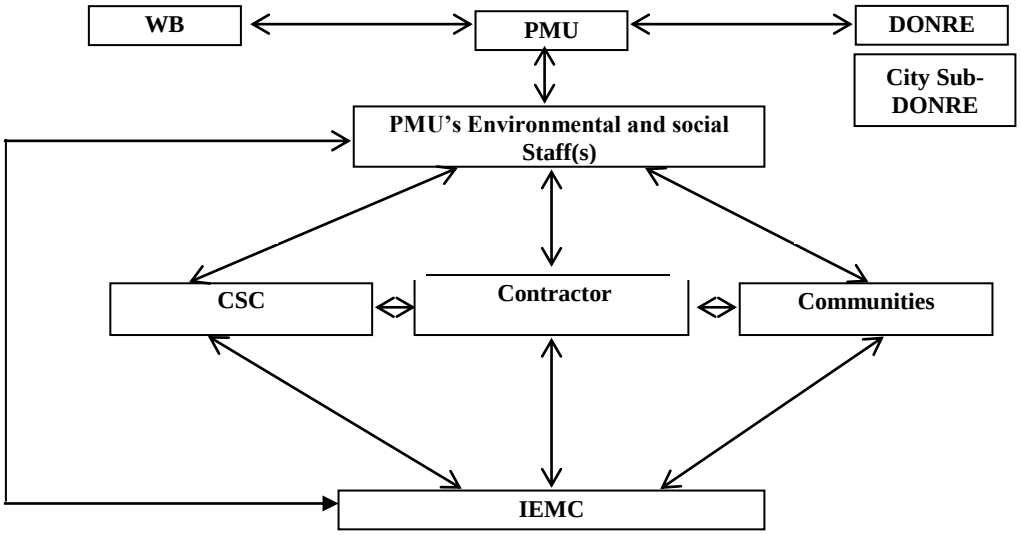


Figure 27. Organization chart for ESMP Implementation

Table 65.Roles and responsibilities of key parties

Community/ Agencies	Responsibilities
PMU	- PMU will be responsible for monitoring the overall subproject implementation, including environmental compliance of the subproject. PMU will have the final responsibility for ESMP implementation and environmental performance of the subproject during the construction and operational phases. - Specifically the PMU will: (i) closely coordinate with local authorities in the participation of the community during subproject preparation and implementation; (ii) monitor and supervise ESMP implementation including incorporation of ESMP into the detailed technical designs and bidding and contractual documents; (iii) ensure that an environmental management system is set up and functions properly; (iv) be in charge of reporting on ESMP implementation to the DONRE and the World Bank.

	- 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	- 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

Consultants (IEMC)	and monitor the CESMP implementation in both construction and operation phases. IEMC will also be responsible to support PMU to prepare monitoring reports on ESMP implementation. - 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.
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.

6.4.2 Environmental Compliance Framework

(i) Environmental Duties of the Contractor

The contractor firstly shall adhere to minimize the impact that may be result of the subproject construction activities and secondly, apply the mitigation measures under ESMP to prevent harm and nuisances on local communities and environment caused by the impacts in construction and operation phases.

Remedial actions that cannot be effectively carried out during construction should be carried out on completion of the works (and before issuance of the acceptance of completion of works)

The duties of the Contractor include but not limiting to:

- Compliance with relevant legislative requirements governing the environment, public health and safety;
- Work within the scope of contractual requirements and other tender conditions;
- Organize representatives of the construction team to participate in the joint site inspections undertaken by the Environmental Staff of the CSC;
- Carry out any corrective actions instructed by the Environmental Staff of the PMU and CSC;
- In case of non-compliances/discrepancies, carry out investigation and submit proposals on mitigation measures, and implement remedial measures to reduce environmental impact;
- Stop construction activities, which generate adverse impacts upon receiving instructions from the Environmental Staff of PMU and CSC. Propose and carry out corrective actions and implement alternative construction method, if required, in order to minimize the environmental impacts; Non-compliance by the Contractor will be cause for suspension of works and other penalties until the non-compliance has been resolved to the satisfaction of the ES of PMU and CSC.

(ii) Contractor's Safety, Social and Environmental Officer (SEO)

The contractor shall be required to appoint competent staff(s) as the Contractor's on-site safety, Social and environmental officer (SEO). The SEO must be appropriately trained in environmental management and must possess the skills necessary to transfer environmental management knowledge to all personnel involved in the contract. The SEO will be responsible for monitoring

the contractor‘s compliance with the ESMP requirements and the environmental specifications. The duties of the SEO shall include but not be limited to the following:

- Carry out environmental site inspections to assess and audit the contractors' site practice, equipment and work methodologies with respect to pollution control and adequacy of environmental mitigation measures implemented;
- Monitor compliance with environmental protection measures, pollution prevention and control measures and contractual requirements;
- Monitor the implementation of environmental mitigation measures;
- Prepare audit reports for the site environmental conditions;
- Investigate complaints and recommend any required corrective measures;
- Advise the contractor on environment improvement, awareness and proactive pollution prevention measures;
- Recommend suitable mitigation measures to the contractor in the case of non-compliance. Carry out additional monitoring of noncompliance instructed by the ES of PMU and CSC
- Inform the contractor and ES (of PMU and CSC) of environmental issues, submit contractor’s ESMP Implementation Plan to the ES of PMU and CSC, and relevant authorities, if required;
- Keep detailed records of all site activities that may relate to the environment.

(iii) Independent Environmental Monitoring Consultant (IEMC)

In order to minimize the environmental impacts during construction phase of the Subproject, the Subproject owner shall ensure that environmental quality monitoring requirements are established for the subproject. An IEMC appointed by PMU shall carry out the monitoring.

- IEMC will be responsible for carrying out environmental sampling, monitoring and marking report during all phases of the subproject. Environmental quality monitoring will be report periodically to PMU and World Bank (respectively every 03 months for PMU and every 6 months for WB in construction phase).
- IEMC will also supply specialized assistance to PMU and ES in environmental matters.

(iv) Environmental and Social Supervision during Construction (CSC)

During construction phase, a qualified CSC reporting to the PMU shall carry out the environmental supervision. The CSC will assign environmental and social staff(s), will be responsible for inspecting, and supervising all construction activities to ensure that mitigation measures adopted in the ESMP are properly implemented, and that the negative environmental impacts of the subproject are minimized. The CSC shall engage sufficient number of Environmental Supervision Engineers with adequate knowledge on environmental protection and construction subproject management to perform the required duties and to supervise the Contractor’s performance. Specifically ES of CSC will:

- Review and assess on behalf of the PMU whether the construction design meets the requirements of the mitigation and management measures of the ESMP,
- Supervise site environmental management system of contractors including their performance, experience and handling of site environmental issues, and provide corrective instructions;
- Review the ESMP implementation by the contractors, verify and confirm environmental supervision procedures, parameters, monitoring locations, equipment and results;

- Report ESMP implementation status to PMU and prepare the environmental supervision statement during the construction phase; and

(v) Compliance with Legal and Contractual Requirements

The constructions activities shall comply not only with contractual environmental protection and pollution control requirements but also with environmental protection and pollution control laws of the Socialist Republic of Viet Nam.

All the works method statements submitted by the Contractor to the CSC and PMU for approval to see whether sufficient environmental protection and pollution control measures have been included.

The CSC and PMU shall also review the progress and program of the works to check that relevant environmental laws have not been violated, and that any potential for violating the laws can be prevented.

The Contractor shall copy relevant documents to the SEO and the ES of CSC and PMU. The document shall at least include the updated work progress report, the updated work measure, and the application letters for different license/permits under the environmental protection laws, and all the valid license/permit. The SEO and the ES shall also have access, upon request, to the Site Log-Book.

After reviewing the documents, the SEO or the ES shall advise the PMU and the contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the SEO or the ES concludes that the status on license/permit application and any environmental protection and pollution control preparation works may not comply with the work measure or may result in potential violation of environmental protection and pollution control requirements, they shall advise the Contractor and the PMU accordingly.

(vi) Environmental Claims and Penalty System

In the compliance framework, if non-compliance with environmental regulations are discovered by CSC/ES/IEMC/PMU during the site supervision, 2% values of interim payment of the contractor of this month will be held back. The Contractor will be given a grace period (determined by CSC/PMU) to repair the violation. If the Contractor performs the repairs within the grace period (confirmed by CSC/PMU), no penalty is incurred and keeping money will be pay. However, if the Contractor fails to successfully make the necessary repairs within the grace period, the Contractor will pay the cost for a third party to repair the damages (deduction from keeping money).

In case of IEMC/CSC/PMU not detected of non-compliance with environmental regulations of the contractor, they will be responsibility payment to repair the violation.

(vii) Reporting Arrangements

ESMP monitoring and reporting requirements are summarized in Table 71 below.

Table 66.Regular Reporting Requirements

No.	Report Prepared by	Submitted to	Frequency of Reporting
1	Contractor to the Employer	PMU	Once before construction commences and monthly thereafter
2	Construction Supervision consultant (CSC)	PMU	Weekly and monthly
4	Community Monitoring	PMU	When the community has any complaint

			about the subproject safeguards implementation
5	PMU	DONRE	Every three-month
6	PMU	WB	Every six-month

6.5 ENVIRONMENTAL MONITORING PROGRAM

6.5.1 Monitoring Location, Parameters and Frequency

Environmental monitoring program is carried out in 3 stages of the subproject: before construction phase; construction phase; operational phase (Tables 72 and 73):

Preparation stage and construction:

Table 67.Location, parameters and frequency of monitoring

No.	Contents	Pre-construction phase	Construction phase	Standard
I	Noise monitoring			
	1. Monitoring parameters	Leq, L50, Lmax	Leq, L50, Lmax	QCVN 26/2010/BTNMT
	2. Monitoring frequency	1 location/day, Measuring 3 times/hour	Measuring 3 months/1 time 1 location/day, measuring 3 times/hour	
	3. Monitoring location	Locations of baseline environment must be established by the construction site at the monitoring time		
II	Monitoring ambient air quality and on the construction site			
	1. Monitoring parameters	TSP, CO, NO_2, SO_2, HC	TSP, CO, NO_2, SO_2, HC	QCVN 05 :2009/BTNMT, QCVN 06:2009/BTNMT
	2. Frequency	1 location/day	Measuring 3 months/time	
	3. Location	Locations of baseline environment must be established by the construction site at the monitoring time		
III	Monitoring quality of surfacewater and groundwater			
	1. Monitoring parameters	pH, temperature, DO, TSS, turbidity, T-N, T-P, BOD5, COD, grease and oil, Coliform	pH, temperature, DO, TSS, BOD5, COD, DO, grease, oil, Coliform	QCVN 08:2008/BTNMT; QCVN 14:2008/BTNMT; QCVN 40:2011/BTNMT
	2. Frequency	1 location/day	06 months/time	
	3. Location	Locations of baseline environment must be established by the construction site at the monitoring time		
VI	Dredged sludge: as required by dredged material management plan			
	1. Parameters	Cu, Pb, Zn, Cd, As	Cu, Pb, Zn, Cd, As	QCVN 03:2008/BTNMT
	2. Frequency	If necessary	If necessary	
	3. Location	From Lam Ha 1 lake and Chau Giang river southern embankment		

Table 68.The total number of monitoring samples

Item	Quang Trung	Lam Ha	Tran Quoc Toan school	Phu Van kinder gaten	Lam Ha 1 lake	Bien Hoa road	Chau Giang river southern embankment	Tran Hung Dao road	Total
Construction duration	16	16	16	16	16	16	20	18	
Number of surfacewater/watewater monitoring locations	1	2	0	1	2	1	2	2	
Number of sludge monitoring locations	0	0	0	0	2	0	2	0	
Number of air monitoring locations	1	2	1	1	1	1	1	2	
Number of air monitoring times	5	5	5	5	5	5	6	6	
Number of surfacewater/wastewater times	3	3	0	3	3	3	3	3	
Number of surfacewater/wastewater samples	3	3	0	3	3	3	4	3	22
Number of sludge samples	0	0	0	0	2	0	2	0	4
Number of air samples	5	5	5	5	5	5	6	6	42

6.5.2 The Estimated Funding for Environmental Monitoring Program

Table 69.The budget of monitoring

No.	Sample	Unit price (VND)	Quantity	Total (VND)	Total (USD)
I	**Air sample**				
1	TSP	75,708	42	3,179,736	143
2	CO	447,223	42	18,783,366	846
3	NO_2	430,848	42	18,095,616	815
4	SO_2	503,446	42	21,144,732	952
5	HC	1,223,239	42	51,376,038	2,313

No.	Sample	Unit price (VND)	Quantity	Total (VND)	Total (USD)
6	Noise	62,125	42	2,609,250	117
II	**Surface water/wastewater**				
1	temperature	84,630	22	1,861,860	84
2	pH	101,041	22	2,222,902	100
3	DO	115,240	22	2,535,280	114
4	TSS	192,275	22	4,230,050	190
5	BOD5	297,782	22	6,551,204	295
6	COD	334,547	22	7,360,034	331
7	Grease/Oil	1,419,905	22	31,237,910	1,406
8	Coliform	1,352,767	22	29,760,874	1,340
III	**Sludge sample**				
1	Cu	382,480	4	1,529,920	69
2	Pb	375,174	4	1,500,696	68
3	Cd	380,342	4	1,521,368	68
4	Hg	379,197	4	1,516,788	68
5	Zn	380,474	4	1,521,896	69
Total				208,539,520	9,388

6.6 CAPACITY BUILDING PROGRAM

Evaluation of PMU's existing capabilities

Subproject implementation experience:

From the actual implementation of the previous WB-funded projects (the MCDP) and other ODA projects on water and environment, Phu Ly PMU has accumulated safeguard experiences. The Phu Ly MCDP subproject PMU has been established base on the PMU of MCDP subproject which had an Environmental Project Management Team (equivalent to department level) for management of Phu Ly subproject under MCDP. Thus, MCDP's PMU shall basically be capable and implementation of project management including the safeguards aspects of the subproject.

As for staffing capacity:

As mentioned above, the current staffing of the PMU is inherited from the PMU of Phu Ly City and added with highly experienced personnel working for ODA projects, so they have much good experience for the implementation of this subproject.

With quite even distribution of qualifications and professions on all fields of construction expertise (Civil, Traffic, Irrigation, Infrastructure) and Economy - Finance as above among the current staffing of the PMU, it can be confirmed that the PMU fulfill the criteria to perform the role of the Client and manage projects in the field of civil construction, transportation, irrigation, urban infrastructure for Grade I works and Group A projects. However, it is required to add internal control staff/division of the PMU according to the new regulations of Vietnam in the coming time. Besides, it is seemingly required to strengthen experts on project management and contract management as well as technical and supervision personnel for the project.

The PMU well carried out the contract management and procurement management in the MCDP subproject. Some gained knowledge and experience about regulations of WB and Vietnam were/will be supplemented or replaced, the staff of PMU is also required to update during the subproject implementation and management period.

According to the assessment results of the MCDP, for consistency, some staffing positions contract management and electromechanical technical management, automation required senior personnel and independent experts with good understanding of contract/equipment/goods management to support current professional staff of the PMU to better meet the requirements of the World Bank, progress and investment quality of the Subproject

As for equipment:
PMU shall need to be supplied, equipped with new softwares for financial and accounting management, analysis and data compilation adequate to Vietnam Accounting Codes as well as of the WB, aiming to establish an adequate and optimum accounting system for financial-accounting tasks.

The table 75 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 subproject 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 subproject 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 Subproject. Three-day training for CSC and contractors is also planned to take place twice a year for at least 2 years.

Table 70.Advanced training program on environmental monitoring management capacity

I. Subjects	**SUBPROJECT MANAGEMENT**
Training	Environmentalmonitoring and reporting
Participants	Staff in charge of environmental issues and environmental management staff
Frequency of training	Immediately after the effective subproject, but at least one month before the first bid package. . The next training will be planned according to the needs.
Time	Four days of training
Content	General environmental management related subprojects including the World Bank's request, the Department of Natural Resources and Environment, in collaboration with stakeholders and responsible authorities concerned Environmental monitoring for the subproject include: - The requirements of environmental monitoring; - Monitoring and implementation of mitigation measures; - The involvement of the community in environmental assessment. - Guidance and monitoring contractors, CSC and community representatives in the implementation of environmental monitoring - The form used in environmental monitoring processes; - Reaction and risk control; - How to receive and submit Form. - Other issues will be decided

Responsibility	Independent environmental monitoring consulting (IEMC), PMU, with the help of technical assistance teams implement safety policies
II. Subjects	**CSC, CONTRACTORS, WARD / COMMUNES, COMMUNITY REPRESENTATIVES**
Training	Implementation of mitigation measures
Participants	CSC; The construction managers, environment officer of the contractor; ward / communerepresentatives; representatives of urban groups
Frequency of training	Shortly after the award of contract for the contractor, updated on demand
Time	3 days of training for CSC and contractors and two days of training for others
Content	- Summary overview of the monitoring of the environment; - The requirements of environmental monitoring; - The role and responsibility of the contractor and of CSC; - The content and methods of environmental monitoring; - Reaction and risk control; - Introduce the monitoring form and instructions on how to fill out a form of environmental monitoring and incident reporting; - Other issues will be determined o - Prepare and submit a report.
Responsibility	PMU, independent environmental monitoring consulting (IEMC) with the help of technical assistance teams implement safety policies
III. Subjects	**COMMUNITY / WORKERS**
Training	Safety andhygienic environmental
Participants	Representatives of workers (team leaders) working directly for the subproject components
Frequency of training	Accordingly
Time	1 daypresentation and 1 day presented at the scene
Content	- Presentation of the preliminary safety issues and environmental overview - Key issues require the attention of the public and construction workers to mitigate the safety risks (roads, waterways, equipment, machinery, etc.) as well as reduce pollution (dust, exhaust, oil spills, waste management, etc.) - Management of safety andhygienic environmental on site and camps - Mitigation measures applied on site and camp - Safety measures for electrical, mechanical, transportation, air pollution - Methods for dealing with emergency situations - Other issues will be determined - 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 independent environmental monitoring consulting(IEMC)

6.7 TOTAL ESTIMATES

The following table provides a cost estimate for the implementation of environmental management plan (ESMP). The cost of ESMP[8] 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,

[8]Excluding costs for RP implementation and independent monitoring the performance of RP/EMP

(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 subproject management budget of the PMU, including safety training programs, and basic allowances to participants in the monitoring programs. After the subproject 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 tables 75 and 76 provides the estimated costs for environmental quality monitoring and IEMC (in accordance with national practices) for reference purposes. However, final costs will be updated in the detailed design phase

Table 71.Estimated cost of EMP implementation (US $ million)

	Cost (millions of $US)	**Source of funds**
(a) Mitigation measures during construction	Part of contracts	WB
(b) Supervision of safeguards during construction	Part of CSC costs in Comp. 4	WB
(c) Environmental Safeguards unit (ESU) of PMU	Part of PMU costs	Counterpart
(d) Independent Environmental Monitoring Consultant (IEMC)	0.0136	WB

Table 72.Estimated costs of IEMC (Exchange rate: 1 USD = 22,214VND)

No.	**Content**	**Unit**	**Quantity**	**Unit price (VND)**	**Total (VND)**	**Total (USD)**
1	Specialist salary	Month_ person	12	35,000,000	420,000,000	18,907
2	Local stays and allowance	Day_person	120	500,000	60,000,000	2,701
3	Travelling expenses	Turn_ person	20	450,000	9,000,000	405
4	Office supply	Monitoring period	12	10,000,000	120,000,000	5,402
5	Office and communication	Monitoring period	12	19,500,000	234,000,000	10,534
6	Environmental quality monitoring				208,539,520	9,388

No.	Content	Unit	Quantity	Unit price (VND)	Total (VND)	Total (USD)
	Total				1,051,539,520	47,337

6.8 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 subproject 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*City/Provincial Court*. In case a complainant brings his/her case to a city/provincial court and the court rules in favor of the complainant, the city/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 CPC/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/city or provincial level.

To minimize the number of complaints at provincial level, the PMU will coordinate with the Municipal Compensation Committee to participate and provide consultation in solving complaints and respond to complainants. Municipal Compensation Committee located at Lam Ha resettlement area, Lam Ha ward, Phu Ly city. Its role and capacity is to carry out the compensation, support and arrange resettlement for affected households and displaced persons on Phu Ly area.

Personnel: The environment and resettlement staff chosen by the PMU will design and maintain a database of the subproject-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 subproject. 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 subproject 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 compl2ainant 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 environmental and monitoring consultants, who have enough the specialized capacity, would be selected by Ha Nam CIW 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 subproject may submit complaints to existing subproject-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 subproject-related concerns. Subproject 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.

Based on the assessment of the potential negative impacts discussed in Chapter 4 and the mitigation measures proposed in the chapter 4 of EIA report and the part 6, this chapter presents the Environmental and Social Management Plan (ESMP) for the subproject. The ESMP identifies actions to be carried out under the subproject including the environmental monitoring program and the implementation arrangements, taken into account the need to comply with the Government's EIA regulations and the World Bank (WB)'s safeguard policies, including those of the World Bank Group's Environmental, Health, and Safety Guidelines.

CHAPTER 7: PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

7.1 PUBLIC CONSULTATION PROCESS

Public consultation is used to help identify opportunities and risks, improved subproject design and implementation, and increase subproject ownership and sustainability. Public consultation is specifically required by the World Bank's environmental and social safeguard policies. A meaningful public consultation was used for the subproject. This is a two-way process in which beneficiaries provide advice and input on the design of the proposed subproject that affect their lives and environment, promotes dialogue between governments, communities, NGOs and implementing agencies to discuss all aspects of the proposed subproject. The feedbacks from consultation will be incorporated into the subproject ESIA and design.

Those affected by the subproject include those resettled and those in the nearby communities affected by subproject impacts, intended beneficiaries of the subproject, key interest groups – depends upon the subproject, local NGOs/Mass organizations, including women's unions, local authorities and other stakeholders.

Public consultation in preparation of the subproject ESIA also must comply with the requirements in the Government's Decree No. 18/2015/ND-CP dated 14 February 2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan, and Circular No. 27/2015/TT-BTNMT dated 29 May 2015 of the Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment and environmental protection plan.

The objectives of public consultation were as follows:

- To share all information on the items and tentative activities of the Subproject with local community and stakeholders;
- To gather opinions/comments and concerns from local authorities and the community on local particularities and environmentally sensitive matters in the subproject area, especially matters that the environmental assessment impact group has not been aware of. On such basis, the concerns of the local community may be proposed for proper settlement during the selection of subproject design options;
- To collect opinions/comments from the local community on the Subproject's tasks in the preparation of the ESIA as well as comments on the draft ESIA to adequately and precisely assess environmental impacts and propose the most effective and feasible mitigation measures for negative environmental impacts.

Information disclosure and public consultations are conducted during the subproject preparation and implementation processes to ensure that affected households and key stakeholders are timely informed about land acquisition, compensation and resettlement. This is also an opportunity for the affected people to participate and express their opinions with regards to resettlement implementation programs. The resettlement preparation in coordination with the representatives of the DPCs, Town PC and CPCs in the subproject area, and leaders of the villages organizes public meetings and consultations in order to inform and guide about the next steps in a timely manner. Organizations and individuals concerned about land acquisition and impacts and resettlement had and will take part of the public meetings and consultations. Representatives of mass organizations in the subproject that area attended the meetings and consultations included the Vietnam Women's Union, and Fatherland Front and Vietnam.

Key topics covered in the public consultations are as followings:

i. Disseminate key information related to policies of the World Bank, the Government and the subprojects.

ii. Provide locals with subproject on resettlement, environment, gender as well as ethnic minority issues through village loudspeaker system and subproject information brochures/leaflets;

iii. Collect opinions and feedback of the local communities regarding the subproject implementation;

iv. In the community consultation, needs to introduce and public all information of subproject and WB's safeguard policies, collect opinions and comments of the residents on design and resettlement options as well as their aspirations and expectations are recorded;

v. Respond questions to local communities concerning the subproject and safeguard policies;

vi. CPCs and PMU provided answers to questions to local residents related to subproject and local policies;

vii. Local communities, representatives of the CPC's and other stakeholders' contributions

7.2 PUBLIC CONSULTATION RESULTS

The first consultation with the local communities and authorities was conducted from 9-13 August 2016, the second consultation was conducted from 11 – 15 October 2016. About two weeks prior to public consultation, the consultant informed the local authority about the prpoposed additional investment and cooperated with the local authority to invite the affected people and representatives of the affected HHs to attend public consultation meeting. Public consultation was conducted through questionairs about the contents of draft ESIA. Public consultation meeting was held in the meeting room of CPCs and cultural house of clusters. The results of the two public consultation meetings are described in the following Table 77 and Table 78.

Table 73. The results of the first public consultation

No.	*Date and Location*	*Description*	*Participants*	*Public opinions*	*Feedback of PMU and Consultant*
1	August 9, 2016 Cultural house in Duong Am cluster	Rehabilitation and upgrading of infrastructure in Duong Am cluster, Lam Ha ward	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- The residents in the subproject area indicated their strong supports for the subproject. They expected that the subproject would be implemented early. - They proposed the upgrading of the four roads in the hamlet that are usually flooded. - They proposed to participate in monitoring to invoid water loss and to ensure construction quality. - Half of the residential area has no access to drainage system. They are therefore happy to know that the project will be implemented. - The residents expected to be supplied with clean water. - They also expected that sewers would be constructed on the two side of road. - They proposed giving priority to the main road in the subproject area.	- PMU receives proposals of the residents to consider including them in subproject design and implementation and will provide clear answer in the second consultation period. - Whether to construct sewerage pipelines on two sides or not depend on existing infrastructure condition of the area. This will be considered for inclusion in the design. - There will be clean water supply system investment.
2	August 9, 2016 Cultural house in Quynh Chan cluster	Rehabilitation and upgrading of infrastructure in Quynh Chan cluster, Lam Ha ward	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject	- The residents in the subproject area indicated their strong supports for the subproject. They expected that the subproject would be implemented early. - They proposed the upgrading of the three roads in the hamlet that are usually flooded.	- PMU receives proposals of the residents to consider including them in subproject implementation and will provide clear answer in the second consultation period.

No.	*Date and Location*	*Description*	*Participants*	*Public opinions*	*Feedback of PMU and Consultant*
			area		
3	August 9, 2016 Cultural house in Dinh Trang cluster	Construction of Lam Ha regulation lake No.1	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- The residents in the subproject area indicated their strong supports for the subproject. They expected that the subproject would be implemented early. - Subproject implementation plan and progress must be informed to the affected HHs for their arrangement for housing. - In the rainy season, wastewater runs from Dong Van industrial zone down to the residential area. The residents requested for construction of canal to collect water from Dong Van industrial zone. - At present, a number of projects have been implemented in Dinh Trang cluster. However, the residents have not supplied clean water. - This the most democratic subproject in Dinh Trang cluster since then. - Resettlement area should be established in Dinh Trang cluster. - All the lighting system, water supply and drainage system in the hamlet should be upgraded. - The residents should be provided with vocational training. - The necessity of transparency is highlighted.	- Implementation schedule will be informed in detail to the residents. - Technical proposals will be considered and adjusted properly. - On-the-spot resettlement is not feasible. PMU will provide new place of resident near the old one as much as possible. - At the present area: There will be investment of Lam Ha 1 Lake item only. There's still not enough budget for implementation of more other items. - There will be vocational training program, which will be mentioned in detailed in RP. - The subproject will always have independent supervisors to ensure transparency.
4	August 11, 2016 People's Committee of Luong Khanh Thien	Upgrading of drainage system and technical infrastructure in Bien Hoa street	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the	- The subproject should be implemented in a synchronous and timely manner. - The residents in the subproject area indicated their strong supports for the subproject.	- Successive construction will be applied not to affect people's personnal activities. - PMU receives proposals of the residents to

No.	*Date and Location*	*Description*	*Participants*	*Public opinions*	*Feedback of PMU and Consultant*
	ward		cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- A proper construction method is needed to minimize impacts on the life and business of the residents. - The payment must be properly inclined to help the residents move their vehicles up or down. - Two kinds of suitable green tree should be selected. - It is necessary to proposed how to relocate the available electricity meters affecting the landscape.	consider including them in subproject implementation and will provide clear answer in the second consultation period.
5	August 11, 2016 People's Committee of Minh Khai ward	Upgrading of drainage system and technical infrastructure in Bien Hoa street	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- The subproject should be implemented in a synchronous manner. - The pavement steps must be designed properly for travelling of the residents. - It is necessary to research suitable kinds of green trees, keeping the ancient trees. - The surface of road should not be heightened to avoid affecting houses of the residents. - Special attention should be paid to drainage to avoide flood.	- PMU receives proposals of the residents to consider including them in subproject implementation and will provide clear answer in the second consultation period. - Purpose of the subproject is to prevent flooding, so there will be no flooding occurrence after the subproject has been completed.
6	August 11, 2016 People's Committee of Hai Ba Trung ward	Rehabilitation and upgrading of Tran Quoc Toan primary school	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations,	- The design options should be reviewed to create the play space for pupils. - The principal proposed changes in the location of kitchen from the presented option, library should be located in the first floor and the council room should be extended. - Proposed design of separate drawing room and location of flag tower hung on the second floor.	- PMU receives proposals of the residents to consider including them in subproject implementation and will provide clear answer in the second consultation period. - Before implementation of work at the subproject areas, a

No.	*Date and Location*	*Description*	*Participants*	*Public opinions*	*Feedback of PMU and Consultant*
			Fatherland Front - Representatives of affected HHs in the subproject area	- Negative impacts on the residential area behind the southern terraced house should be avoided. - The subproject should be implemented in a timely manner	work implementation notice and plan will be submitted to the local government and people.
7	August 12, 2016 CPC of Phu Van	Construction of Phu Van kindergarten	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- Local authority and the affected HHs indicated their strong support for the subproject for the lack of shool for the children in the commune. - The subproject should be implemented in a timely manner.	- The subproject will receive consultative contributions of the local residents and will work out options to minimize impacts on HHs as much as possible. - Before implementation of work at the subproject areas, a work implementation notice and plan will be submitted to the local government and people. - The subproject hopes for co-operation and support of the local government and residents so as for the subproject to soon be completed as scheduled.
8	August 12, 2016 People's Committee of Quang Trung ward	Rehabilitation and upgrading of the northern residential area of Quang Trung ward	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland	- The subproject should be implemented in the ward. - The ward is depressed, water must be pumped out the rainy days. It is necessary to find out the best drainage option. - The residents indicated their support for extention of planning road for drainage of the ward.	- PMU receives proposals of the residents to consider including them in subproject implementation and will provide clear answer in the second consultation period. - The subproject hopes for co-operation and support of the local government and residents so as for

No.	*Date and Location*	*Description*	*Participants*	*Public opinions*	*Feedback of PMU and Consultant*
			Front - Representatives of affected HHs in the subproject area		the subproject to soon be completed as scheduled.
9	August 12, 2016 Me Noi communal house	- Construction of the southern embankment of Chau Giang river, from Liem Chinh bridge to Cau Gie-Ninh Binh highway - Upgrading of Tran Hung Dao street	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- The residents in the subproject area indicated their strong supports for the subproject. - The relation between Tran Hung Dao street and Liem Chinh bridge should be clarified because of people affected by the two projects. - The subproject should be implemented in a timely manner to avoide delay.	
10	August 13, 2016 Trieu Xa cultural house	- Construction of the southern embankment of Chau Giang river, from Liem Chinh bridge to Cau Gie-Ninh Binh highway - Upgrading of Tran Hung Dao road	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- The residents in the subproject area indicated their strong supports for the subproject. - Proper land acquisition to avoid unnecessary land acquisition for other purposes. - Impacts on the residents must be minimized during implementation process of the subproject. - The drainage system in Trieu Xa should be reconsidered. - The road from pumping station to Trieu Xa hamlet and the road from Ngai Tri hamlet to hamlet 7 must be reconstructed.	- The existing relevant infrastructure system will be checked before construction. - PMU receives proposals of the residents to consider including them in subproject implementation and will provide clear answer in the second consultation period.

Table 74. The results of the second public consultation

No.	Location	Description	Participants	Public opinions	Feedback of PMU and Consultant
1	October 11, 2016 Cultural house in Me Noi village	- Construction of Chau Giang river southern embankment from Liem Chinh bridge to Cau Gie-Ninh Binh expressway - Upgrading Tran Hung Dao road	- Consultant team - PMU staff - Representatives of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- The residents in the subproject area indicated their strong supports for the subproject. - Adequate infrastructure for the resettlement area should be invested. - Compensation shall follow the old option. - Is the dyke land compensated or not? - Be provided with land use rights certificate after payment made to the resettlement area. - 2 locations were proposed for resettlement: + Road surface 491, near Viet Duc hospital. + On-site resettlement, selling the land area behind to avoid the displacement for local residents. - Construction should be done quickly.	- The resettlement area will have sufficient infrastructure system. - The resettlement area is: Liem Chinh Resettlement Area. - Red book issuance procedures will be by the charge of Department of Natural Resources & Environment.
2	October 13, 2016 Cultural house in Duong Am residential group	Rehabilitation and upgrading of infrastructure in Duong Am, Lam Ha ward	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the residential group, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- Local residents strongly supported to the subproject and hope the subproject to be implemented soon. - Propose to upgrade 1 local road in the lane which is currently suffering from flood. - The residents can be involved in supervising to avoid loss, ensure the quality of works. - The residents can have access to clean water. - Construct wastewater sewers at both sides if possible.	- The additional line will be considered. - The residents will be allowed to participate in the subproject's community monitoring committee.

No.	Location	Description	Participants	Public opinions	Feedback of PMU and Consultant
3	October 13, 2016 Cultural house in Quynh Chan residential group	Upgrading and improving infrastructure for Quynh Chan residential group, Lam Ha ward	- Consultant team - PMU staff - Representatives of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- The residents in the subproject area indicated their strong supports for the subproject and hoped the subproject to be implemented soon. - Proposed to upgrade 3 more local roads for the lane to create connectivity in the region and avoid flood.	The additional line will be considered. - The residents will be allowed to participate in the subproject's community monitoring committee.
4	October 13, 2016 Minh Khai ward PC	Upgrading drainage and technical system for Bien Hoa road	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- Is the old sewers left out? - Electric control panel should not be placed in front of households. - Need to cooperate with electric sector to implement. - Construction should be done quickly.	- The old system will be replaced by a completely new one. - Electric cabiniet installation: Will co-operate with the electricity sector. - Successive construction will be applied.
5	October 13, 2016 Luong Khanh	Upgrading drainage and technical system for Bien Hoa	- Consultant team - PMU staff - Representatvies	- Elevation of road surface should not be changed much. - Need to clarify the connection of drainage line from households to the	- Road surface elevation will be basically remained intact. - HHs will be

No.	Location	Description	Participants	Public opinions	Feedback of PMU and Consultant
	Thien ward PC	road	of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	drainage system. - Electric control panel should be placed between two households, not at one side. - Electric meter should be located appropriately. - Sidewalk should be leveled to facilitate the activities of the residents. - Cable, internet, etc should be underground. - Totally support the subproject.	connected to collection pipeline system, before the WW to enter the main sewerage pipelines. - Sidewalk will be beveled for travelling convenience. - Undergrounding of power cables will be carried out synchronously.
6	October 14, 2016 Cultural house in Dinh Trang residential group	Construction of Lam Ha 1 regulation lake	- Consultant team - PMU staff - Representatives of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- The residents in the subproject area indicated their strong supports for the subproject and hoped the subproject to be implemented soon. - The residents agreed with the proposed resettlement area nearby road 68m.	- The resettlement area is near Road 68, very convenient for people. - The subproject hopes for co-operation and support of the local government and residents so as for the subproject to soon be completed as scheduled.
7	October 14, 2016 Trieu Xa cultural house	- Construction of Chau Giang river southern embankment from Liem Chinh bridge to Cau Gie-Ninh Binh expressway - Upgrading	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union,	- The residents in the subproject area indicated their strong supports for the subproject. - The land acquisition for the subproject should be done appropriately, not revoke land for other purposes. - On-site resettlement was proposed, the proposed resettlement site is far (in Khe Loi village, Liem Tiet	- Land acquisition will be carried out for each implementation step of the subproject, and there will not be excessive land acquisition. - At present there's not on-the-spot land reserve for resettlement. So, the

No.	Location	Description	Participants	Public opinions	Feedback of PMU and Consultant
		Tran Hung Dao road	Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	commune, 3km away from their current residence).	subproject propose displacement to Khe Loi Area.
8	October 14, 2016 Hai Ba Trung ward PC	Rehabilitating and upgrading Tran Quoc Toan primary school	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- The existing school yard is low which is prone to be flooded during rainy time. Need solution to address this situation. - Enclosures should be constructed in brick. - Expand garage. - The south block has no construction joints, which not ensure safety with the length of the range. Need to consider. - Reinstate the road surface if the construction vehicles cause damage to it. - Support expenses for movement of school and pupils during construction time (the school will send a detailed estimate). - The subproject should be implemented soon.	- School yard is designed with elevation matching drainage condition of the area. - PMU receives the technical proposals. - Public infrastructure items damaged by the subproject's construction activities will be recovered. - Displacement cost is not included in the subproject cost, so PMU recommends the school to discuss with the city about this.
9	October 14, 2016 Quang Trung ward PC	Upgrading and rehabilitating infrastructure for the North Quang Trung ward	- Consultant team - PMU staff - Representatives of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front -	- The residents hoped that the subproject would be implemented soon. - One route in the proposal was not included in the option.	- After consideration, a line is excluded for low feasibility and efficiency. - The subproject hopes for co-operation and support of the local government and residents so as for the subproject to soon be completed as scheduled.

No.	Location	Description	Participants	Public opinions	Feedback of PMU and Consultant
			Representatives of affected HHs in the subproject area		
10	October 15, 2016 Phu Van commune PC	Construction of Phu Van kindergaten	- Consultant team - PMU staff - Representatvies of the People's Committee, Head of the cluster, secretary, Women's Union, Youth's Union, Farmers' Associations, Fatherland Front - Representatives of affected HHs in the subproject area	- Need to have spare space for the increase in number of pupils in the future. - Expand concrete road in front of Phu Van primary school, the width is same to the road in front of kindergarten (13,5m). - Reinstate road surface if it causes damage during construction. - The subproject should be implemented soon to serve local residents.	- The subproject will consider to include back-up space in the design. - PMU receives the technical proposals. - Public infrastructure items damaged by the subproject's construction activities will be recovered.

7.3 RESPONSES AND COMMITMENTS OF SUBPROJECT OWNER

The Subproject Owner agrees on and acknowledges opinions/comments from the People's Committees of Wards/Communes and their local residents. The Subproject Owner and the Consultant have reviewed and incorporated those opinions/comments in the report and finalized the ESIA report on the basis of fully acquiring opinions/comments of the People's Committeesof Wards/Communes and local communities in the subproject area.

The Subproject Owner will continue to pay attention to the implementation and supervise the Contractor's performance of mitigation measures for environmental impacts adequately and in accordance with the contents in the ESIA report.

The Subproject Owner commits to reasonably handle all issues related to compensation and assistance for local people, according to regulations prescribed by the Vietnamese Government.

7.4 INFORMATION DISCLOSURE

The draft ESIA had been published at the offices of Phu Ly City People's Committee and the People's Committees of subproject wards and communes on November 30, 2016. Information on the release date was posted on the website of Phu Ly People's Committee. Basing themselves on the contents of the ESIA, the local people could get the Subproject information and contribute their opinions/comments on environmental issues of the Subproject.

The draft ESIA was also sent to the World Bank office in Vietnam for its disclosure in the World Bank's Operations Portal on November 29, 2016.

CONCLUSIONS, RECOMMENDATIONS AND COMMITTMENTS

1. CONCLUSIONS

The Subproject will contribute to improving drainage conditions, overcoming inundation, bettering the natural environment and hygienic conditions in the areas of Phu Ly city. In the process of urbanization and modernization of the city, the implementation of this Subproject proves to be necessary, thereby contributing to the sustainable development of Ha Nam province in general and the city of Phu Ly in particular.

The contents of ESIA report comply with the current requirements for environmental impact assessment stipulated by the Vietnamese Government and WB's policies. The report will be one of the key documents to be submitted to State management agencies in charge of the environment to determine the location and scope of the work as a basis for applying for a subproject investment license. In addition, this is also an important document helping in subproject appraisal and in the negotiation and signing of the loan agreement between the Government of Vietnam and the World Bank

Environmental impacts:

The ESIA report has identified and assessed the environmental impacts in all phases of the Subproject, as well as environmental risks that may occur during the Subproject phases. However, some impacts are beyond accurate forecastssuch as impacts on climate change, unexpected incidents likely to take place during the construction and operation of the Subproject. The reason of failing to provide accurate forecasts for those impacts can be seen as being objective, as any unforeseen naturalhappening could materialize at any time in the future. Whether some other impacts are at a low, moderate or severe level depends greatly on contractors' performance as well as environmental management and occupational safety, local authorities' management, awareness of the community, etc. Those factors are of no firm grounds for accurate forecasts.

The environmental impacts, during the assessment process, were assessed on the basis of theoretical and experimental formulas, statistical data and experience from similar subprojects. However, no assessment method has been known to be completely accurate, and assessment is relativequantification of the impacts instead. In the process of subproject implementation, there will be appropriate adjustments on the basis of opinions forwarded by the environmental monitoring consultant so as to minimize adverse impacts on the environment.

The beneficial impacts of the Subproject include improvement of environmental sanitation, mitigated inundation, better drainage, and safer traffic conditions for invested areas in Phu Ly city, especially reducing negative impacts from wastewater. Treated wastewater meeting environmental standards before being discharged into the receiving waterswill help pollution levelsof surface water sources of Chau Giang river.

Most of the impacts during the pre-construction and construction stagesare temporary and short-term, taking place in areas around construction sites or on transport routes and at disposal sites. In the construction phase, several impacts related to dust, noise,social security, or occupational safety are much likely to arise. However, these can be limited or mitigated to lowest levels by the implementation of the ESMP.

Subproject construction operations might cause a number of negative impacts on the social life of residents in the Subproject area, by bringing about changes in their living conditions and disturb their daily routines as well as production and economy. Nevertheless, these impacts are short-term and mild.

Negative impacts arising in the operation stage of the wastewater treatment plantswill be of a potential and lasting nature. Therefore, the Owner is to carry out all mitigation measures for negative impacts mentioned in this report to comply with Vietnamese environmental standards.

Mitigation measures:

Measures to control pollution and limit adverse impacts on environment in the construction and operation phases proposed and recommended in this report prove to be feasible and able to meet Vietnamese environmental standards.

A common feature shared by all proposed mitigation measures is attention to be paid to communication and education for betterconsciousness and awareness among local communities, coupled with managerial and technical measures, with the prevention of environmental issues that might occur and with the plans for addressing arising environmental problems. These measures are feasible and highly effective, and have been proven successfulin many similar subprojects.

The environmental monitoring program will be carried out as soon as the State's approval and the license of subproject construction and operation have been obtained. Monitoring data will be stored and serve as a legal basis for compliance with the Environmental Protection Law of Vietnam as well as the environmental safeguard policies of World Bank – the donor. These data will also serve the evaluation of the effectiveness and environmental sustainability of the Subproject.

On the basis of the characteristics of the current environmental status and the forecasts of pollution level, the Subproject' measures to prevent and mitigate the impactsare established in conformity with general conditions and each particular case. In order to ensure uniform environmental protection, an environmental management system is set up from subproject establishment until the operation of the Subproject. The environmental management system will ensure the management, monitoring, reporting, preparation and adjustment of measures to minimize environmental pollution during subproject implementation. Environmental monitoring will be regularly carried out in accordance with the Environmental Protection Law and the guidelines of the State.

The Subproject has been communicated to local people and local authorities in the subproject area. The Subproject has also received support and valuable constructive opinions from local people and local authorities.

2. RECOMMENDATIONS

This is an environmentally significant subproject, aiming at future sustainable development, and also one of the prerequisites of socio-economic development in Ha Nam province in general and Phu Ly city in particular. Therefore, the Owner would like to propose for DONRE's appraisal and approval of the ESIA report of the Subproject as well as WB's approval for timely and prompt deployment of the subproject.

In the process of subproject implementation, the PMU would propose relevant departments andlocal administrative agencies to participate in environmental protection throughout subproject implementation from the preparation to operation stage of the Subproject.

During the implementation of the Subproject, the PMU would seek the coordination as well as support and constructive comments from MONRE, Ha Nam province's DONRE, and the Department of Environment and Resources of Phu Ly city to carry out environmental protection efficiently.

3. COMMITMENTS

During the operation of the Subproject, the Ownercommits to carrying out seriously the regulations of Vietnam's environmental protection laws, including: the Law on Environmental Protection No.55/2014/QH13 passed by the National Assembly of the Socialist Republic of Vietnam dated 23 June, 2014; Decree No.80/2014/ND-CP dated 6 August, 2014 by the Government on drainage and wastewater treatment; Decree No.19/2015/ND-CP dated 14 February, 2015 by the Government detailing the implementation of some Articles of the Law on Environmental Protection; Decree No.18/2015/ND-CP dated 01 April, 2015 by the Government on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan; Circular No.27/2015/TT-BTNMT dated 29 May, 2015 by MONRE on strategic environmental assessment, environmental impact assessment and environmental protection plan, and other relevant documents. The Owner also commits to complying with WB's environmental safeguard policies.

In addition, the Client commits to carrying out environmental protection and mitigation measures as mentioned in Chapter 5 and implementing the environmental and social management plan for the Subproject as mentioned in Chapter 6, and fulfilling commitments towardsthe communities specified in Chapter 7. The Owner also commits to make compensation and overcoming environmental pollution once environmental incidents and risks occur during the implementation of the Subproject,and taking steps of environmental recovery in accordance with to legal regulations on environmental protection when subproject operation has been completed.

APPENDIX 1: MCDP AF PHU LY DREDGED MATERIALS MANAGEMENT PLAN

1. Location of Dredging, Volume and Characteristics of Dredged Materials

Dredging area: Lam Ha 1 lake, Chau Giang River southern embankment. The volume of dredging sludge estimated about 60,000m^3.

Several other areas such as Tran Hung Dao road, Duong Am residential group, Quyanh Chan residential group, the residence in the north Quang Trung ward, Bien Hoa road generate about 325,446 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 16 km from dredging area.

Although a separate management plan is prepared for the excavated materials of the entire project, disposals of the excavated materials will also follow the above principles. During construction phase additional tests for deeper layer will also be carried out by the contractors.

3. Contractor's Dredging Management Plan

To supplement the work done during the feasibility study, detailed design scope will include additional analysis of chemicalcomposition, and update the DMDP with more details information on amount and quality of sludge, 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 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 soil are separated from dredged materials from source. Excavated soils will be reused on-site and off-site as much as possible and transported to the nearest disposal site appraised under ESIA, or identified and approved during detail engineering design or construction phase;
- The mitigation measures are adequate to address the potential social and environmental impacts associated with various steps and activities, areas of influence and receptors of dredging, temporary storage, transportation and final disposal of the dredged materials.
- Field survey are carried out by the Contractor during the preparation of the CDMP in order to identify if there are additional sensitive receptors not identified previously under CCSEP and proposed additional site-specific mitigation measures accordingly.
- Contractor's environmental monitoring plan are included
- Commitments to carry out corrective actions when excessive pollution is determined, or when there are complaints about environmental pollution, social impacts from any stake holders

4.Potential Impacts and Mitigation Measures for Dredging and Embankment lining

Impacts and Description	Mitigation Measures
AT DREDGING and TEMPORARY LOADING AREAS	
Odour and air pollution, nuisance Decomposition of organic matters under anaerobic conditions generates strong odour-generated gases such as SO_2, H_2S, VOC etc. When the muds are disturbed and excavated, these gases are released much faster into the air. Exposure to odour pollution affect the health of workers, local residents and cause	- 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

Impacts and Description	Mitigation Measures
public nuisance	outside the construction corridor determined for each canal section - Avoid loading the sludge in populated residential areas or near public buildings such as kindergarten. Load the sludge as far from the houses and buildings as far as possible - Cover the temporary sludge loads when loading near sensitive receptors or longer than 48 hours unavoidable
Dust and nuisance Temporary loading of sludge at the construction site cause nuisance to the public Dry and wet mud may be dropped along the dredging area and on transportation route causing nuisance to the public and traffic safety risks	- Avoid temporary loading of dredged materials on-site - Dredged materials must be transported to the final disposal sites earliest possible and no later than 48 hours from dredging. - Use truck with water-tight tank to transport wet/damp dredged materials; - All trucks must be covered tightly before leaving construction site to minimise dust and mud dispersion along the road
Traffic Disturbance The placement and operation of dredging equipment and construction plants on the ground, temporary loading of the dredged materials may obstruct or disturb traffic and cause safety risks for the people travelling on the canal-side road, particularly on canal-crossing bridges which are usually very narrow	- Arrange worker to observe and direct excavators driver when traffic is busy
Social Disturbance Concentration of workers and equipment, construction plants, temporary loading of materials and wastes, traffic disturbance, dusts and odour pollution etc. will disturb daily activities and the lives of local residents Conflicts may also be arisen if workers, waste, materials, equipment etc. are present outside the construction corridor	- Inform the community at least one week before construction is started - Monitor to ensure that physical disturbances are within the construction corridors only - Contractor recruit local labours for simple works, brief them about project environmental and safety requirements before started working - Contractor register the list of workers who come from other localities to the commune at the construction site - Led the water leaked from wet/damp dredged materials going back to the river, not to affect garden or agricultural land - Keep the areas to be disturb minimal - Enforce workers to comply with codes of

Impacts and Description	Mitigation Measures
	conducts
Landslide and soil subsiding risks at dredging area Relative deep excavation or cut and fills on the embankments that create slopes may lead to landslide and soil subsiding at the slops or excavated areas, particularly in rainy weather Deep excavation also cause risks to the existing buildings nearby, particularly the weak structures or located too close to the deep excavation area.	- During field survey for the preparation of CDMP, the contractor in coordination with the Environmental Officer of PMU and the Environmental Consultant of the CES identify weak structures that may be at risk and determine appropriate mitigation measures accordingly - Consider and select appropriate dredging method that allow minimising soil subsiding risks, for example carry out stepped excavation, stabilise slops in parallel to dredging - Apply protective measures such as sheet piles at risky locations
Water Quality Degradation Turbidity in water will be increased when the mud is disturbed; Water leaked from dredged material and suface runoff through disturbed ground also contain high solid contents. Muddy water entering irrigation ditch will cause sedimentation. Aquatic livest in the canal would also be affected by turbid water.	- Build coffer dams surrounding the dredging area and pump the water out before starting dredging - If dredging is carried out directly onto the water, dredge at intervals to allow suspended materials to resettle before continuing. Observe water colour at 20 m upstream and stop dredging when water colour there started to change
Increased Safety risk for the Public	- Place stable barriers along the construction corridor boundary to separate the site with nearby structures - Place warning signs and reflective barriers along the construction area, at dangerous locations and within sensitive receptors - Ensure adequate lighting at
Health and Safety risk to the workers The health of workers may be affected due to exposure to odour and other contaminants from sludge Risk of being drown	- Within two weeks before dredging is started, the contractor will coordinate with local authority to identify good swimmers or those who can dive in the locality, and hire at least one of them at each canal construction site deeper than 3 m and there are workers working on or near water surface. - Provide and enforce the workers to use masks. If and when working in the water, protective cloths, rubber boots, gloves and hats must be wore.
Others	- Other relevant measures specified in ECOP or proposed by the contractors as necessary
MATERIAL LOADING AND TRANSPORTATION	

Impacts and Description	Mitigation Measures
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 45o - Build/create the walls to protect slopes - Create and maintain drainage at the foot of each dump higher than 2 m
Soil and Water Quality Pollution - The disposal of salty soil would not affect the existing soil quality - No risks of subsidence and landslide for residential areas around this area - No impacts on river water quality.	- Apply measures that ensure rainwater onto the materials is not mix with the surface runoff from the surrounding to overflow uncontrolled at the site; rainwater will be infiltrated onto the ground on-site. This can be done by the following mitigation measures: + Build drainage ditches surrounding the designated disposal area + Use impermeable materials to cover the walls surrounding the materials to isolate it with the surrounding + Other measures proposed by the contractors to meet pollution control targets

5. Specific Guidance for Dredging at Lam Ha 1 lake and Chau Giang River southern embankment

- Identifying the available land for disposing the dredged materials. The plan should also identify the possible lands to be appropriated for the disposal of dredged materials. Public land, land for construction of rural roads, public works, private land, etc. may be used, with an agreement with the project affected households. It should also meet local plans for land use.
- Preparing for a transportation plan. In case, the dredge disposal area is far away from the dredged sites, the DMP shall set out a transportation plan including: (a) methods of transportation (pipeline, barges, hopper barges) and uploading to the disposal area. If trucks are used, indicate proposed route of the transport from the dredged site to the disposal area, (b) time of operation, (c) type of vehicles/trucks and proposed measures to reduce the leakage of the dredged materials from the transport trucks, (d) contractors' responsibilities for cleaning the roads and carry out remedial works if necessary, and (e) a communication plan for the nearby communities including contact number for possible complaints.

- Plan for managing the disposal areas including: (a) plan for reducing the drainage, (b) construction of the perimeter dykes, (c) construction of sub-containment area, if applicable, (d) planned thickness of the dredged materials (typically less than 1.5 meters), (e) any measures to protect ground water and soils (e.g., installation of PVC membrane).
- Designing the Draining for Disposal lands. As the dredged materials are in the state of mud at first and soil particles are suspended for 24 to 48 hours. All drainage water from disposal land shall be driven to the drains and discharged back to the river. In order to limit the negative impacts of mud (produced by dredging) on the environment as well as the water quality of the canals, the dredged sediment will be transported to a containing area which is appropriately located and properly design with an adequate size. The dredged spoil will be pumped to the disposal land and then overflow to a settlement pond, where turbidity and total suspended solids are settled. After some time, effluent is returned to the river. A typical design of the dike around each disposal may be as follows: Height: 2m, Footing width: 5 m, and Surface width: 1m. The plan should set out a basic layout.
- Monitoring the Disposed Dredged Materials. A plan for monitoring the dredged materials as well as water quality of effluent would be required. As stated before, an intensive monitoring would be required if the dredged materials contains higher content of the heavy metals and other harmful materials than the national thresholds.
- In order to mitigate the issue of turbidity during dredging operation, the DMP shall set out dredging equipment and/or techniques suitable to the particular site. On laying dredging machines on a barge, contractors can use a proper mud –stopping net for enclosing the dredging site and keeping back mud on land, not to let it goes back to the canal. If the disposal site for dredge materials is located far away from the dredger, a suction dredger should be used to transfer all the mud and soil in water to the disposal sites. The length of dredging sections should be limited less than 1 km and the dredging should be done one by one.
- At the completion of the contract, carry out an assessment on dredged materials, and determine the use of the dredged materials for activities such as: (a) construction (roads and dykes), (b) basis for individual houses, and (c) gardening