HA NAM PROVINCE PEOPLE’S COMMITTEE
PHU LY CITY PEOPLE’S COMMITTEE

MEDIUM CITIES DEVELOPMENT PROJECT
PHU LY CITY SUBPROJECT, HA NAM PROVINCE

ENVIRONMENTAL MANAGEMENT PLAN FOR
PROJECT’S ADDITIONAL ITEMS

HA NAM PROVINCE PEOPLE’S COMMITTEE
PHU LY CITY PEOPLE’S COMMITTEE
MEDIUM CITIES DEVELOPMENT PROJECT
PHU LY CITY SUBPROJECT, HA NAM PROVINCE

ENVIRONMENTAL MANAGEMENT PLAN FOR
PROJECT’S ADDITIONAL ITEMS

INVESTOR

CONSULTING ASSOCIATION
TABLE OF CONTENTS

TABLE OF CONTENTS ................................................................. i
LIST OF ABBREVIATIONS ........................................................ viii
LIST OF TABLES ............................................................................. iii
LIST OF FIGURES ......................................................................... iv
1. INTRODUCTION AND BRIEF PROJECT DESCRIPTION ............... 1
   1.1. BACKGROUND AND PROJECT OBJECTIVES .......................... 1
       1.1.1. Background .............................................................. 1
       1.1.2. Project objectives .................................................... 2
       1.1.3. EMP scope ............................................................. 2
   1.2. BASIC LAW, LEGISLATION, TECHNIQUES AND IMPLEMENTATION METHODS ......................................................... 3
   1.3. BRIEF PROJECT DESCRIPTION AND ADDITIONAL ITEMS ......... 4
       1.3.1. Project location ......................................................... 4
       1.3.2. Project contents ....................................................... 7
       1.3.3. Project’s additional works ......................................... 8
       1.3.4. The ancillary facilities ............................................... 17
       1.3.5. Institutional Arrangement ......................................... 18
       1.3.6. Implementing plan for the additional works .................. 19
   1.4. PROJECT’S AREA OF INFLUENCE ...................................... 19
2. NATURAL, ENVIRONMENTAL AND SOCIAL-ECONOMIC CONDITIONS 22
   2.1. Natural condition ............................................................. 22
       2.1.1. Geographical location .............................................. 22
       2.1.2. Meteorological condition ......................................... 24
       2.1.3. Hydrological conditions ......................................... 25
       2.1.4. Geological engineering, hydrogeology ......................... 26
       2.1.5. Ecosystem and biological resources ......................... 26
   2.2. Social-economic condition .................................................. 27
       2.2.1. Luong Khanh Thien ward ......................................... 27
       2.2.2. Lam Ha ward ........................................................... 27
       2.2.3. Liem Chinh ward ...................................................... 27
       2.2.4. Physical cultural works ............................................ 28
       2.2.5. Water supply system .............................................. 28
       2.2.6. Drainage system ..................................................... 28
       2.2.7. Solid waste management .......................................... 29
       2.2.8. Traffic system status ............................................... 29
   2.3. Environmental quality status ................................................. 30
       2.3.1. Mud quality ........................................................... 30
       2.3.2. Air quality ............................................................. 30
       2.3.3. Surface water quality .............................................. 31
       2.3.4. Underground water quality ...................................... 32
3. ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT FOR ADDITIONAL INVESTMENTS ......................................................... 33
   3.1. Level of impacts ............................................................... 33
   3.2. Investment on construction of Luong Khanh Thien secondary school ................................. 36
       3.2.1. Ground clearance .................................................... 36
       3.2.2. Construction stage .................................................. 36
       3.2.3. Operation stage ..................................................... 39
   3.3. Investment on embankment to prevent landside at North Chau Giang riverside . 39
3.3.1. Clearance stage........................................................................... 39
3.3.2. Construction stage...................................................................... 40
3.3.3. Operation stage.......................................................................... 44
3.4. Construction component of a road connecting from medical unit of Bach Mai hospital to D4-N7 road.......................................................... 45
3.4.1. Ground clearance stage................................................................. 45
3.4.2. Construction stage....................................................................... 45
3.4.3. Operation stage.......................................................................... 48
3.5. Construction component of DT491 detour ........................................ 49
3.5.1. Ground clearance......................................................................... 49
3.5.2. Construction stage....................................................................... 49
3.5.3. Operation stage.......................................................................... 52
4. MITIGATION MEASURES FOR ENVIRONMENTAL IMPACTS.............. 53
4.1. Design stage.................................................................................. 53
4.2. Mitigation measures in ground clearance stage.................................... 53
4.3. Mitigation measures in construction process........................................ 54
4.4. Measures to mitigate site-specific impacts of project additional works during construction ................................................................. 67
4.4.1. Measures to mitigate site-specific impacts for construction of Luong Khanh Thien secondary school .................................................. 67
4.4.2. Measures to mitigate site-specific impacts for construction component of North embankment of Chau Giang river side .................... 67
4.4.3. Measures to mitigate site-specific impacts for construction component of North route of medical basis - Bach Mai hospital connects to D4-N7 road ............................................................. 68
4.4.4. Measures to mitigate site-specific impacts for construction component of DT491 detour ................................................................. 68
4.5. Mitigation measures for operation stage............................................. 69
4.5.1. Mitigation measures in operation stage of Luong Khanh Thien secondary school .......................................................... 69
4.5.2. Mitigation measures in operation stage of North Chau Giang embankment .................................................. 70
4.5.3. Mitigation measures in operation stage of road connecting from medical basis of Bach Mai hospital to D4-N7 road and DT491 detour .................................................. 70
5. ENVIRONMENTAL MANAGEMENT PLAN (EMP).......................... 71
5.1. Environmental Codes of Practice (ECOPs)........................................ 71
5.2. Site-specific impacts ........................................................................ 71
5.3. Environmental monitoring program................................................. 76
5.3.1. Supervising contractor’s safety implementation .................................. 76
5.3.2. Environmental quality monitoring .................................................. 76
5.4. Roles and responsibilities for emp implementation ............................ 78
5.4.1. Organization arrangement............................................................. 78
5.4.2. Specific responsibilities of PMU, CSC and IEMC ......................... 81
5.4.3. Reporting arrangement................................................................. 83
5.5. Training programs proposed............................................................. 83
5.6. Estimated emp cost.......................................................................... 84
6. PUBLIC CONSULTATION................................................................. 86
6.1. Objects of community consultation:.................................................. 86
6.2. Conducted methods.......................................................................... 86
6.3. Consultation results.......................................................................... 86
6.4. Dissemination of information ............................................................ 88
## LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCBDA/PPU</td>
<td>Project Preparation Unit</td>
</tr>
<tr>
<td>BOD</td>
<td>Biological oxygen demand</td>
</tr>
<tr>
<td>BTNMT/MONRE</td>
<td>Ministry of natural resources and environment</td>
</tr>
<tr>
<td>CSC</td>
<td>Construction Supervision Consultant</td>
</tr>
<tr>
<td>COD</td>
<td>Chemical Oxygen Demand</td>
</tr>
<tr>
<td>DO</td>
<td>Dissolved Oxygen</td>
</tr>
<tr>
<td>DOC</td>
<td>Department of Construction</td>
</tr>
<tr>
<td>DPI</td>
<td>Department of Planning and Investment</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>EMP</td>
<td>Environmental Management Plan</td>
</tr>
<tr>
<td>GoV</td>
<td>Government of Vietnam</td>
</tr>
<tr>
<td>IDA</td>
<td>International Development Association</td>
</tr>
<tr>
<td>IEMC</td>
<td>Independent Environmental Monitoring Consultant</td>
</tr>
<tr>
<td>MCDP</td>
<td>Medium Sized Cities Development Project</td>
</tr>
<tr>
<td>ODA</td>
<td>Official Development Assistance</td>
</tr>
<tr>
<td>PMU</td>
<td>Project Management Unit</td>
</tr>
<tr>
<td>PPC</td>
<td>Phu Ly People’s Committee</td>
</tr>
<tr>
<td>QCVN</td>
<td>Vietnam National Technical Regulation</td>
</tr>
<tr>
<td>SS</td>
<td>Suspended Solid</td>
</tr>
<tr>
<td>TCVN</td>
<td>Vietnam standard</td>
</tr>
<tr>
<td>TDS</td>
<td>Total dissolved solid</td>
</tr>
<tr>
<td>T-N</td>
<td>Total nitrogen</td>
</tr>
<tr>
<td>T-P</td>
<td>Total phosphorus</td>
</tr>
<tr>
<td>TPS</td>
<td>Total particular solid</td>
</tr>
<tr>
<td>TSS</td>
<td>Total suspended solids</td>
</tr>
<tr>
<td>URENCO</td>
<td>Urban Environmental Company</td>
</tr>
<tr>
<td>VIWASE</td>
<td>Vietnam Water, Sanitation and Environment JS Company</td>
</tr>
<tr>
<td>VND</td>
<td>Vietnam Dong</td>
</tr>
<tr>
<td>VOC</td>
<td>Volatile Organic compound</td>
</tr>
<tr>
<td>WB</td>
<td>World Bank</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>ECOPs</td>
<td>Environmental Codes of Practice</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 1. the proposed investment items of Project .......................................................... 7
Table 2. Construction volume ......................................................................................... 11
Table 3. Syntheseiss of DT491 detour construction volume ........................................ 15
Table 4. Result of analyzing mud quality (July 13, 2015) ............................................. 30
Table 5. Result of analyzing air quality (July 13, 2015) ................................................ 30
Table 6. Result of analyzing surface water quality (July 13, 2015) ............................ 31
Table 7. Result of analyzing underground water quality (July 13, 2015) ................. 32
Table 8. Negative impact levels of additional items ....................................................... 34
Table 9. Volume of emission ......................................................................................... 36
Table 10. Noise level ....................................................................................................... 37
Table 11. Volume of emission ....................................................................................... 40
Table 12. Noise pollution level ...................................................................................... 41
Table 13. Volume of emission ....................................................................................... 46
Table 14. Noise pollution level ...................................................................................... 47
Table 15. Volume of emission ....................................................................................... 49
Table 16. Noise pollution level ...................................................................................... 50
Table 17. Environemtnal Codes of Practice ECOPs ..................................................... 55
Table 18. Site-specific impacts and mitigation measures .............................................. 71
Table 19. Environmental monitoring scale in construction process ............................... 76
Table 20. Estimation table of total samples in environmental monitoring process ........ 77
Table 21. The cost of sampling ...................................................................................... 77
Table 22. Roles and responsibilities of key parties (explanation for figure above) ....... 79
Table 23. Training Program for Capacity Strenthening on Environmental Supervision and Management .......................................................... 83
Table 24. Estimated Cost for EMP implementation for Phu Ly (million USD) ........... 85
Table 25. Estimated Cost (IEMC) for additional invesments ....................................... 85
Table 26. Consultation result .......................................................................................... 86
LIST OF FIGURES

Figure 1. Project location and affected areas ................................................................. 5
Figure 2. Area locations of project .................................................................................... 6
Figure 3. Construction location of Luong Khanh Thien secondary school .................. 9
Figure 4. Location of Northern dyke of Chau Giang river ............................................. 12
Figure 5. Location of Northern road of medical examination basis – Bach Mai hospital connecting to D4-N7 road (27 m) ................................................................. 14
Figure 6. Location of DT 491 detour ............................................................................... 15
Figure 7. Status of additional items’ location ................................................................. 24
Figure 8. Basins of Chau Giang river, Day river in Ha Nam province .......................... 26
Figure 9. Organization Diagram for EMP Implementation ............................................. 79
1. INTRODUCTION AND BRIEF PROJECT DESCRIPTION

1.1. BACKGROUND AND PROJECT OBJECTIVES

1.1.1. Background

Phu Ly City is the political, economic and cultural center of Ha Nam province. It is located about 50 km south of Hanoi, on the main North-South and East-West important traffic axis including: Highway 1A, North-South railway; Highway 21 leading to Hoa Binh and Nam Dinh provinces. The city is presently small consisting essentially of an old urban area clustered along both banks of the Chau Giang River.

In recent years, Phu Ly city has been developing continuously in its economy, politics, society and culture. The technical and social infrastructure has also been improving progressively. Nevertheless, the city is still struggling to keep up with rising demand for basic urban infrastructure including traffic system, drainage and environmental sanitation systems, water supply systems, etc. To address these issues as well as to support its role and functions in the socio-economic development of the provincial and the wider northern region of the country, the city has prepared a master plan towards 2020 which has been approved by Ha Nam Provincial People’s Committee.

Ha Nam Provincial People’s Committee (PPCs), which is responsible for Phu Ly City, has requested World Bank (WB) support for essential infrastructure under the proposed Medium Cities Development Project (MCDP, or “the Project”).

The Project will finance multi-sector infrastructure investments in Phu Ly responding to infrastructure deficits and urban services demands as expressed through the city’s master plan. Specifically, the project will support infrastructure rehabilitation and improvement in the old part of the city, and new infrastructure in the new urban area into which the city will expand. The investments include surfacing existing roads and lanes in selected urban areas; extending water supply and drainage networks and linking the latter to a new wastewater plant, also to be constructed under the project; and expanding and improving several small lakes that will become part of the city’s green space while also serving an important flood mitigation and retention purpose. In the new urban area, the project will finance construction of a core access road, with a bridge across the Chau Giang River that will provide a strong connection between the northern and southern parts of the city. The road will incorporate water supply and drainage/wastewater pipe networks within its corridor, the latter connecting to the project-financed wastewater plant that is to be constructed in the northwest of the expanded city area.

The project will also support the city with implementing the project, with developing a more comprehensive and appropriate approach to urban planning, and with developing the capacity to manage its expanding infrastructure assets.
1.1.2. Project objectives

Short term objective

- Improve and raise the living conditions of low-income residents in the project area.
- Enhance the capacity for rainwater drainage, wastewater collection and treatment; improving the hygienic and environmental conditions; provide clean water to improve people’s living conditions, contribute to comprehensive infrastructure development, and meet the overall development requirements of the city
- Rehabilitate degraded roads and construct new inter-ward and inter-commune roads, thus contributing to socio-economic development
- Construct main roads and urban bridges as planned to facilitate a dynamic urban development and inter-regional exchange, and attract investments to the province
- Support capacity building for the PMU implementing the project to ensure the project is prepared and implemented effectively to meet the goals of the project, in accordance with the requirements of the Vietnam Government as well as The World Bank. Capacity building and technical assistance to agencies involve with urban planning and urban asset management.

Long term objective

- Develop Phu Ly City into a big urban area, economic center spearheading the growth to meet socio-economic development objectives of Ha Nam Province; a motivation for the economic development in the whole southern area of the northern Delta.
- Invest in construction to create the technical infrastructure framework in accordance with Phu Ly City Master Plan towards 2020, thereby attracting investors to the city, create a momentum to promote economic development of the city to make it perfect and become a satellite city to Hanoi Capital.

1.1.3. EMP scope

In project construction process, although embankments for the Lam Ha 2 lake have been constructed, the embankment of Lam Ha 1 lake was not undertaken. Therefore, after agreement with the World Bank, the financial resources originally envisioned to fund the embankment of Lam Ha 1 lake will now be utilized for other investments, namely: renovating and upgrading Luong Khanh Thien secondary school (PL1-03 bid package); embankment of North Chau Giang river, segment from outlet of Lac Trang II to Chau Giaing bridge (additional into PL2-01 bid package); construction of North route, from medical basis of Bach Mai hospital to D4-N7 road (additional into PL3-01 bid package); and construction of DT491 detour (additional into PL3-02).

Therefore, his EMP report has been established to assess social-environmental impacts, based on proposals of mitigation measures to this impacts for project’s additional items. This report will be reviewed and approved by World Bank and it will be also reviewed and carried out by Investor in additional items implementation process.
1.2. BASIC LAW, LEGISLATION, TECHNIQUES AND IMPLEMENTATION METHODS

Environmental management plan for Project’s additional items: “Medium cities development in Vietnam – Phu Ly subproject, Ha Nam province” will ensure supplying Vietnam Government’s requirements and World Bank’s safeguard policies.

**Laws, Decrees, Circulars and Regulations and Standards in Vietnam:**

- Law on Environmental protection no.55/2014/QH13 dated June 23, 2014;
- Law on Water resource no. 17/2012/QH13 dated June 21, 2012;
- Law on Urban planning no. 30/2009/QH12 dated June 17, 2009
- Law on Biological ecosystem no. 20/2008/QH12 dated November 13, 2008;
- Law on Technical regulations and standards no.68/2006/QH11 dated June 29,2006;
- Decree no.18/2015/ND-CP of Government on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental plan dated February 14, 2015
- Decree no.19/2015/ND-CP dated February 14, 2015 of Prime Minister providing detail on implementing some articles of environmental protection law.
- Decree no.80/2014/ND-CP dated August 8, 2014 of Government on discharging water and treating wastewater;
- Decree no.149/2004/ND-CP dated July 27, 2004 of Prime Minister on the licensing of exploration and use of water resources, discharge of wastewater into water source
- Circular no.02/2005/TT-MONRE dated May 24, 2005 of Ministry of natural resources and environment guiding implementation of Decree no.149/2004/ND-CP dated April 27, 2004 of Government on the licensing of exploration and use of water resources, discharge of wastewater into water source
- Circular no.27/2015/MONRE dated May 29, 2015 of Ministry of natural resources and environment on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental plan
- National regulations, standards on environmental field
- Decision no. 03/2008/QD-UBND dated January 16, 2008 of Ha Nam province People’s Committee on releasing environmental protection regulations on Ha Nam province.
- Decision no. 33/2009/QD-UBND dated December 4, 2009 of Ha Nam province People’s Committee on releasing solid waste and wastewater management on Ha Nam province
- Decision 854/QD-UBND dated July 18, 2008 on approval of investment project “Project on urgent solution for shore erosion and urban embellishment at section of upstream of
Phu Ly culvert from Phu Ly bridge through 1A National Highway to discharge channel of Me pump station”.

- Decision 705/QD-UBND dated July 12, 2010 on EIA report’s approval for investment project “urgent solution to prevent shore erosion and urban embellishment at section of upstream of Phu Ly culvert from Phu Ly bridge through 1A National Highway to discharge channel of Me pump station”.

- Document no. 547/UBND-GTXD dated April 3, 2015 of Ha Nam province People’s Committee agreed to supplement North route of medical unit – Bach Mai hospital connecting to D4-N7 road into PL3-01 bid package of Phu Ly city subproject

- Document no. 694/UBND-GTXD dated April 28, 2014 of Ha Nam province People’s Committee agreed to supplement of detour (DT491) according to the planning at Southern intersection into PL03-02 of medium urbans development project – Phu Ly city subproject

- The written approval of investment policy no. 1491/UBND-NV dated September 4th, 2014 of Ha Nam province People’s Committee on adjustment of several bid packages and supplement investment in renovation for Luong Khanh Thien secondary school into Phu Ly city subproject

- Announcement on the conclusion of PPC’s Chairman at the meeting of report on adjusting designs of Lam Ha 1 and Lam Ha 2, which belong to Phy Ly city urban development subproject under WB’s financing (Announcement no. 1121/TB-VPUB dated October 1, 2014 of PPC’s office)

**World Bank’s safe policies and guiding documents**

World Bank’s safeguard policies t by Phu Ly subproject include:

- Environmental Assessment (OP/BP 4.01)
- Involuntary Resettlement (OP/BP 4.12)
- Physical Cultural Resources (OP 4.11)

### 1.3. BRIEF PROJECT DESCRIPTION AND ADDITIONAL ITEMS

#### 1.3.1. Project location

Project is located Phu Ly city, Ha Nam province. Project’s research scale is focused on areas having essential demands and important to create urban development motivation and improve environment, enhance people’s living condition. Areas included:

- Quang Trung ward, Phu Ly city
- North Chau Giang urban area
- Hoa Lac resident group, Lam Ha commune (belong to North Chau Giang urban area)
- Me Noi resident group, Liem Chinh commune, Phu Ly city
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

Figure 1. Project location and affected areas
Environmental management plan (EMP) for additional items
Medium urban development project – Phu Ly city subproject

Figure 2. Area locations of project
1.3.2. Project contents

Project includes 04 components with the investment listed below:

- Component 1: Improve services and upgrade basic infrastructures
- Component 2: Improve environmental sanitation
- Component 3: Roads and bridges of urban
- Component 4: Assist technique strengthen capacity

Table 1. The proposed investment items of Project

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Component 1</td>
<td>Upgrade basic infrastructure and improving services</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Quang Trung commune infrastructure</td>
<td>2</td>
<td>Range includes (i) constructing one road with 0.9 km length, (ii) installing a rainwater drainage system with 0.9 km length, (iii) install a water supply system connecting with an existing main water supply network, total of length is about 5km</td>
</tr>
<tr>
<td>1.2</td>
<td>Infrastructure of Hoa Lac resident group, Lam Ha commune</td>
<td>2</td>
<td>Range includes (i) upgrading the existing local road with 2.1km length and unchanged width; (ii) installing a wastewater – rainwater drainage system with 2.7km of total length; (iii) installing the water supply system to connect a existing main water supply network with 4.25km of total length</td>
</tr>
<tr>
<td>1.3</td>
<td>Infrastructure of Me Noi resident group, Liem Chinh commune</td>
<td>2</td>
<td>Range includes (i) Upgrading the existing local road with 0.8km length and unchanged width; (ii) installing a wastewater – rainwater drainage system with 0.8km of total length; (iii) installing the water supply system to connect an existing main water supply network with 6.12km of total length</td>
</tr>
<tr>
<td>1.4</td>
<td>Constructing school at Quang Trung ward</td>
<td>1</td>
<td>Construct (i) a primary school for 425 students; (ii) and kindergartens for 350 students</td>
</tr>
<tr>
<td>2</td>
<td>Component 2</td>
<td>Improve environmental sanitation</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Quang Trung and Lam Ha regulating lakes</td>
<td>2</td>
<td>Construct some regulating lakes at Lam Ha and Quang Trung wards with areas respectively are 14.7 ha and 2.5ha</td>
</tr>
<tr>
<td>2.2</td>
<td>Wastewater drainage system of the Northern Chau Giang along D4-N7 road</td>
<td>2</td>
<td>Construct a separated wastewater drainage system bases on a pipeline with 7km of length leading to Northern Chau Giang wastewater treatment plant that sponsored by project (see below), and (ii) a pipeline containing clean water along D4-N7 road that sponsored by project too (see below).</td>
</tr>
<tr>
<td>2.3</td>
<td>Wastewater pumping station</td>
<td>2</td>
<td>Construct two (2) wastewater pumping stations following component 2.2</td>
</tr>
</tbody>
</table>
### Environmental management plan (EMP) for additional items

**Medium urbans development project – Phu Ly city subproject**

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4</td>
<td>Pumping station at Quang Trung regulating lake</td>
<td>2</td>
<td>Construct a pumping station to control flood with capacity of 4,000 m³/h between Quang Trung regulating lake and Nhue river</td>
</tr>
<tr>
<td>2.5</td>
<td>Wastewater treatment plant of Northern Chau Giang</td>
<td>2</td>
<td>Construct a wastewater treatment plant for proposed urban of Northern Chau Giang area with capacity of 3,000 m³/day</td>
</tr>
</tbody>
</table>

#### 3 Component 3  
**Roads and bridges of urban area**

| 3.1 | D4-N7 road                                                           | 1 & 2 | Construct D4-N7 road to serve a Northern new urban, it is administrative and trading area of this city with 4.74km of length and there are 4 traffic lines, drainage system, walking route, lighting system, and other extensions for people |
| 3.2 | Bridge through Chau Giang river                                     | 2     | Construct a bridge with 4 lines, 195m of length, connecting with D4-N7 raid                                                            |

#### 4 Component 4  
**Project to support management and technical assistant**

| 4.1 | Supporting management and construction supervision                  | 1 & 2 | Range includes (i) supporting all activities of PMU: buying, reporting, financial and other monitoring activities, (ii) monitoring all activities of construction, and (iii) an Information – Education – Community (IEC). |
| 4.2 | Independent monitoring                                              | 1 & 2 | Range includes independent services for environmental monitoring and resettlement, (ii) financial audit; and (iii) review after project done. |
| 4.3 | Technical assistant                                                 | 1     | Range includes the independent programs for (i) urban planning; (ii) asset management and capacity strengthening, (iii) Build up a local audit ability |
| 4.4 | Equipment and vehicles                                              | 1     | Range includes to equipment and human resources to serve PMU and city agencies that relating to technical support program above          |
| 4.5 | Training                                                             | 1     | Range includes training for city authorities, PMU’s staff                                                                            |
| 4.6 | The operating cost of PMU                                           | 1 & 2 | It was sponsoring by counterpart funds, salaries of project management units, offices and other the costs related to the management of the project PMU. |

### 1.3.3. Project’s additional works

Project’s additional items belong to components 1 and 3 and include works as follows:

**1.3.3.1. Renovate and upgrade Luong Khanh Thien secondary school**

Luong Khanh Thien secondary school (belonging to Luong Khanh Thien ward had been added for investment according to document no. 1491/UBND-NV dated September 4, 2014 of Ha Nam province PC)
Total planning area is 2,865.5 m$^2$. Currently, Luong Khanh Thien secondary school has 427 students with 4 levels; 6$^{th}$ grade: 130 students, 7$^{th}$ grade: 94 students, 8$^{th}$ grade: 94 students and 9$^{th}$ grade: 109 students. Every grade includes 3 classes with the number of students equally.

The main construction components included 01 three-floors building with 12 study classes (construction area is 338.0 m$^2$), 01 two- floors building for subjects and administrative board (construction area is 325.0 m$^2$). Besides, there are several additional facilities such as safeguard house, garage, water tanks, fences, water and electricity systems, etc.... will be equipped.

![Figure 3](image_url). Construction location of Luong Khanh Thien secondary school

### 1.3.3.2. Embankment of North Chau Giang river, segment from outlet of Lac Trang II to Chau Giang bridge

Investment project to provide solution to prevent bank landslides and erosion as well as urban embellishment, upstream segment from Phu Ly bridge to discharging culvert of Me Noi pumping station, Phu Ly city, Ha Nam province was invested by Phu Ly city with total investment 219,187,519,000 VND (about 9.75 million $US)

Project’s objectives
Environmental management plan (EMP) for additional items
Medium urban development project – Phu Ly city subproject

- Prevent inland flood and create the advantages for inspection and management on embankment in flood season
- Prevent bank erosion, expand riverine corridor, create the beautiful landscape and protect ecosystem environment
- Ensure safety and convenience for waterway and road traffic on two Chau Giang riverside and development of urban and tourist infrastructures

Project includes the main items: the embankment of North and South Chau Giang riverside: (i) The embankment of North Chau Giang riverside with 1,513m of length, top elevation of wall +5m, reinforced concrete structure, width of sidewalk bordering embankment 10m, lighting system, drainage system; (ii) The embankment of South Chau Giang riverside with 1,360m of length, top elevation of wall +5m, width of sidewalk bordering embankment 3m, lighting system, drainage system.

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

It was planned that the project will be implemented from 2008-2011. In fact, from 2010 to 2013, 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.

Due to the need of expansion planning of Phu Ly city embellishment, especially Chau Giang riverside area to provide a combination of objectives: waterway traffic, tourism and recreation, recreation and the prevention of erosion phenomenon to ensure people’s safety. Therefore, it is clear that the embankment of Northern Chau Giang riverside is necessary.

In order to solve bank landslide issues for households living along North Chau Giang riverside, Phu Ly city MCDP subproject under the World Bank’s financing will sponsor 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. The rest of North embankment of Chau Giang river will continue the investment for this component in the next time when the city set up a funding source.

At the area of North Chau Giang embankment, the project area is composed of a local road along the river bank and residential land with many households living along the river bank and is about 20 m distant from the embankment. This area is along 1A Highway to Chau Giang bridge with a part of area bordered residential area (2,142m²), the remaining land (27810m²) is public land managed by ward PC. There is no navigation activity at the river. There area 19 graves need to be relocated in this area.

Main specifications of anti-landslide project:
- Type of work: Embanking to prevent erosion slope and embankment foot, IV-level-irrigation work
- Main works:

  * **North dyke of Chau Giang river**: L=1,513m. Dyke wall is the kind of wall with two layers, gravity wall, prismatic toe of embankment made by freestone, top elevation of wall +5m, reinforced concrete structure, width of sidewalk bordering embankment 10m, lighting system, drainage system.

  * **South dyke of Chau Giang river**: L=1,360m. Dyke wall is the kind of retaining wall with one layer, top elevation of wall +5m, width of sidewalk bordering embankment 3m, lighting system, drainage system.

*Main specifications of additional component “The embankment of North Chau Giang riverside from 1A Highway to Chau Giang bridge”*:

- The level of work: IV
- The length of embankment system: 807m
- Dyke structure: dyke wall is a type of retaining wall combined with embankment foot that had got elevation of top wall (+5.00m), reinforced concrete structure; Embankment foot with slope = 2m from elevation (+0.8) to elevation (-2.0), width of sidewalk 5 – 10m, drainage and lighting systems.

**The main volume:**

<table>
<thead>
<tr>
<th>No</th>
<th>Component</th>
<th>Unit</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Concretes</td>
<td>m3</td>
<td>7,464</td>
</tr>
<tr>
<td>2</td>
<td>Board wood form</td>
<td>m2</td>
<td>27,617</td>
</tr>
<tr>
<td>3</td>
<td>Steels</td>
<td>tons</td>
<td>582</td>
</tr>
<tr>
<td>4</td>
<td>Excavating land</td>
<td>m3</td>
<td>49,103 (Dredged sludge about 20,000m3)</td>
</tr>
<tr>
<td>5</td>
<td>Embanking land</td>
<td>m3</td>
<td>49,035</td>
</tr>
<tr>
<td>6</td>
<td>Freestone</td>
<td>m3</td>
<td>1,253</td>
</tr>
<tr>
<td>7</td>
<td>Falling freestone</td>
<td>m3</td>
<td>7,824</td>
</tr>
<tr>
<td>8</td>
<td>TS40 Geotextile</td>
<td>m2</td>
<td>1,854</td>
</tr>
<tr>
<td>9</td>
<td>Granit stone</td>
<td>m2</td>
<td>1,270</td>
</tr>
<tr>
<td>10</td>
<td>sawn stone</td>
<td>m2</td>
<td>6,959</td>
</tr>
</tbody>
</table>
1.3.3.3. Constructing North road segment connecting medical unit of Bach Mai hospital to D4-N7 road

The route invested on construction is located at Lam Ha ward, with the total length of 185.5 m and the width of 27 m. This route will connect D4-N7 road (investment under Component 3 of Phu Ly MCDP) at km 2+350 with to service land DVO4-NO2 to create the connection of city’s central area and convenience of traffic in whole area, and will improve infrastructure of Northern Chau Giang urban area. This route has been added into PL3-01 according to document no. 547/UBND-GTXD dated April 3rd, 2015 of Ha Nam province PC).

The areas are rice fields with irrigation ditch passing through. At present, the project area is uninhabited with sparse through traffic.

**Figure 4.** Location of Northern dyke of Chau Giang river
- Width of road surface according to planning is 27m (sidewalk 6.5m and road surface 14m), paving a part of two sides of sidewalk 3.5m, the others part will construct slope (due to there are rice field two sides). Road surface spraued 2 Asphalt Concrete layers: top layer of 5cm thick fine-grained, middle-layer of 7cm thick mediating particles of particles (first step constructing 7cm thick mediating particles).

- Infrastructure achieved:

  + Install the pipelines D110mm (cast-iron pipe) transferring clean water connecting from water supply pipelines D250mm (go along D4-N7 road) through Tunnel to the North sidewalk and contributing to existing pipelines D110mm (cast-iron pipe) of DVO4-NO2 land area, which was constructed already.

  + Rain drainage culvert along road: Set up a rain drainage culvert system along the left of road and a road culvert to contribute drainage system of DVO4-NO2 land area at existing manholes. Use D800-H10, D800-H30, D1250-H30 culverts

  + Manhole 1A (5 manholes), manhole 2A (1 manhole), manhole 4A (5 manholes), manhole 4B (1 manhole) and manhole 1A (5 holes), manhole 2A (1 holes), manhole 4A (5 holes), manhole 4B (1 holes), pit entry (12 pit entries).

  + Lighting system: install the lighting system (arranging two rows of light column on sidewalk in a symmetric manner) including light columns and equipments such as power cables connected from lighting system of D4-N7 road.

  + Tree rows: plant along two sidewalks of this route

Volume of excavated soil of earthworks is 2,331.26m$^3$ and volume of excavated soil of culvert system is 280.59m$^3$

Volume of earthworks soil is 8,404.86m$^3$, volume of culvert embarking soil is 198.33m$^3$. 
1.3.3.4. Constructing DT491 detour

Liem Chinh bridge (investment No 3.2 under component 3 – Road and bridge of urban of Phu Ly MCDP) will be constructed on Quarter 3/2015, 24. When the Liem Chinh Bridge is built, it will cut the existing 491 route with unfavorable elevation (about 2m), at the position of intersection which is at the top of bridge which has a large slope. It will cause influences to traffic on existing 491 route. Traffic density in this area is quite high. Therefore, in order to ensure traffic safety, it is necessary for construction of a new detour under Liem Chinh bridge, along South embankment of Chau Giang river and connected to existing 491 road (see Fig 6) The new DT491 detour will located below the Liem Chinh Bridge (about 4 m lower).

This proposed investment has been included PL3-02 bid package according to Document 694/UBND-GTXD dated May 28 of Ha Nam province PC.
DT491 detour locates at Liem Chinh ward with 568.67m of total length. The first detour is on T-junction of Liem Chinh gas station (near Me Noi pagoda) and under Liem Chinh bridge. This detour is near Me Noi pagoda (about 80 m) and runs along South embankment of Chau Giang river (about 320 m), then turn right to connect with existing DT491 route.

![DT491 detour location](image)

**Figure 6. Location of DT 491 detour**

The scope of investment for this route: 568.68m of length (including 10.5m of pavement, 3m of every sidewalk), 16.5m of width. The drainage system used in the route is the two side trench that connected to existing Phu Dong culvert, arranged manholes for collecting surface water.

**Total mass volume**

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Unit</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>DT491 detour</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chau Giang river</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Old 491 road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Liem Chinh bridge over Chau River</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 3. Summary of DT491 detour construction volume**
## Environmental management plan (EMP) for additional items
### Medium urbans development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>A.</th>
<th>DT491 detour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment’s length</td>
<td>m</td>
</tr>
<tr>
<td></td>
<td>586.67</td>
</tr>
</tbody>
</table>

### I. Embankment

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>m3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td></td>
<td>371.94</td>
</tr>
<tr>
<td>2</td>
<td>Foundation digging</td>
<td></td>
<td>2289.24</td>
</tr>
<tr>
<td>3</td>
<td>Remove unsuitable soil</td>
<td></td>
<td>1719.68</td>
</tr>
<tr>
<td>4</td>
<td>Cutting existing pavement</td>
<td></td>
<td>169.65</td>
</tr>
<tr>
<td>5</td>
<td>Filling embankment K95</td>
<td></td>
<td>8460.95</td>
</tr>
<tr>
<td>6</td>
<td>Subgrade K98 thickness 50cm</td>
<td></td>
<td>2702.07</td>
</tr>
</tbody>
</table>

### II. Pavement

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>m2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Smooth asphalt concrete 5cm</td>
<td>m2</td>
<td>6335.47</td>
</tr>
<tr>
<td>2</td>
<td>Bitumen tack coat 0.5kg/m2</td>
<td>m2</td>
<td>6335.47</td>
</tr>
<tr>
<td>3</td>
<td>Rough asphalt concrete 7cm</td>
<td>m2</td>
<td>6335.47</td>
</tr>
<tr>
<td>4</td>
<td>Bitumen prime coat 1kg/m2</td>
<td>m2</td>
<td>6335.47</td>
</tr>
<tr>
<td>5</td>
<td>Base 15cm</td>
<td>m3</td>
<td>950.32</td>
</tr>
<tr>
<td>6</td>
<td>Subbase 25cm</td>
<td>m3</td>
<td>1583.87</td>
</tr>
</tbody>
</table>

### III. Side walk

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>m2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brick Sidewalk</td>
<td>m2</td>
<td>2748.51</td>
</tr>
<tr>
<td>2</td>
<td>Mortar M100# thickness 2cm</td>
<td>m2</td>
<td>2748.51</td>
</tr>
<tr>
<td>3</td>
<td>Compacted yellow sand 10cm</td>
<td>m3</td>
<td>274.85</td>
</tr>
<tr>
<td>4</td>
<td>Curb BTXM 23x26x100 (cm)</td>
<td>m</td>
<td>1046.40</td>
</tr>
<tr>
<td>5</td>
<td>Curb BTXM 23x26x100</td>
<td>ck</td>
<td>1046.00</td>
</tr>
<tr>
<td>6</td>
<td>Concrete 20MPa, stone 1x2</td>
<td>m3</td>
<td>57.53</td>
</tr>
<tr>
<td>7</td>
<td>Concrete form</td>
<td>m2</td>
<td>1004.16</td>
</tr>
<tr>
<td>8</td>
<td>Mortar M100# 2cm</td>
<td>m3</td>
<td>4.60</td>
</tr>
<tr>
<td>9</td>
<td>Concrete 10MPa, stone 1x2, thickness 10cm</td>
<td>m3</td>
<td>28.24</td>
</tr>
<tr>
<td>10</td>
<td>Ditch panel BTXM kt 25x50x5 (cm)</td>
<td>m</td>
<td>1046.40</td>
</tr>
<tr>
<td>11</td>
<td>Ditch panel BTXM kt 25x50x5</td>
<td>ck</td>
<td>523.00</td>
</tr>
<tr>
<td>12</td>
<td>Concrete 20MPa, stone 1x2</td>
<td>m3</td>
<td>3.27</td>
</tr>
<tr>
<td>13</td>
<td>Concrete form</td>
<td>m2</td>
<td>39.23</td>
</tr>
<tr>
<td>14</td>
<td>Mortar M100, thickness 2cm</td>
<td>m3</td>
<td>1.31</td>
</tr>
<tr>
<td>15</td>
<td>Concrete 10MPa, stone 1x2 thickness 5cm</td>
<td>m3</td>
<td>3.27</td>
</tr>
<tr>
<td>16</td>
<td>Sidewalk block</td>
<td>m</td>
<td>633.60</td>
</tr>
</tbody>
</table>
1.3.4. The ancillary facilities

The ancillary facilities for additional items include construction of material transport routes, worker’s camps, and temporary warehouse. This works will be used temporarily in project construction process.

**Route leading to the site**

*For item of Luong Khanh Thien secondary school:*

- Access roads are the local Le Loi road and the road along South Chau Giang riverside

*For item of North Chau Giang riverside and road connecting from medical basis of Bach Mai hospital to D4-N7 road:*

- Access road to the site is local road in Lam Ha ward

*For DT491 detour:*

- Access road to site is existing 491 road and local road of Liem Chinh ward

**Campus**

The camps will be set up to sever workers, construction contractors, monitoring management staff and engineers. Warehouses will be used to contain construction materials and equipment.

**Water supply system**

Surface water is a water supply source for activities on site. Drinking water is taken from clean water supply system of Ha Nam province.

Domestic and construction water: use city’s urban domestic water

**Construction materials**

Types of construction material using for project are taken from permitted natural mines. Ha Nam province is the land having variety construction material sources, can fully supply some construction materials such as: Soil, rock, asphalt.

- Soil: can be taken at Thanh Nhi – Thanh Liem mine (Ha Nam province handed over this mine to companies, management organization for exploitation); the site of this borrow pit is about 13 – 15km distant from construction site.

- Rock: can be taken from quarries of Cum mountain, which belong to Thanh Hai commune, Thanh Liem ward (exploited and managed by Thanh Tam Ltd Company), Dong Ao quarry belongs to Thanh Thuy commune, Thanh Liem ward (exploited and managed by Trannmeco construction stone One member Ltd Company), which is about 13 – 20 km distant from construction site.
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

- Sand: can be taken from Cau Yen Lenh, Moc Nam commune, Duy Tien district, Ha Nam province (exploited and managed by Thuy Hien commercial construction material Ltd Company), sand mine Nguyen Ly – Ly Nhan – Ha Nam outside Red river’s alluvial ground belongs to Tran Xa village, Nguyen Ly commune, Ha Nam (the commune handed over this mine to Mr.Dang Xuan Phuong for management and exploitation) and transported from Red river through Thuong Tin district (Hanoi) to site on Highway 1A.

**Route of material transportation**

Route of material transportation mainly is overland (1A Highway, DT491, DT492, local traffic route in commune, ward of Phu Ly city) to the construction site

**Landfill:** The waste treatment area at Thung Dam Gai, Thanh Thuy commune, Thanh Liem district

1.3.5. Institutional Arrangement

**Investment decision maker:** Ha Nam Province People’s Committee (PPC), is responsible for:

- To provide guidance and execution to the project;
- To provide counterpart fund for the subproject; instruct the project owner to comply with the Credit Agreement covenants; instruct relevant departments to carry out assigned tasks during implementation;
- To arrange for review and approval of the subproject Feasibility Study Report.

**Project owner:** Phu Ly Town People Committee

The project owner is responsible for

- Establishing and maintaining a Project Management Unit during the project implementation and
- Directly managing the project preparation, land acquisition and implementation;
- Preparing compensation and resettlement plan;
- Coordinating with relevant local departments to carry out tasks as assigned by the PPC; reporting to the PPC, various ministries and partners on relevant issues;
- Procurement of civil works as per the applicable Law on Procurement and relevant Decrees and Circulars;
- Complying with relevant GoV’s applicable regulations and Credit Agreement covenants

**Project Management Unit (PMU)**

The PMU will be in operation from project preparation to physical completion of all components, final payment and hand-over.

The PMU will be responsible for

- Directly managing and monitoring the project preparation, land acquisition and implementation;
Preparing compensation, relocation and resettlement plan;

Coordinating with relevant local departments to carry out tasks as assigned by the PPC; reporting to the PPC, various ministries and partners on relevant issues, implementation progress and performance;

Recruiting the project consultant and contractors for all components of works as per applicable regulations

**Operation and Maintenance Agencies**

*Urban Management Division, Phu Ly city:*

Receive and manage items under component 3: Urban roads and bridges

*Ha Nam Environment and Urban construction JSC*

To receive and manage investment items under components 1, 2 and 3 including:

- Manage and operate the drainage system and wastewater treatment plant
- Urban lighting;

*Ha Nam Water Supply JSC*

To receive and manage items under component 1 and 2 in the field of water supply

**1.3.6. Implementing plan for the additional works**

*Implementing plan*

Construct Luong Khanh Thien secondary school: 2015-September/2016

Embanking North Chau Giang riverside: 2015-June/2017

27m Road connecting from medical basis of Bach Mai hospital to D4-N7 road: 2015-August/2016

DT491 detour: 2015-June/2017

**1.4. PROJECT’S AREA OF INFLUENCE**

From the point of view of the environmental and social assessment of a project, it is important to define the area for that environmental and social impacts are being considered.

The proposed Luong Khanh Thien secondary school is next to Luong Khanh Thien primary and kindergarten. Additionally, there were a lot of households around this construction area. In front of school is Le Loi road and a market on Le Loi road, which at a distance about 200m from the school. Construction land area is on existing ground of school (1,322m²).

At the area of North Chau Giang embankment, the project area is composed of a local road along the river bank and residential land with many households living along the river bank and is about 20 m distant from the embankment. This area is along 1A Highway to Chau Giang bridge with a part of area bordered residential area (2,142m²), the remaining land (27810m²) is public land
managed by ward PC, mainly is duckweed, weed and bamboo. There is no navigation activity at the river. There area 19 graves need to be relocated in this area.

Regarding the proposed Northern road connecting medical unit of Bach Mai hospital to D4-N7 road, the project area is composed of rice field, uninhabited and is agricultural land (3,962 m²).

Area of construction DT491 detour: the affected area directly is Me Noi resident group, people living along old 491 road. In which, people’s housing land is 409 m², and 9,084 m² of public land managed by ward PC.

The project area of influence of the proposed investments includes the project area and surrounding area where the new investments are constructed. Environmental impacts of the project investments will also relate to some others area like the Chau Giang river section where the embankment activities are carried out, borrow pits for the Northern road and Northern Chau Giang embankment, and disposal of dredged materials and WWTP sludge at the city sanitary landfill; affected area also includes transportation route such as embankment along Chau Giang river, local traffic route in Lam Ha ward, 491 existing route, camps on site.

Besides, there are several projects already implemented or prepared to conduct can cause influences indirectly to this project, including projects as following:

- Name of project: urgent solving project shore erosion and urban embellishment at section of upstream of Phu Ly culvert from Phu Ly bridge through 1A National Highway to the discharging channel of Me pump station, Phu Ly town, Ha Nam province
- Investor: Phu Lu city People’s Committee
- Funding source: The central budget and other funding sources
- Objectives of project:
  o Prevent inland flood; facilitate the inspection and management of dykes during rainy seasons and flood situations.
  o Protection and prevention of bank scouring, enlargement of the river gateway, embellish the landscape, protect ecological environment.
  o Ensure safe and convenient transportation along Chau Giang river banks, urban infrastructure and tourism development.

Project includes the main items: the embankment of North and South Chau Giang riverside: (i) The embankment of North Chau Giang riverside with 1,513 m of length, top elevation of wall +5 m, reinforced concrete structure, width of sidewalk bordering embankment 10 m, lighting system, drainage system; (ii) The embankment of South Chau Giang riverside with 1,360 m of length, top elevation of wall +5 m, width of sidewalk bordering embankment 3 m, lighting system, drainage system.

FS report approved according to Decision 854b/QD-UBND dated July 18, 2008. EIA report of project also approved according to Decision 705/QD-UBND dated July 12, 2010.
Project implementation progress: 2008-2011. From 2010 to 2013, Investor deployed the construction completion of South riverside from 1A Highway to Liem Chinh bridge. Currently, the embankment segment of North riverside is in research stage and have not yet carried out because the funding source is unallocated.

Due to the need of expansion planning of Phu Ly city embellishment, especially Chau riverside area carries out the combination between waterway traffic and services of tourist, recreation and the prevention of erosion phenomenon to ensure people’s safety so embanking Northern Chau Giang riverside is necessary.

In order to solve bank landslide issues for households living along North Chau Giang riverside, Phu Ly city subproject and a funding source of World Bank will sponsor a part of Northern embankment segment of Chau Giang river from Highway 1A to Chau Giang bridge (belong to Lam Ha ward), it is an area that frequently suffers erosion affecting the safety of people living along the river. The completion of North embankment of Chau Giang river will be undertaken when additional funding is identified.

Main specifications of anti-landslide project:

- Type of work: Embanking to prevent erosion slope and embankment foot, IV-level-irrigation work

- Main works:

  * **North dyke of Chau Giang river**: L=1,513m. Dyke wall is the kind of wall with two layers, gravity wall, prismatic toe of embankment made by freestone, top elevation of wall +5m, reinforced concrete structure, width of sidewalk bordering embankment 10m, lighting system, drainage system.

  * **South dyke of Chau Giang river**: L=1,360m. Dyke wall is the kind of retaining wall with one layer, top elevation of wall +5m, width of sidewalk bordering embankment 3m, lighting system, drainage system.

Relation to subprojects in Phu Ly city: Currently, embanking South Chau Giang riverside has been already completed. Embanking North Chau Giang riverside hasn’t been carried out yet. A part of embankment segment of North Chau Giang riverside from Highway 1A to Chau Giang bridge will be sponsored by the Phu Ly MCDP project. There are no identified cumulative impacts.
2. NATURAL, ENVIRONMENTAL AND SOCIAL-ECONOMIC CONDITIONS

2.1. Natural condition

2.1.1. Geographical location

Phu Ly City is the political, economic and cultural center of Ha Nam Province, located in the central part of the province, at the confluence of three large rivers: Day, Nhue and Chau Giang. It is located 50 km southwest of Hanoi at the North Latitude of 20°30’- 20°35’ and the East Longitude of 105°54’ – 105°58’. Geographical boundaries of Phu Ly city are as follows:

- The Eastern and Southern border Thanh Liem district.
- The Western borders Thanh Liem district and Kim Bang district.
- The Northern borders Kim Bang district and Duy Tien district.

Liem Chinh ward belongs Phu Ly city, the Eastern borders Liem Tuyen ward, the Western borders Tran Hung Dao ward, the Southern borders Thanh Chau ward and Liem Trung commune, the Northern borders Lam Ha ward and Liem Tuyen commune.

DT 491 detour belongs to Me Noi village, Liem Chinh ward, the first point of this detour route is on T-junction of Liem Chinh gas station (near Me Noi pagoda). This detour route run along embankment of Southern Chau Giang riverside (about 320m), after that, turn right to connect with existing DT491 route. Area of affected land is 9,493 m$^2$, in which, people’s housing land is 409 m$^2$, 9,084 m$^2$ of public land managed by ward PC. There is a Me Noi pagoda next to the 491 route pavement. This route has been under clearance and handed over to project.

Lam Ha ward belongs to Phu Ly city, the Eastern borders Tien Hai ward, the Western borders Quang Trung ward, the Southern borders Luong Khanh Thien and Liem Chinh wards, the Northern borders Tien Tan and Tien Hiep communes.

Northern route connecting medical unit - Bach Mai hospital D4-N7 road is located at Lam Ha ward, the Northern and Southern border people’s rice field, the Western borders D4-N7 road which has been constructed, the Eastern is deserted land with agricultural irrigation ditch flowing through. All of acquisition area is agricultural land (3,962 m$^2$), the number of affected households is 17 households, and there are no households that require resettlement.

Regarding embankment of North Chau Giang riverside from Highway 1A to Chau Giang bridge is belong Lam Ha ward. The land consists of people’s housing land (2,142m$^2$), the remaining public land (27,810 m$^2$) managed by ward PC. The number of affected households of land acquisition is 62 households, of which 12 households has to be resettled. There is a small temple of Dinh Trang residential quarter, about 20 m distant from the Northern embankment section. There is no navigation activity at the Chau Giang river.

Luong Khanh Thien ward belongs to Phu Ly city, the Northern borders Chau Giang river, the Eastern borders Liem Chinh ward, the Western borders Quang Trung ward.
Luong Khanh Thien secondary school belongs to Luong Khanh Thien ward, the Northern borders a road along Chau Giang river, the Southern borders Le Loi road, the Western borders Luong Khanh Thien preschool and the Eastern border Luong Khanh Thien primary school. In front of the school is Le Loi road and a market on Le Loi road, which is about 200 m distant from the school. Construction land area is on existing ground of school (1,322m²), and no land acquisition is required.

North embankment area of Chau Giang river

The road connected from medical basis of Bach Mai hospital to D4-N7 road

South embankment had been under completion
Project area is located in the region with specific climate of the northern delta in a tropical monsoon, more sun and rain. There are main seasons:

Winter season: lasts from November to April of next year, mainly is damp cold northeast monsoon, a lot of rainy days. Weather particularly causes unpleasant and harmful for agriculture, the forms of "drizzle northern wind" damaging cold, very cold and wet.

Summer season: lasts from May to October, hot weather and strong fluctuations for various types of weather causing heavy rains, floods, all kinds of grooves, typhoon, tropical convergence...

Under is some indicators of climate factors monitored at Phu Ly station:

**Air temperature:**

Average air temperature is 23.1°C. the highest average temperature of month is 32.1°C (July), absolutely highest temperature is 41.5°C, the lowest air temperature is 14.2°C month average (January), the absolutely lowest temperature is 4.5°C, the hottest month is the month VI, VII and VIII, the coldest month is the month I, II and XII.

**Rain:**

The average annual rainfall in years is 1,697mm. The rainy season starts from May to October with a total average rainfall is 1,442mm for full season, accounting for 85% of the average annual rainfall; rainfall of 4 largest consecutive month (the month VI to IX) averagely is 1,085mm, accounting for 64% of average annual rainfall. Dry season from November to April next year with average annual rainfall is 255mm, just accounting for 15% of the average annual rainfall. The average rainfall of 3 consecutive driest months (December to February) is 75mm, accounting for 4.4% of average annual rainfall. The average number of rainy days in that year is
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

146.4 days from March to September. Averagely, each month got about 12.3 – 17.4 days of rain. For the November and December, this two months just got 5.2 – 6.3 days of rain.

**Humidity:**

Average humidity of month is 85.1% and the absolutely lowest humidity for years is 17 – 41%. Time getting the highest humidity is February to April, about 87.6%.

**Wind, storm:**

The average wind speed is 3.0m years/s, the maximum wind speed caused by storm and tempest or the northeast monsoon observed is 36m/s.

**Sunny:**

Total number of sunshine hours in many average years is about 1,693 hours, there are 4.6 hours of sunshine per day.

### 2.1.3. Hydrological conditions

Chau river: Chau river (or Chau Giang river) flows over Phu Ly city with winding, meandering shapes and complex flow. The mainstream approached the left side from Me prison to the end of Me embankment. The upstream segment from Phu Ly bridge to 1A National Highway, the mainstream approached he right side, uneven riverbed’s width is about 100-180m, elevation of this river is from (-2m) to (-4m). Particularly, there is local deep location (-7m) and it is in front of Luong Khanh Thien secondary school. This area can be landslide, causing dangerous to the households who are living here.

**Chau Giang river’s hydrogeology:** the Chau Giang water source is belong to Phu Ly city and it is influenced by upstream of the Red River system. The average water level in dry season for many years is +1.2m. The flood season, the average water level for many years is +2.18m. Respectively the water source flows of dry season and flood season are Q = 36 m³/s, Q = 69.61 m³/s.

Annual surface water run-off from the Red, Day and Nhue rivers into the territory is about 87.6 billion m³. Groundwater flows through the territory is always supplemented by those from other regions. Day river’s basin area is 5,800 km² with 240km of river length, the length flows through Ha Nam province is 47 km. According to Ha Nam hydrometeorology station, Day river’s water level at Phu Ly station is as following:

The driest water level: -0.14m (in dry season)

Water level of history flood: 4.72m (in 1985)

Alarm water level: Alarm 1: +2.9m; Alarm 2: +3.5m; Alarm 3: +4.1m (according to Decision 632/QDTTg dated May 10th, 2010 of Prime Minister at Phu Ly station).

Day river’s flow is about 105 m³/s in dry season and 400 m³/s in rain season

The Nhue River is a tributary of the Red River from Thuy Phuong (Tu Liem, Hanoi) into Ha Nam province with a length of 14.5 km, and it then flows into the Day river (Phu Ly city). Nhue
river not only supplies water for agriculture irrigation but also is area receives most of wastewater and rain water of Ha Noi Capital.

![Diagram of river basins in Ha Nam province](image)

**Figure 8.** Basins of Chau Giang river, Day river in Ha Nam province

### 2.1.4. Geological engineering, hydrogeology

**Geological engineering:** regional stratigraphy consists of 4 grades: Grade 1 is a mixture of brown and gray clays with hard state; Grade 2 is a mixture of gray and gray-brown clays with plastic state; Grade 3 is a mixture of mud and gray sand; and the other grade is gray, brown, small dust.

Groundwater level appears in the bores about +0.75 to +1.65 meters elevation, river water levels measured about +1.20 to +1.36 meters

### 2.1.5. Ecosystem and biological resources

Plant species in project area mainly are rice, sweet potato, potato... Some fruit trees, timbers such as eucalyptus, longan, litchi... and some grass and weeds. There are no rare plant species.

Animals: most kind of animals here aren’t rare species (birds, starlings, mouses, lizards, frogs, paddock...).

Underwater flora and fauna mainly are perch, snails, crustaceans (shrimp, crab...) Plant species include hyacinth, duckweed, spinach, vegetables, water grass...
In general, biological resource and ecosystem in this area are poor and there are no rare animal and plant species, mainly biological resource and ecosystem were made by human so sustainability, stabilities ecological value are low.

2.2. Social-economic condition

2.2.1. Luong Khanh Thien ward

Total revenues in 2014 of Luong Khanh Thien ward is 6,662,903,457 VND increasing 44.37% compared to the plan.

In the field of administration: Ward also regularly checked the land encroachment at Chau Giang river embankment area.

In the social-cultural field: Carrying out well some contents about disseminating Party’s celebration.

Invalids and Social Affairs: implementing well the task giving subsidized rice to poor people.

The medical, education field: propagandaat the facilities to avoid disease outbreaks.

The political, security situation, social order and safety, traffic safety on the ward are stable.

2.2.2. Lam Ha ward

Agricultural production: Total planted area in first 6 months of 2015 was 206 ha, got 100% area, of which the area planting rice is about 190.6ha, 15.5 ha of crop. Total cattles and poultries are 27,560 units.

Industry, handicraft industry: industrial production and handicraft values of 6 months was estimated at 4.2/9.7 billion with 43.2% of annual plan.

Social-Cultural: implementation of clearance, agricultural productions, remodeling of religious relics.

Labour, Invalids and Social Affairs: The basic social policies ensure to priority subjects fully and timely

Education: 3 national standard schools in Phase 1, the remaining elementary school is completing procedures to request recognition of the national standards in stage 2.

Health: Making good disease prevention and primary health care for people.

Transportation, environmental hygiene: frequently checks traffic routes, handles households squatting sidewalk, making good works of garbage collection, sanitation.

2.2.3. Liem Chinh ward

In 2014, Liem Chinh ward has carried out economic-social development plan and it has been achieved some results as following:

- There was 70% households in ward achieving commercial service development targets (achieve 100% ward PC’s resolution proposed)
- Budget revenue reached 117.3% of the allocated plan
- Completed criteria of calling youth to enlist
- Rate of poor households dropped to 30 households, corresponding to 1.54% (down 17 households compared with the assigned plan), poor marginal households was 27, corresponding to 1.38%.
- Rate of natural population growth were 0.9%, increasing 0.7% with ward’s resolution
- Education: the schools have still reached the national standard for years
- Medical: medical examination, treatment and prevention have been achieved high effects
- Securities: ensure security and order, social security

2.2.4. Physical cultural works

In area of implementation of several additional investments, there are some cultural works can be affected during construction process:

- The small temple near area of embankment of North Chau Giang riverside (about 20m distant) belongs to Dinh Trang residential quarter, Lam Ha ward
- Me Noi pagoda (Me Noi village, Liem Chinh ward) is next to the DT491 detour (construction area of DT491 detour)
- There are 19 graves needed to be relocated in project area of North bank of Chau Giang river (Lam Ha ward)

2.2.5. Water supply system

The used water source supplying for Phy Ly city is surface water of Day river. This water source was treated by 2 water treatment plants

- Water supply treatment plant No.1 is located in Quang Trung ward, Phu Ly city with capacity of 10,000 m3/day, built in 1997s
- Water supply treatment Plant No.2 is located in Thanh Son commune, Kim Bang district with capacity of 21,000 m3/day, built in 2001.

The water supply network includes a pipeline that connects consumer households comprises of conveyance, distribution and services lines and various materials such as cast iron, plastic and galvanized-iron pipes. About 96% of the city’s population is connected to the supply network. Total length of the main pipelines is around 25km with diameter 100 – 300 mm

Besides, the households living in this area have also used rain water and water of the drilling wells serving their living activities, however, those water quality are not good.

2.2.6. Drainage system

The city has a combined drainage system in the old urban areas and combined drainage system for wastewater and rain water. The combined drainage system in the old urban areas is relatively
stable, while in the new urban areas, the drainage system is still under construction. Drainage collection systems and treatment plants are being built in each area.

Currently, domestic, industrial and hospital wastewater as well as agriculture wastewater is discharged directly into the storm water drainage and then into existing water bodies of the city including Chau Giang, Nhue and Day Rivers.

### 2.2.7. Solid waste management

Currently, the solid waste processing plant No.1 has been under operation. This plant is located in Thung Dam Gai, Thanh Thuy commune, Thanh Liem district, about 10 km distant from Phu Ly city. The plant area is 4.5 ha. Capacity of solid waste treatment is about 120 tons per day. Solid waste will be collected daily and transported to solid waste processing plant in Thung Dam Gai, Thanh Thuy commune, Thanh Liem district.

### 2.2.8. Traffic system status

*Overview traffic network in Phu Ly city area*

**+ Railway:**
- North-South railway: runs parallel to National Highway 1A, and is 01 m single track facility;
- Specialized railway runs from the Phu Ly station to the Thinh Chau station and the But Son cement factory, 5 km long, with single 01 m track.

**+ Waterway:**
- The Day River route: 8 km in length, third level engineering standard of river, minimum width is 100 m, minimum depth is 2.5 m, maximum water level is 4.72 m. Ships of up to 200T can pass through;
- The Nhue River route: 3.5 km length, average width of 60 m; min depth is 3.0 m;

**+ Roads:**
- National Highway No.1A (Le Hoan Street) runs through Phu Ly city with 3.7 km length; the road’s surface is made of asphalt concrete, sections: 5m+11.5m+2m+11.5m+5m+5m
- Highway No.21B: Running through Phu Ly city is 0.5 km long. The road’s surface is made of asphalt concrete, 5 m in width.
- Highway No.21A (Dinh Tien Hoang, Tran Binh Trong, Dinh Cong Trang, and Ly Thuong Kiet Streets): Running through Phu Ly city is 9.5km. The road’s surface is made of asphalt concrete, 12 m in width.
- Provincial Road No.971 (Tran Hung Dao street to Ly Nhan): Running through Phu Ly city is 2.5 km; 7 m in width;
- Cau Gie – Ninh Binh Highway to the east of the project area: under construction;
- **Inner-city traffic:** The city’s inner city network is based on a grid, with roads about 150 – 200 m apart; most of which have been asphalted. The road network in the east of the city is degraded with no pavements. The road network in west is new, and the quality is still good.
Total length of the Phu Ly city’s road network: 236.5km, in which:
  + Inter-provincial roads: 29 km
  + Urban roads: 33.5 km
  + Roads in villages, hamlet, roads to field: 174 km

2.3. Environmental quality status

Condition of environmental quality status through field-work in areas as following:

2.3.1. Mud quality

**Table 4. Result of analyzing mud quality (July 13, 2015)**

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Unit</th>
<th>Test result</th>
<th>QCVN 43:2012/MONRE (Freshwater sediment)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>B1</td>
<td>B2</td>
</tr>
<tr>
<td>1</td>
<td>As</td>
<td>mg/kg</td>
<td>1,594</td>
<td>1,961</td>
</tr>
<tr>
<td>2</td>
<td>Cd</td>
<td>mg/kg</td>
<td>0,35</td>
<td>0,40</td>
</tr>
<tr>
<td>3</td>
<td>Cu</td>
<td>mg/kg</td>
<td>15,87</td>
<td>16,20</td>
</tr>
<tr>
<td>4</td>
<td>Pb</td>
<td>mg/kg</td>
<td>12,80</td>
<td>19,05</td>
</tr>
<tr>
<td>5</td>
<td>Zn</td>
<td>mg/kg</td>
<td>17,50</td>
<td>36,05</td>
</tr>
<tr>
<td>6</td>
<td>pH (H₂O)</td>
<td>-</td>
<td>6,27</td>
<td>6,85</td>
</tr>
</tbody>
</table>

B1, B2: Chau Giang river’s mud samples

Sampling time: 9:20am – 9:30am on July 13, 2015

Sampling location: B1 (N20°54'28.27'', E105°92'17.99'') Chau Giang riverbed mud at area of construction of North Chau Giang riverside embankment

Sampling location: B2 (N20°54'54.62'', E105°91'63.88'') Chau Giang riverbed mud at area of construction of North Chau Giang riverside embankment

Analysis results show that analyzing parameters of this mud samples aren’t exceed allowable standards according to QCVN 43:2012/BTNMT – National technical regulations on sediment quality

2.3.2. Air quality

**Table 5. Result of analyzing air quality (July 13, 2015)**

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Unit</th>
<th>Test result</th>
<th>QCVN 05:2013/MONRE TB 1h</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Temperature</td>
<td>°C</td>
<td>31.2</td>
<td>33.2</td>
</tr>
<tr>
<td>2</td>
<td>Humidity</td>
<td>%</td>
<td>72.1</td>
<td>68.2</td>
</tr>
<tr>
<td>3</td>
<td>Wind direction</td>
<td></td>
<td>North-South</td>
<td>North-South</td>
</tr>
<tr>
<td>4</td>
<td>Wind velocity</td>
<td>m/s</td>
<td>1.2</td>
<td>1.1</td>
</tr>
<tr>
<td>5</td>
<td>Noise</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) for additional items
Medium urban development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Unit</th>
<th>Test result</th>
<th>QCVN 08:2008/MONRE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>NM1</td>
<td>Cột B1</td>
</tr>
<tr>
<td>1</td>
<td>Temperature</td>
<td>°C</td>
<td>30,7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>pH</td>
<td>-</td>
<td>7,04</td>
<td>5,5-9</td>
</tr>
<tr>
<td>3</td>
<td>TSS</td>
<td>mg/l</td>
<td>2,5</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>TDS</td>
<td>mg/l</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>COD</td>
<td>mg/l</td>
<td>7,6</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>BOD</td>
<td>mg/l</td>
<td>3,4</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>DO</td>
<td>mg/l</td>
<td>6,07</td>
<td>≥ 4</td>
</tr>
<tr>
<td>8</td>
<td>NH₄⁺(N)</td>
<td>mg/l</td>
<td>0,394</td>
<td>0,5</td>
</tr>
<tr>
<td>9</td>
<td>NO₂⁻(N)</td>
<td>mg/l</td>
<td>0,065</td>
<td>0,04</td>
</tr>
<tr>
<td>10</td>
<td>NO₃⁻(N)</td>
<td>mg/l</td>
<td>0,409</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>PO₄³⁻(P)</td>
<td>mg/l</td>
<td>0,037</td>
<td>0,3</td>
</tr>
<tr>
<td>12</td>
<td>Cl⁻</td>
<td>mg/l</td>
<td>14,86</td>
<td>600</td>
</tr>
<tr>
<td>13</td>
<td>SO₄²⁻</td>
<td>mg/l</td>
<td>9,995</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Total Fe</td>
<td>mg/l</td>
<td>0,303</td>
<td>1,5</td>
</tr>
<tr>
<td>15</td>
<td>Pb</td>
<td>mg/l</td>
<td>0,001</td>
<td>0,05</td>
</tr>
<tr>
<td>16</td>
<td>Cu</td>
<td>mg/l</td>
<td>0,021</td>
<td>0,2</td>
</tr>
<tr>
<td>17</td>
<td>Mn</td>
<td>mg/l</td>
<td>0,223</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Zn</td>
<td>mg/l</td>
<td>0,109</td>
<td>1,5</td>
</tr>
<tr>
<td>19</td>
<td>Total N</td>
<td>mg/l</td>
<td>2,861</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Total P</td>
<td>mg/l</td>
<td>0,247</td>
<td></td>
</tr>
</tbody>
</table>

KK1: Air sample nears Luong Khanh Thien secondary school and Chau Giang river (N 20°54'55" E 105°9'16")

KK2: Air sample nears residential area along Chau Giang river, the segment of construction of North Chau Giang riverside embankment (N 20°55'50" E 105°9'21")

Analyzing parameters of air samples aren’t exceed allowable standards according to QCVN 05:2013/MONRE – National technical regulations on ambient air and (*) QCVN 26:2010/MONRE – National technical regulations on noise

2.3.3. Surface water quality

Table 6. Result of analyzing surface water quality (July 13, 2015)
NM1: Surface water sample of Chau Giang river at area of North embankment of Chau Giang river.

Parameter NO$_2^-$ of this surface water exceeds allowable standards according to QCVN 08:2008/MONRE – Column B1- National technical regulations on surface water quality using for proposes of irrigation or other similar using proposes, the remaining parameters are acceptable.

### 2.3.4. Underground water quality

Table 7. Result of analyzing underground water quality (July 13, 2015)

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Unit</th>
<th>Test result</th>
<th>QCVN 09:2008/ MONRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Temperature</td>
<td></td>
<td>30,7</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>pH</td>
<td>-</td>
<td>6,26</td>
<td>5,5-8,5</td>
</tr>
<tr>
<td>3</td>
<td>TDS (g)</td>
<td>mg/l</td>
<td>275</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>NH$_4^+$ (N)</td>
<td>mg/l</td>
<td>3,859</td>
<td>0,1</td>
</tr>
<tr>
<td>5</td>
<td>NO$_2^-$ (N)</td>
<td>mg/l</td>
<td>0,020</td>
<td>1,0</td>
</tr>
<tr>
<td>6</td>
<td>NO$_3^-$ (N)</td>
<td>mg/l</td>
<td>0,112</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>SO$_4^{2-}$</td>
<td>mg/l</td>
<td>0,355</td>
<td>400</td>
</tr>
<tr>
<td>8</td>
<td>PO$_4^{3-}$ (P)</td>
<td>mg/l</td>
<td>0,024</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Cl</td>
<td>mg/l</td>
<td>36,35</td>
<td>250</td>
</tr>
<tr>
<td>10</td>
<td>Hardness</td>
<td>mg/l</td>
<td>131,54</td>
<td>500</td>
</tr>
<tr>
<td>11</td>
<td>Mn</td>
<td>mg/l</td>
<td>2,627</td>
<td>0,5</td>
</tr>
<tr>
<td>12</td>
<td>Fe</td>
<td>mg/l</td>
<td>8,584</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>As</td>
<td>mg/l</td>
<td>0,004</td>
<td>0,05</td>
</tr>
<tr>
<td>14</td>
<td>Cu</td>
<td>mg/l</td>
<td>0,209</td>
<td>1,0</td>
</tr>
<tr>
<td>15</td>
<td>Zn</td>
<td>mg/l</td>
<td>0,139</td>
<td>3,0</td>
</tr>
<tr>
<td>16</td>
<td>Coliform</td>
<td>MPN/100ml</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

NN1: Deep well water sample of Ms. My household, Lam Ha ward, Phu Ly city

Analysis results show that parameters NH$_4^+$ and Fe of underground water sample exceed allowable standards according to QCVN 09:2008/MONRE – National technical regulations on underground water quality.
3. ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT FOR ADDITIONAL INVESTMENTS

3.1. Level of impacts

The type and scale of potential negative impacts of components of Phu Ly city subproject are summarized in table 3 below. The level of impacts are assigned as follows: 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 some are irreversible and require compensation.

In general, work embanking Chau Giang has environmental impacts at average level during construction process, this impacts 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, type and nature of the impacts change dramatically according to the nature and scale of the operation, location and its social-environmental conditions, human habits and factors of time.
## Table 8. Negative impact levels of additional items

<table>
<thead>
<tr>
<th>Component</th>
<th>Physical</th>
<th>Biological</th>
<th>Social</th>
<th>The others</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Air, noise, vibration</td>
<td>Earth, water</td>
<td>Solid waste, Dredged mud</td>
<td>Jungle, Natural ecosystem</td>
<td>Fish, Aquatic animal</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Luong Khanh Thien secondary school</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation</td>
<td>M</td>
<td>M</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Construction</td>
<td>N</td>
<td>N</td>
<td>M</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Operation</td>
<td>N</td>
<td>N</td>
<td>M</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Embanking North Chau Giang riverside from Highway 1A to Chau Giang bridge</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>N</td>
</tr>
<tr>
<td>Construction</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Operation</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td><strong>27m – width – road connects from medical basis of Bach mai hospital to D4-N7 road</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Construction</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Operation</td>
<td>M</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>DT491 detour</th>
<th>Preparation</th>
<th>L</th>
<th>L</th>
<th>L</th>
<th>N</th>
<th>N</th>
<th>M</th>
<th>N</th>
<th>N</th>
<th>N</th>
<th>L</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>L</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Operation</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

Notes: (1) The following criteria used to assess the level of impact: None (N) has no effect; Low (L) - small works, small impact, can be reversible, temporary; Medium (M), small works in the urban area / sensitivity, the medium-scale works with the average impact of which can be reversed, minimized and managed; High (H) - The medium scale projects in urban areas / small sensitive, large-scale projects with significant impact (social and / or environmental) where many cases irreversible and requiring compensation, both M and H should supervise and implement the mitigation measures as well as institutional capacity commensurate safety.

(2) The small and medium scale projects, most of the local and temporary effects and can be mitigated through the application of technical solutions and good management practices, with supervision, inspection and consultation tightly with local communities.
3.2. Investment on construction of Luong Khanh Thien secondary school

3.2.1. Ground clearance

Impacts to society: Affected land area by building Luong Khanh Thien secondary school is 1,322 m². However, it be built on the location of old school should not have to pay compensation for land. Therefore this effect is negligible. The school campus originally had fifteen (15) mature over forty year old Royal Poinciana trees. Two of these had to be temporarily relocated to accommodate the new construction. The trees have been trimmed, and relocated close to the school. At the end of construction they will be replanted in the school yard. In addition, nine Poinciana saplings will be planted in the school grounds.

For school’s students, during construction period, the school will rent the temporary study place for students in Minh Khai ward area.

Impacts to cultural works: Building Luong Khanh Thien secondary school doesn’t cause any impacts to cultural works.

The impacts of demolition works are negligible due to permanent buildings on the campus currently do not have many.

3.2.2. Construction stage

Luong Khanh Thien secondary school is located in Le Loi road, next to the two Luong Khanh Thien primary and nursery schools, its behind borders embankment road along Chau Giang river

(i) The generic impacts:
In construction process, the arisen impacts mainly are emission, noise, solid waste, and workers’ domestic wastewater. Due to construction scale is small so this impacts are low level and can be mitigated by management measures.

Emission:
Total volume of leveling by sand (estimated about 521 tons) that based on project area is 372.54 m³. Number of transportation vehicles estimated 105 trips (if use vehicles 5 tons). According to the technical documentation, with 10km running, the vehicles consumed about 0.0025 to 0.003 tons of oil. Thus the volume of oil consumed about 0.2625 – 0.315 tons for go on and go back.

Currently, Vietnam hasn’t yet standardized data on emissions source of pollutants emitted by vehicles, so we based on the document of the World Health Organization (WHO) using methods rapid identification of waste sources under the "coefficient of air pollution", to calculate the amount of air pollutants from process transporting waste and materials. Preliminary estimates are as following:

Table 9. Volume of emission

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Pollution coefficient (kg of emissions / ton of used oil)</th>
<th>Volume of emission (kg)</th>
</tr>
</thead>
</table>

VIWASE 36
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>Dust</th>
<th>4.3</th>
<th>1.13 -1.35</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO₂</td>
<td>20S</td>
<td>5.2S-6.3S</td>
</tr>
<tr>
<td>NOₓ</td>
<td>55</td>
<td>14.4-17.3</td>
</tr>
<tr>
<td>CO</td>
<td>28</td>
<td>7.35-8.82</td>
</tr>
<tr>
<td>VOC</td>
<td>12</td>
<td>3.15-3.78</td>
</tr>
</tbody>
</table>

*S: Rate (%) of sunphua in fuel (about 0.2-0.4%)*

Volume of emission, dust arising in construction process but it isn’t big problem and can be mitigated by management measure.

**Noise:**

Noise pollution levels forecasted as follows:

The spread of noise is calculated using the formula:

\[ L_{eq} = E.L \times 10 \log (U.E) - 20 \log (D/D_1) - 10 \log (D/D_1) \quad [1] \]

- In which: \( L_{eq} \): Noise at D distance
- \( E.L \): Noise at measurement locations (D1 distance from the discharging source)
- \( G \): Terrain coefficient
- \( D \): The distance have to calculate
- \( D_1 \): Distance measures at source point
- \( U.F \): useful using ratio of the engine

Almost all of engines are used a maximum way so coefficient is \( U.F=1 \), assuming no obstacles should factor \( G = 0 \). In this case, the propagation of noise is calculated using the formula:

\[ L_{eq} = E.L \times 20 \log (D/D_1) \]

Noise pollution levels by construction and transport vehicles:

**Table 10. Noise level**

<table>
<thead>
<tr>
<th>No</th>
<th>Name of engine, equipment</th>
<th>Noise at 15.24 m*</th>
<th>The spread of noise (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 m</td>
</tr>
<tr>
<td>1</td>
<td>bulldozers</td>
<td>85</td>
<td>74.68</td>
</tr>
<tr>
<td>2</td>
<td>Generator</td>
<td>83</td>
<td>72.68</td>
</tr>
<tr>
<td>3</td>
<td>Truck</td>
<td>88</td>
<td>77.68</td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>QCVN 26–2010/MONRE</th>
<th>6a.m – 21p.m</th>
<th>70</th>
<th>70</th>
<th>70</th>
<th>70</th>
<th>70</th>
<th>70</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>21p.m – 6a.m</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
</tr>
</tbody>
</table>

Source: *The US Federal Transit Administration (FTA). Transit Noise and Vibration Impact Assessment*

According to calculation, the use of trucks to transport materials will arise noise exceeding allowable standards (QCVN 26-2010/MONRE). Especially, for the regulations on allowable noise of residential area from 21p.m-6a.m, the use of construction machineries in 21p.m-6a.m will arise noise exceeding allowable standards in 200m range. Construction area is an area with many population, therefore, in construction process, contractors have to reduce maximum the construction time in night and don’t let transportation vehicles going through residential area in this period

*Wastewater:*

Estimated water volume uses for hygienic, living condition of workers on construction site is about 45 litter/person/day (use local worker). Flow of wastewater arises approximately 80% of supply water flow. The number of workers is about 20 persons so domestic wastewater flow: \( Q = 20 \text{ persons} \times 45 \text{ litter/person/day} \times 0.8 = 720 \text{ (l/day)} \)

Total domestic wastewater volume of worker temporarily estimated as above, so we can see volume of wastewater is not too much, its effect is Low level and can be mitigated.

*Solid waste and hazardous waste:*

Volume of domestic waste can be estimated as following: there are about 20 workers working on the site, every people discharge about 0.5kg of domestic waste. Volume of domestic waste estimated about 10kg. Contractor need put tanks of 200L on site to collect this domestic solid waste, in necessary situation, contractor can also hire an environment hygienic team to collect this waste

Hazardous waste on site mainly includes oil and grease waste. Due to scale and volume of construction aren’t much so this waste volume estimated about 5kg/month.

*(ii) Site-specific Impacts:*

Construction area of Luong Khanh Thien secondary school is next to embankment road of Chau Giang river so volume of soil, garbage can be washed away by rain water into the river. However, construction scale isn’t too big so this impacts are negligible, on the other hand, it can be reduced by management measures on site

Beside, construction area borders Luong Khanh Thien primary and preschool so in construction process, the safety of students here should be special attention. This also is the one of density
population areas so contractor have to ensure issues of traffic accident during vehicles using process.

The impacts to traffic by the increase of transportation vehicles should be noted because it is urban area that got a high traffic density, near market area and two Luong Khanh Thien primary and preschool.

### 3.2.3. Operation stage

**Wastewater:**

There have 427 students and teachers in Luong Khanh Thien secondary school. Averagely, each people use 80 liter/day of water, wastewater volume is equal with 80% of supply water volume. According to estimated, wastewater volume is about 28.8m³. However, students just study in morning/afternoon at school so wastewater volume will drop to 1/3, estimated about 9.6m³.

**Other waste:**

Each people averagely arises 0.5kg/day domestic waste. The volume of domestic waste is about 225kg/day. However, because students only study in the morning/afternoon at school, domestic solid waste may only drop to 1/3, estimated about 75 kg/day.

Hazardous waste: broken bulbs. This amount of waste is not many and estimated about 10 kg/year.

### 3.3. Investment on embankment to prevent landside at North Chau Giang riverside

#### 3.3.1. Clearance stage

**Social impacts:**

In this stage, the most impact is people’s land acquisition and local disturbance. Total affected land area of this investment is 29,952 m². The acquired land area for construction of North Chau Giang riverside embankment includes 2,142 m² of residential land and 27,810 m² public land (managed by commune PC, city). Total affected households of acquisition land are 62 households, 12/62 households have to relocate. There are 19 graves must be relocated in this area.

**Impacts on PCR:**

- Based on the EA survey, about 19 graves will be relocated for the investment on embankment of Chau Giang riverside. The mitigation measures for grave relocation including relocation cost, will be covered in the updated resettlement plan (which is under preparation).

- In addition, the Dinh Trang small temple (about 20 m distant to North Chau Giang embankment) will be temporarily affected during the construction period). However, the embankment will not require land acquisition of the temple. Access to the temple will be maintained during construction.
3.3.2. Construction stage

Construction area is adjacent to residential areas, road accessing to the waterfront area is small, narrow, and there is segment with no road. Population density is quite crowded along to riverside. Internal roads in the area are made by concrete road, about 1-2m of width. Traffic density in the region is not high. Embankment system is next to small temple of village (20m), which could be affected during in construction process. There is no river traffic along the waterway.

In construction process, the temple will be temporarily fenced off. To minimize the impact of noise and dust and vibrations, insofar as possible, cement mixers and other construction equipment will be operated at a distance from the temple. Construction materials will not be stored near the temple.

(i) Generic impacts:

_Emission:_

The riverside is quite densely populated and the temporary increase of pollution due to construction will affect household living conditions.

Total volume of construction materials for this component is estimated about 323,633 tons including steels, rocks, excavating soil, embanking soil, etc... For this big volume of construction materials, if use trucks of 15 tons for transportation need 21,575 trips

Length of embankment system is about 807m, the dredged mud in riverbed is estimated about 20,000m³, equivalent to 28,000 tons. If use trucks of 15 tons for transportation need 1,870 trips.

According to the technical documentation, with 10km running, the vehicles consumed about 0.0025 to 0.003 tons of oil. Thus the volume of oil consumed about 58.6 – 70.3 tons for go on and go back.

Currently, Vietnam hasn’t yet standardized data on emissions source of pollutants emitted by vehicles, so we based on the document of the World Health Organization (WHO) using methods rapid identification of waste sources under the "coefficient of air pollution", to calculate the amount of air pollutants from process transporting waste and materials. Preliminary estimates are as following:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Pollution coefficient (kg of emissions / tons of used oil)</th>
<th>Volume of emission (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust</td>
<td>4.3</td>
<td>251.9-302.3</td>
</tr>
<tr>
<td>SO₂</td>
<td>20S</td>
<td>1,172S-1,406S</td>
</tr>
<tr>
<td>NOₓ</td>
<td>55</td>
<td>3,223-3,866</td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) for additional items
Medium urban development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th></th>
<th>CO</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>28</td>
<td></td>
<td>1,640.8-1,968.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VOC</td>
<td>12</td>
<td>703.2-843.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( S: \ rate\ (%)\ of\ Sulfur\ in\ fuel\ (it\ took\ over\ 0.2-0.4\%) \)

This volume of emission arising during construction time causes Lam Ha ward’s area and people living along 1A National Highway. This volume of emission is quite much, therefore, in construction time, contractor need to carry out reducing dust such as watering on site, transport vehicles be covered fully and frequently check vehicles’ quality

\( Noise: \)

Noise pollution levels forecasted as follows:

The spread of noise is calculated using the formula:

\[ L_{eq} = E.L + 10 \log(U.E) - 20 \log(D/D_1) - 10 \log(D/D_1) \] [1]

- In which: \( L_{eq} \): Noise at D distance
- \( E.L \): Noise at measurement locations (D1 distance from the discharging source)
- \( G \): Terrain coefficient
- \( D \): The distance have to calculate
- \( D_1 \): Distance measures at source point
- \( U.F \): useful using ratio of the engine

Almost all of engines are used a maximum way so coefficient is \( U.F=1 \), assuming no obstacles should factor \( G = 0 \). In this case, the propagation of noise is calculated using the formula:

\[ L_{eq} = E.L - 20 \log (D/D_1) \]

Noise pollution levels by construction and transport vehicles:

\( Table\ 12.\ Noise\ pollution\ level\)

<table>
<thead>
<tr>
<th>TT</th>
<th>Name of engines, equipment</th>
<th>Noise at 15.24 m*</th>
<th>The spread of noise (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 m</td>
</tr>
<tr>
<td>1</td>
<td>Bulldozer</td>
<td>85</td>
<td>74.68</td>
</tr>
<tr>
<td>2</td>
<td>Excavator</td>
<td>83</td>
<td>72.68</td>
</tr>
<tr>
<td>3</td>
<td>Roller</td>
<td>74</td>
<td>63.68</td>
</tr>
<tr>
<td>4</td>
<td>Truck</td>
<td>88</td>
<td>77.68</td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>5</th>
<th>Cutting machine</th>
<th>93</th>
<th>82.68</th>
<th>78.60</th>
<th>76.66</th>
<th>75.08</th>
<th>73.14</th>
<th>70.64</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>QCVN 26–2010/MONRE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 a.m – 21 p.m</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>21 p.m – 6 a.m</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
</tr>
</tbody>
</table>


According to calculation, the use of trucks to transport materials will arise noise exceeding allowable standards (QCVN 26-2010/MONRE). Especially, for the regulations on allowable noise of residential area from 21p.m-6a.m, the use of construction machineries in 21p.m-6a.m will arise noise exceeding allowable standards in 200m range. Therefore, in construction process, contractor have to reduce maximum the construction time in night and don’t let transport vehicles going through residential area in this time period.

According to analysis as shown in the Table 12, the workers on the construction site will be constantly exposed to all kinds of high-intensity noise. According to calculations, within 15 meters, noise intensity is above 85dB. This is the noise threshold if continuous exposure will cause tired feeling to human, if the noise threshold is too high intensity and it exceeding 90 dB will affect the hearing. Thus, workers on the construction site need avoid exposure too long with this noise sources, limiting the idle operating machineries on construction sites and wearing labor protection equipment.

**Wastewater:**

Estimated water volume using for hygienic, living condition of workers on construction site is about 45 litter/person/day (use local worker). Flow of wastewater arises approximately 80% of feed water flow. The number of workers is about 30 persons so domestic wastewater flow: \( Q = 30 \text{ persons} \times 45 \text{ litter/person/day} \times 0.8 = 1080 \text{ (l/day)} = 1.08 \text{ (m}^3\text{/day)} \)

Total domestic wastewater volume of worker temporarily estimated as above, so we can see volume of wastewater is not too much, its influence is Low level and can be mitigated.

**Solid waste and hazardous waste:**

There are about 30 workers working on the site, every people discharges about 0.5kg of domestic waste. Volume of domestic waste estimated about 15kg/day. Contractor need put tanks of 500L on site to collect this domestic solid waste, in necessary situation, contractor can also hire an environment hygienic team to collect this waste.

Hazardous waste on site mainly contains waste oil and grease. According to estimation, machineries will discharge about 30 liter of waste oil for one used time, about 3 months/time.
The number of machineries using on site are about 5 units. The average waste oil volume is 150L/3 months.

**Social security and order:**

In construction process, there are a big number of workforce on site will cause the increase of risks such as security and order, social evils, diseases and other social problems. Besides, the construction area of this component is quite close to residential area, so in construction process, workers on site can occur disputes, conflicts with households here.

(ii) **Site-specific impacts:**

**Dredged mud:**

Dredging riverside will arise about 20,000 m³ of non-contaminated mud.

**Risk of landslide in construction process:**

Total length of embankment system of Chau Giang river is about 807m, Chau Giang river has a winding and complex flow. Therefore, when flood season comes, flow velocity of this river is very fast. A big flood will cause riverside landslide, affect to the construction area. Hence, it is the safest when contractor constructs in dry season because the months in this dry season are especially little rainfall.

In process of embankment construction, if not reinforce bank well, or construction time lasted to rain season, big water flow can cause land subsidence, dangerous for workers and affect construction process.

In design stage, hydraulics, hydrology, flow, geological factors was calculated carefully to reduce maximum the negative impacts in construction process.

**Influence to Chau Giang river’s water environment:**

Dredging river can arise an amount of suspended solid washing away to downstream. Rain water washed away pollutants includes construction materials, oil flowing into the river. This will be harmful to aqua fauna and flora in the river. In construction process, preventing of cross section of flow will increase flow velocity, especially in rain season, which can lead to riverside erosion and downstream area.

**Occupational safety:**

Residents living along the river are quite crowded so contractor need to pay attention while using construction vehicles in construction process to avoid the risks of traffic accident for people. For activities use transport trucks, there need someone to guide traffic through residential areas such as putting speed limit signboards, setting up nighttime lighting systems

Risks of landslide, dyke subsidence will cause dangerous for workers and people. Therefore, safety measures need to be carefully considered in design, construction period to prevent the risk. In addition, the incidents of cracking embankment can appear if construction vehicles transport a material overload when going on embankment system.
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

**Damaged local traffic routes:**

Due to the number of transport vehicles are quite many (about 23,445 trips of transporting materials and dredged mud during 3 years, equivalent to 22 trips/day) so it can cause damage to local traffic road in residential area along Northern Chau Giang riverside (Dinh Trang residential quarter). In this case, after construction done, contractor has responsible to return the route to its orginal state.

**Influence to household’s works, temple:**

Construction is near residential area. Besides, there is a temple inside construction area (near construction location of embankment system about 20m). In construction process can affect to households living along riverside and this temple as cracking fence and house-wall. Contractors need ensure safe to this works, if there are any deteriorations, contractors have to deal compensation with people.

In the construction process, the temple will be temporarily fenced off. To minimize the impact of noise and dust and vibrations, insofar as possible, cement mixers and other construction equipment will be operated at a distance from the temple. Construction materials will not be stored near the temple

**3.3.3. Operation stage**

**Reducing erosion risks:**

Chau Giang river flows over Phu Ly city with winding, meandering shape and complex flow. The mainstream approached the left side from Me prison to the end of Bien Hoa road. The upstream segment from Phu Ly bridge to 1A National Highway, the mainstream approached the right side. South riverside had been under embankment, so heavy rain just cause erosion of Northern riverside and affect to household living along this riverside (Dinh Trang residential quarter). Embanking Northern Chau Giang riverside will remove this one.

**Chau Giang river’s water environment:**

Embanking river basically is no affect directly to river water quality. However, after completing embankment and corridor road, traffic flow on this route will increase quickly and it can cause phenomenon of people littering into the river. Therefore, local authority need to set up regulations, and environmental propagandas to people about environmental protection awareness.

**Landscape:**

Embanking Chau Giang riverside will mitigate landslide of North riverside. Besides, if local authority has well environmental management will contribute to create a green – clean – beautiful landscape in city area.

**Incidents of cracking/breaking embankment:**
For embanking Chau Giang riverside, in construction process as well as operating this embankment system, this issues can be happened the incidents of cracking/breaking embankment as following:

- Heavy rain, big flood and weak foundation reinforcement will cause erosion of embankment, more seriously the incident of broke embankment
- Gathering overload of construction materials is the one of main reason causing embankment erosion.
- Cracking, breaking embankment in operation process are caused by natural factors or use exceeding the design parameters.

The incidents of broke embankment will directly affect the quality of works, reduce the capacities of flood prevention and disaster mitigation of embankment system. Incidents of embankment erosion also affect work quality and environmental landscape in area.

The incidents of broke embankment will directly affect the life of people living near the embankment system, affect the quality of houses, buildings and structures that located on protection range of embankment system.

### 3.4. Construction component of a road connecting from medical unit of Bach Mai hospital to D4-N7 road

#### 3.4.1. Ground clearance stage

In this stage, the most impact is people’s land acquisition and local disturbance. The affected land area is 3,962 m² with 100% agricultural land. Total affected households of acquisition are 17 households and there are no households have to relocation.

Due to construction area is vacant land, sparse traffic, no household living around there so natural environmental impacts in Clearance stage are negligible and there are no any impacts to cultural works.

#### 3.4.2. Construction stage

The length of constructed route is 186 lying on a vacant land area surrounded by people’s rice fields. This is a desert area with sparse traffic. First point of this 27m-width-road connecting with D4-N7 route has been under construction. This 27m-width-road go through water supply ditch of people.

(i) The generic impacts:

**Emission:**

This impact is generally only local properties on construction site and objects mainly are workers working on site because this is a desert area without households

Total volume of excavation and embankment is estimated about 11,215.04 m³ (equivalent to 15,701 tons). If use trucks of 15 tons need 1,007 trips for transportation
According to the technical documentation, each 10 kilometers, vehicles consumed about 0.0025 to 0.003 tons of oil. Thus the volume of oil is consumed about 2.51-3.02 tons of oil

Currently, Vietnam has no standardized data on emission sources of pollutants emitted by vehicles, so we were based on the document of the World Health Organization (WHO) using methods rapid identification of waste sources under the "coefficient of air pollution", to calculate the amount of air pollutants from waste and materials transportation process and. Preliminary Estimation as following:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Pollution coefficient (kg waste/used oil)</th>
<th>Volume of emission (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust</td>
<td>4.3</td>
<td>10.8-13.0</td>
</tr>
<tr>
<td>SO2</td>
<td>20S</td>
<td>50.2S-60.4S</td>
</tr>
<tr>
<td>NOx</td>
<td>55</td>
<td>138-166</td>
</tr>
<tr>
<td>CO</td>
<td>28</td>
<td>70.3-84.6</td>
</tr>
<tr>
<td>VOC</td>
<td>12</td>
<td>30.1-36.2</td>
</tr>
</tbody>
</table>

*S: Rate (%) of sulfur in fuel (0.2-0.4%)

This volume of emission and dust arising in construction time are not much and can be mitigated by management measures.

**Noise**

Noise pollution levels forecasted as follows:

The spread of noise is calculated using the formula:

\[
L_{eq} = E.L + 10 \log(U.E) - 20 \log(D/D_1) - 10 \log(D/D_1) \quad [1]
\]

- In which: \(L_{eq}\): Noise at D distance
- \(E.L\): Noise at measurement locations (\(D_1\) distance from the discharging source)
- \(G\): Terrain coefficient
- \(D\): The distance have to calculate
- \(D_1\): Distance measures at source point
- \(U.F\): useful using ratio of the engine

Almost all of engines are used a maximum way so coefficient is \(U.F=1\), assuming no obstacles should factor \(G = 0\). In this case, the propagation of noise is calculated using the formula:

\[
L_{eq} = E.L - 20 \log(D/D_1)
\]
Environmental management plan (EMP) for additional items
Medium urban development project – Phu Ly city subproject

Noise pollution levels by construction and transport vehicles:

<table>
<thead>
<tr>
<th>TT</th>
<th>Name of engines, equipment</th>
<th>Noise at 15.24 m*</th>
<th>The spread of noise (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 m</td>
</tr>
<tr>
<td>1</td>
<td>Bulldozer</td>
<td>85</td>
<td>74.68</td>
</tr>
<tr>
<td>2</td>
<td>Excavator</td>
<td>83</td>
<td>72.68</td>
</tr>
<tr>
<td>3</td>
<td>Roller</td>
<td>74</td>
<td>63.68</td>
</tr>
<tr>
<td>4</td>
<td>Truck</td>
<td>88</td>
<td>77.68</td>
</tr>
<tr>
<td>5</td>
<td>Cutting machine</td>
<td>93</td>
<td>82.68</td>
</tr>
</tbody>
</table>

**QCVN 26–2010/MONRE**

<table>
<thead>
<tr>
<th>Time</th>
<th>Noise (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 a.m – 21 p.m</td>
<td>70</td>
</tr>
<tr>
<td>21 p.m – 6 a.m</td>
<td>55</td>
</tr>
</tbody>
</table>


According to analysis as presented in the Table 14, the workers on the construction site will be constantly exposed to all kinds of high-intensity noise. According to calculations, within 15 meters, noise intensity is above 85dB. This is the noise threshold if continuous exposure will cause tired feeling to human, if the noise threshold is too high intensity and it exceeding 90 dB will affect the hearing. Thus, workers on the construction site need avoid exposure too long with this noise sources, limiting the idle operating machineries on construction sites and wearing labor protection equipment.

**Domestic wastewater**

Estimated water volume uses for hygienic, living condition of workers on construction site is about 45 litter/person/day (use local worker). Flow of wastewater arises approximately 80% of feed water flow. The number of workers is about 20 persons so domestic wastewater flow: \( Q = 20 \text{ persons} \times 45 \text{ litter/person/day} \times 0.8 = 720 \text{ (l/day)} = 0.72 \text{ (m}^3\text{/day)} \)

Total domestic wastewater volume of worker temporarily estimated as above, so we can see volume of wastewater is not too much, its influence is at low level and can be mitigated.
Solid waste and hazardous waste

Domestic solid waste: there are about 20 workers working on the site, every people discharge about 0.5kg of domestic waste. Volume of domestic waste estimated about 10kg/day

Excavated soil estimated about 2,331 m$^3$. This volume of soil uses for leveling

Hazardous waste on site mainly contain waste oil and grease. According to estimation, machineries will discharge about 30 liter of waste oil for one times, averagely 3 months/times. The number of machineries using on site are about 5 units. The average waste oil volume is 150L/3 months. This waste oil volume will be collected into tanks of 150-200L locating at maintenance area and it must to be treated by capable unit. Waste oil need to be managed well to avoid situations workers discharging waste oil out areas around, cause land pollution of people

Occupational safety

In construction process, risks of occupational accidents could happen on site. Contractor need prepare the first aid kits, medicine cabinet on site, equips labor protection for workers and regularly reminds good hygiene and healthy lifestyle for workers.

(ii) Site-specific impacts:

The influence to irrigation ditch:

Due to 27m-width-road runs through agricultural irrigation ditch so construction of this road can affect to flow, cracking ditch or clogging ditch caused by solid waste... Contractor should have a plan for flow control or repairing ditch when was damaged.

The influence to people’s rice field:

Due to construction area is lying around people’s rice fields so this construction process can affect to agricultural production by some incidents such as solid waste, dust, oil and grease, etc...

3.4.3. Operation stage

Impacts of emission and dust

After construction of the road, the traffic through the area will significantly increase. Therefore, the increase of emission and dust on this route is unavoidable.

Solid waste:

The construction of route connecting from medical unit to D4-N7 route will cause increasing traffic low, and it is one of main causes of arising solid waste on this route.

Risks of traffic accident

The formation of route connecting from medical examination basis to D4-N7 route creates favorable movements for local people, however, it also increases significantly risks of traffic accident in current time if traffic participants don’t abide by traffic rules.
3.5. Construction component of DT491 detour

3.5.1. Ground clearance

In this stage, the most impact is people’s land acquisition and local disturbance. The affected land area is 9,493 m², in which area of affected households is 409 m², the remaining part is belong ward PC’s management (9,084 m²). Total affected households of acquisition land are 32 and 3/32 households have to relocate.

There are no any impacts to cultural works in this stage

3.5.2. Construction stage

Length of DT491 detour is 586.67m, the first point of this detour route is on T-junction of Liem Chinh gas station (near Me Noi pagoda). This detour runs along embankment of South Chau Giang river (about 320m), after that, turn right to connect with existing DT491 route. Traffic density here is not high.

(i) The generic impacts

Emission:

The soil volume of excavation and embankment to construct DT491 road estimated 15,713.53 m³ (equivalent 22,000 tons). If use trucks of 15 tons need 1,500 trips for transportation. According to the technical documentation, each 10 kilometers, vehicles consumed about 0.0025 to 0.003 tons of oil. Thus the volume of oil was consumed about 3.75-4.5 tons of oil.

Currently, Vietnam has no standardized data on emission sources of pollutants emitted by vehicles, so we were based on the document of the World Health Organization (WHO) using methods rapid identification of waste sources under the "coefficient of air pollution", to calculate the amount of air pollutants from waste and materials transportation process and. Preliminary Estimation is as following:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Pollution (waste/used oil)</th>
<th>Pollution coefficient</th>
<th>Volume of emission (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust</td>
<td>4,3</td>
<td></td>
<td>16.13-19.35</td>
</tr>
<tr>
<td>SO₂</td>
<td>20S</td>
<td></td>
<td>755-90</td>
</tr>
<tr>
<td>NO₅</td>
<td>55</td>
<td></td>
<td>206.25-247.5</td>
</tr>
<tr>
<td>CO</td>
<td>28</td>
<td></td>
<td>105-126</td>
</tr>
<tr>
<td>VOC</td>
<td>12</td>
<td></td>
<td>45-54</td>
</tr>
</tbody>
</table>

S: Rate (%) of sulfur in fuel (0.2-0.4%)
This volume of emission and dust arising in 24 months of construction time are not much and can be mitigated by management measures.

**Noise:**

Noise pollution levels forecasted as follows:

The spread of noise is calculated using the formula:

\[
L_{\text{eq}} = E.L + 10 \log(U.E) - 20 \log(D/D_1) - 10 \log(D/D_1) \quad [1]
\]

- In which: \(L_{\text{eq}}\): Noise at \(D\) distance
- \(E.L\): Noise at measurement locations (\(D_1\) distance from the discharging source)
- \(G\): Terrain coefficient
- \(D\): The distance have to calculate
- \(D_1\): Distance measures at source point
- \(U.F\): useful using ratio of the engine

Almost all of engines are used a maximum way so coefficient is \(U.F=1\), assuming no obstacles should factor \(G = 0\). In this case, the propagation of noise is calculated using the formula:

\[
L_{\text{eq}} = E.L - 20 \log (D/D_1)
\]

Noise pollution levels by construction and transport vehicles:

**Table 16. Noise pollution level**

<table>
<thead>
<tr>
<th>TT</th>
<th>Name of engines, equipment</th>
<th>Noise at 15.24 m*</th>
<th>The spread of noise (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 m</td>
</tr>
<tr>
<td>1</td>
<td>Bulldozer</td>
<td>85</td>
<td>74.68</td>
</tr>
<tr>
<td>2</td>
<td>Excavator</td>
<td>83</td>
<td>72.68</td>
</tr>
<tr>
<td>3</td>
<td>Roller</td>
<td>74</td>
<td>63.68</td>
</tr>
<tr>
<td>4</td>
<td>Truck</td>
<td>88</td>
<td>77.68</td>
</tr>
<tr>
<td>5</td>
<td>Cutting machine</td>
<td>93</td>
<td>82.68</td>
</tr>
</tbody>
</table>

**QCVN 26–2010/MONRE**

<table>
<thead>
<tr>
<th></th>
<th>6 a.m – 21 p.m</th>
<th>21 p.m – 6 a.m</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>70</td>
<td>55</td>
</tr>
<tr>
<td>70</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>70</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>70</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>70</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>70</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>70</td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject


According to calculation, the use of trucks to transport materials will arise noise exceeding allowable standards (QCVN 26-2010/MONRE). Especially, for the regulations on allowable noise of residential area from 21p.m-6a.m, the use of construction machineries in 21p.m-6a.m will arise noise exceeding allowable standards in 200 m range. The construction area is highly populated. Therefore, in construction process, contractor have to reduce maximum the construction time in night and don’t let transport vehicles going through residential area in this time period.

The workers on the construction site will be constantly exposed to all kinds of high-intensity noise. According to calculations, within 15 meters, noise intensity is above 85dB. This is the noise threshold if continuous exposure will cause tired feeling to human, if the noise threshold is too high intensity and it exceeding 90 dB will affect the hearing. Thus, workers on the construction site need avoid exposure too long with this noise sources, limiting the idle operating machineries on construction sites and wearing labor protection equipment.

**Domestic wastewater**

Estimated water volume using for hygienic, living condition of workers on construction site is about 45 litter/person/day (use local worker). Flow of wastewater arises approximately 80% of feed water flow. The number of workers is about 30 persons so domestic wastewater flow: \[Q = 30 \text{ persons} \times 45 \text{ litter/person/day} \times 0.8 = 1080 \text{ l/day} = 1.08 \text{ m}^3/\text{day}\]

Total domestic wastewater volume of worker temporarily estimated as above, so we can see volume of wastewater is not too much, its influence is Low level and can be mitigated

**Solid waste and hazardous waste:**

There are about 30 workers working on the site, every people discharge about 0.5kg of domestic waste. Volume of domestic waste estimated about 15kg/day

Excavated soil estimated about 4,550m$^3$ will use for leveling in area

Hazardous waste on site mainly contains waste oil and grease. According to estimation, machineries will discharge about 30 liter of waste oil for one recharging time, averagely 3 months/times. The number of machineries using on site are about 5 units. The average waste oil volume is 150L/3 months

Besides, there are several impacts of occupational safety, security and order in area.

(ii) **Site-specific impacts**

*Impacts to Chau Giang river’s water environment*

The construction area borders embankment system of Chau Giang river so the volume of soil, sand and garbage could be washed away into river by rain water. However, due to construction scale is not big so this kind of impact is in an average level, on the other hand, it can be mitigated by management measures on site.
Impacts to traffic

Local traffic route is quite small achieving a big traffic density so in construction process can cause the increase of traffic congestion in area, especially in the rush hours.

The influence to local traffic works

Due to the number of material transport vehicles is quite many (about 1500 trips), so it can cause damaged to local traffic routes of residential area (Me Noi population group). In this situation, after construction done, the contractor has responsible to restore the original state of routes.

Impacts on physical cultural works:

The Me Noi pagoda is located next to the DT491 detour. In construction process, contractor will use rollers and compactors, this kind of machineries can cause affecting Me Noi ward’s pagoda near DT491 construction site.

3.5.3. Operation stage

Impacts of dust and emission:

The formation of detour will significantly increase traffic flow in area. Therefore, the increase of emission and dust on this route is unavoidable.

Solid waste:

The formation of DT491 detour not only increases traffic flow but also dramatically arises a volume of solid waste.

Incidents of traffic accident:

The completion of this route will make favorable traffic, however, it also increases traffic accidents at current time if traffic participants don’t abide by traffic rules.
4. MITIGATION MEASURES FOR ENVIRONMENTAL IMPACTS

Part 4 will determine mitigation measures of additional items in ground clearance, construction and operation stages. Mitigation measures presented in table of Environmental Codes of Practice (ECOPs); it will be applied to mitigate works’ general impacts.

For the site-specific impacts on specified locations, there need separate mitigation measures applying to this locations for two stages of operation and construction achieving general measures determined in ECOPs

4.1. DESIGN STAGE

Embarkment system of North Chau Giang riverside (the embankment segment from 1A Highway to Chau Giang bridge) is designed running along riverside to avoid site clearance to the temple and residential areas. Besides, the embankment segment is still guaranteed in terms of from construction process of dyke system has been calculated on hydrological surveys (flooding flow, flow regime...), topography and geology of the area to ensure the safe, efficient operation of the embankments.

Ensure that detailed designs of this works have to be presented correctly and exactly with regard managing soils disposal: dredging, transporting by covered trucks and dumping at appropriately allowable locations (waste mud samples at mud dumps checked and analyzed to ensure that regulated limits; sanitation landfills for contaminated materials exceed regulated limits – example: sanitation landfills at Thung Dam Gai)

For the routes: Design pavement drainage system, arrange manholes, lighting system and standard ensuring signboards along road

School: Design fire-preventing system and water supply tanks for fire-preventing, treat wastewater before discharging out general drainage system

In detail designing, PMU will ensure that detail designing include drainage system to avoid inundation risk in construction and operation process

4.2. MITIGATION MEASURES IN GROUND CLEARANCE STAGE

The main issue in this stage is compensation to people for the damages to their lands, and properties and effects on their incomes. Carrying out compensation of Clearance will abide by according to updated resettlement plan

When carrying out compensation on damaged properties for affected households, there are some key aspects

- Widely propagate about economic development and the compensation policies of the Project to the people. Propagating for implementation exactly on obligations, rights and State laws.

- Publicize prices for compensation (in detail for each compensated asset) to the affected people.

- Publicize and disseminate correctly the amount of compensation for each household.
-Before construction, relocation of the graves shall be done before in accordance with the updated Resettlement Plan which is currently being prepared, cleared by the Bank and adopted by the local authorities.

4.3. MITIGATION MEASURES IN CONSTRUCTION PROCESS

ECOPs describes typical requirements carried out by contractors and supervised by engineers during construction process. Final ECOPs will be put in as an appendix in bidding documents and contracts (BD/CD) of detail designing stage, contractors will be disseminated officially in bidding process. Scope and content of ECOP as following:

Scope: Construction activities for medium and small works cooperated by ECOPS, this activities is activated in limited and temporary ranges, and easily manage for construction activities well.

Mitigation measures described in ECOPs are fully to mitigate most of potential negative impacts during construction process.
Table 17. Environmental Codes of Practice ECOPs

<table>
<thead>
<tr>
<th>Environmental-social issues</th>
<th>Mitigation measure</th>
<th>Vietnam regulations/standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dust generation</td>
<td>• The Contractor is responsible for compliance with relevant Vietnamese legislation with respect to ambient air quality.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The Contractor shall ensure that the generation of dust is minimized and is not perceived as a nuisance by local residents and shall implement a dust control plan to maintain a safe working environment and minimize disturbances for surrounding residential areas/dwellings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The Contractor shall implement dust mitigation measures (e.g. use water spraying vehicles to roads, covering of material stockpiles, etc.) as required.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Dust masks should be used by workers where dust levels are excessive</td>
<td>• QCVN 05: 2013/MONRE: National technical regulation on ambient air quality</td>
</tr>
<tr>
<td>2. Air pollution</td>
<td>• All vehicles must comply with Vietnamese regulations controlling allowable emission limits of exhaust gases.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Vehicles in Vietnam must undergo a regular emissions check and get certified named: “Certificate of conformity from inspection of quality, technical safety and environmental protection” following Decision No. 35/2005/QD-BGTVT;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• There should be no burning of waste or construction materials (e.g. Bitumen, etc.) on site.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cement processing plants should be far from residential areas</td>
<td>• TCVN 6438-2005: Road vehicles. Maximum permitted emission limits of exhaust gas.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• No. 35/2005/QD-BGTVT on inspection of quality, technical safety and environmental protection;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• QCVN 05:2013/BTNMT: National technical regulation on air</td>
</tr>
</tbody>
</table>
### Environmental-social issues

### Mitigation measure

- The contractor is responsible for compliance with the relevant Vietnamese legislation with respect to noise and vibration.
- All vehicles must have appropriate “Certificate of conformity from inspection of quality, technical safety and environmental protection” following Decision No. 35/2005/QD-BGTVT; to avoid exceeding noise emission from poorly maintained machines.
- Avoiding or minimizing transportation though community areas and avoiding as well as material processing areas (such as cement mixing).

### Vietnam regulations/standards

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

### 3. Impacts from noise and vibration

### Environmental-social issues

### Mitigation measure

- The Contractor must be responsible for compliance with the relevant Vietnamese legislation relevant to wastewater discharges into watercourses.
- Portable or constructed toilets must be provided on site for construction workers. 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 water body.
- Wastewater over standards set by relevant Vietnam technical standards/regulations must be collected in a conservancy tank and removed from site by licensed waste collectors.
- 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 contract have been obtained
- At completion of construction works, wastewater collection tanks and septic tanks shall be safely disposed or effectively sealed off.

### Vietnam regulations/standards

- QCVN 09:2008/BTNMT: National Technical Standard on underground water Quality
- QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater;
- QCVN 40: 2011/BTNMT: National technical regulation on industrial wastewater;
- TCVN 7222: 2002: General requirements on centralized
### Environmental management plan (EMP) for additional items
**Medium urbans development project – Phu Ly city subproject**

<table>
<thead>
<tr>
<th>Environmental-social issues</th>
<th>Mitigation measure</th>
<th>Vietnam regulations/standards</th>
</tr>
</thead>
</table>
| 5. Drainage and sedimentation control | - The Contractor shall follow the detailed drainage design included in the construction plans, intended to prevent storm water from causing local flooding or scouring slopes and areas of unprotected soil resulting in heavy sediment loads affecting local watercourses.  
- Ensure drainage system is always maintained cleared of mud and other obstructions.  
- Areas of the site not disturbed by construction activities shall be maintained in their existing conditions.  
- Earthworks, cuts, and fill slopes shall be properly maintained, in accordance with the construction specifications, including measures such as installation of drains, use of plant cover.  
- To avoid sediment-laded runoff that could adversely affect watercourses, install sediment control structures where needed to slow or redirect runoff and trap sediment until vegetation is established. Sediment control structures could include windrows of logging slash, rock berms, sediment catchment basins, straw bales, storm drain inlet protection systems, or brush fences.  
- Site de-watering and water diversions: In the case that construction activities require that work be carried out within the watercourse (e.g. culvert or bridge crossing construction, retaining wall construction, erosion protection works), the work area must be dewatered to provide for construction in dry conditions. The sediment laden water pumped from the work area must be discharged to an appropriate sediment control measure for treatment before re-release to the stream.  
- Use techniques such as beaming or diversion during construction to limit the exposure of disturbed sediments to moving water  
- Stream diversions or construction of cofferdams would require site-specific mitigation measures in the EMP. | - TCVN 4447:1987: Earth works-Codes for construction  
- Decree No. 22/2010/TT-BXD on regulation of construction safety  
- QCVN 08:2008/BTNMT – National technical regulation on quality of surface water |
### Environmental issues

<table>
<thead>
<tr>
<th>Environmental-social issues</th>
<th>Mitigation measure</th>
<th>Vietnam regulations/standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6. Management of stockpiles, quarries</strong></td>
<td>• Large-scale borrow pits or stockpiles will need site-specific measures that go beyond those in these ECOPs.&lt;br&gt;• All locations to be used must be previously identified in the approved construction specifications. Sensitive sites such as scenic spots, areas of natural habitat, areas near sensitive receptors, or areas near water should be avoided.&lt;br&gt;• An open ditch shall be built around the stockpile site to intercept wastewater.&lt;br&gt;• Stockpile topsoil when first opening a borrow pit and use it later to restore the area to near natural conditions.&lt;br&gt;• If needed, disposal sites shall include a retaining wall.&lt;br&gt;• If the need for new sites arises during construction, they must be pre-approved by the Construction Engineer.&lt;br&gt;• If landowners are affected by use of their areas for stockpiles or borrow pits, they must be included in the project resettlement plan.&lt;br&gt;• If access roads are needed, they must have been considered in the environmental assessment.</td>
<td></td>
</tr>
</tbody>
</table>

<p>| <strong>7. Garbage</strong>                              | • Hazardous wastes are not covered by these ECOPs and would require specific mitigation measures.&lt;br&gt;• Before construction, a solid waste control procedure (storage, provision of bins, site clean-up schedule, bin clean-out schedule, etc.) must be prepared by Contractors and it must be carefully followed during construction activities.&lt;br&gt;• Before construction, all necessary waste disposal permits or licenses must be obtained.&lt;br&gt;• Measures shall be taken to reduce the potential for litter and negligent behavior with regard to the disposal of all refuse. At all places of work, the Contractor shall provide litter bins, containers and refuse collection facilities.&lt;br&gt;• 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, for example, URENCO. | | |</p>
<table>
<thead>
<tr>
<th>Environmental-social issues</th>
<th>Mitigation measure</th>
<th>Vietnam regulations/standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No burning, on-site burying or dumping of solid waste shall occur.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Recyclable materials such as wooden plates for trench works, steel, scaffolding material, site holding, packaging material, etc. shall be collected and separated on-site from other waste sources for reuse, for use as fill, or for sale.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• If not removed off site, solid waste or construction debris shall be disposed of only at sites identified and approved by the Construction Supervision Consultant and included in the solid waste plan. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas, such as in areas of natural habitat or in watercourses.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The removal of asbestos-containing materials or other toxic substances shall be performed and disposed of by specially trained and certified workers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Used oil and grease shall be removed from site and sold to an approved used oil recycling company.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Used oil or oil-contaminated materials that could potentially contain PCBs shall be securely stored to avoid any leakage or affecting workers. The local DONRE must be contacted for further guidance.</td>
<td></td>
</tr>
<tr>
<td>8. Management of dredged materials</td>
<td>• Large quantities of dredged materials, or materials that are contaminated, would require mitigation measures not covered in these ECOPs.</td>
<td>Decree No. 59/2007/ND-CP on solid waste management</td>
</tr>
<tr>
<td></td>
<td>• Dredging plan should be established including time schedule, method statement to meet the requirements of traffic safety, public health and</td>
<td></td>
</tr>
<tr>
<td>Environmental-social issues</td>
<td>Mitigation measure</td>
<td>Vietnam regulations/standards</td>
</tr>
<tr>
<td>----------------------------</td>
<td>--------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td></td>
<td>Environmental sanitation. In order to ensure dredging that is consistent with environmental regulations, key decision makers (local authority, DONRE, utility company, CSC, etc.) must be involved and concur in each key decision point in the process leading to preparation and implementation of a plan. • Characteristics of sediment should be determined by sampling and analysis if not already fully evaluated during the EIA. Dredge material that is contaminated would require special mitigation measures. • Ensure that dredged material management plans incorporate environmental considerations in the identification of short-term and long-term disposal alternatives, consider methods to reduce dredging, and maximize the beneficial use of dredged materials. • Lixiviate from dredged materials should not be allowed to enter watercourses without appropriate filtering or treatment. • Collected dredged materials have to be processed, as per Vietnamese regulations on waste collection, to ensure safe and environmentally secure transportation, storage, treatment, and management. • Those involved in handling of dredged materials should be specialized and be certified. • Sanitary landfill site should meet technical requirements, based on level of potential contamination. In the case of disposal at a dumpsite, a hazardous cell may need to be constructed if dredged material is contaminated by heavy metals.</td>
<td>Circular No. 12/2011/TT-BTNMT on management of hazardous substance</td>
</tr>
</tbody>
</table>

9. Disruption of vegetative cover and ecological resources  
   • The Contractor shall prepare a Clearance, Revegetation and Restoration Management Plan for prior approval by the Construction Engineer, following relevant regulations. The Clearance Plan shall be approved by Construction Supervision Consultant and followed strictly by contractor. Areas to be cleared should be minimized as much as possible.  
   • Site clearance in a forested area is subject to permission from Department of Agriculture and Rural Development.  
   • Law on Environment protection No. 55/2014/QH13 |
### Environmental-social issues

- The Contractor shall remove topsoil from all areas where topsoil will be impacted on by rehabilitation activities, including temporary activities such as storage and stockpiling, etc.; the stripped topsoil shall be stockpiled in areas agreed with the Construction Supervision Consultant for later use in re-vegetation and shall be adequately protected.
- The application of chemicals for vegetation clearing is not permitted.
- Prohibit cutting of any tree unless explicitly authorized in the vegetation clearing plan.
- When needed, erect temporary protective fencing 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 PMUs, IEMC and the relevant local authorities. This could include areas of breeding or feeding of birds or animals, fish spawning areas, or any area that is protected as a green space.
- The Contractor shall ensure that no hunting, trapping shooting, poisoning of fauna takes place.

### Mitigation measure

- Before construction, carry out consultations with local government and community and with traffic police.
- 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 this is necessary to ensure safe traffic circulation.
- Place signs around the construction areas to facilitate traffic movement, provide directions to various components of the works, and provide safety advice and warning.
- Employing safe traffic control measures, including road/rivers/canal signs and

### Vietnam regulations/standards

- Law on traffic and transportation No. 23/2008/QH12
- Law on construction No. 50/2013/QH13
- Decree No. 22/2010/TT-BXD on regulation of construction safety
<table>
<thead>
<tr>
<th>Environmental-social issues</th>
<th>Mitigation measure</th>
<th>Vietnam regulations/standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>flag persons to warn of dangerous conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Avoid material transportation for construction during rush hour.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Passageways for pedestrians and vehicles within and outside construction areas should be segregated and provide for easy, safe, and appropriate access. Signpost shall be installed appropriately in both water-ways and roads where necessary.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Interruption of utility services</td>
<td>• Planned and unplanned interruptions to water, gas, power, internet services: the Contractor must undertake prior consultation and contingency planning with local authorities about the consequences of a particular service failure or disconnection.</td>
<td>Decree No. 73/2010/ND-CP on administrative penalization security and society issues</td>
</tr>
<tr>
<td></td>
<td>• Coordinate with relevant utility providers to establish appropriate construction schedules.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provide information to affected households on working schedules as well as planned disruptions (at least 5 days in advance).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Interruptions of water supply to agricultural areas must also be avoided.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The contractor should ensure alternative water supply to affected residents in the event of disruptions lasting more than one day.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Any damages to existing utility systems of cable shall be reported to authorities and repaired as soon as possible.</td>
<td></td>
</tr>
<tr>
<td>12. Restoration of affected areas</td>
<td>• Cleared areas such as borrow pits which are no longer in use, disposal areas, site facilities, workers’ camps, stockpiles areas, working platforms and any areas temporarily occupied during construction of the project works shall be restored using landscaping, adequate drainage and revegetation.</td>
<td>Law on Environment protection No. 55/2014/QH13</td>
</tr>
<tr>
<td></td>
<td>• Start revegetation at the earliest opportunity. Appropriate local native species of vegetation shall be selected for the planting and restoration of the natural landforms.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Spoil heaps and excavated slopes shall be re-profiled to stable batters, and grassed to prevent erosion;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• All affected areas shall be landscaped and any necessary remedial works shall</td>
<td></td>
</tr>
<tr>
<td>Environmental-social issues</td>
<td>Mitigation measure</td>
<td>Vietnam regulations/standards</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
</tbody>
</table>
| 13. Worker and public Safety | - Contractor shall comply with all Vietnamese regulations regarding worker safety.  
- Prepare and implement action plan to cope with risk and emergency  
- Preparation of emergency aid service at construction site  
- Training workers on occupational safety regulations  
- If blasting is to be used, additional mitigation measures and safety precautions must be outlined in the EMP.  
- Ensure that ear pieces are provided to and used by workers who must use noisy machines such as piling, explosion, mixing, etc., for noise control and workers protection.  
- During demolition of existing infrastructure, workers and the public must be protected from falling debris by measures such as chutes, traffic control, and use of restricted access zones.  
- Install fences, barriers, dangerous warning/prohibition site around the construction area which showing potential danger to public people  
- The contractor shall provide safety measures as installation of fences, barriers warning signs, lighting system against traffic accidents as well as other risk to people and sensitive areas.  
- If previous assessments indicate there could be unexploded ordnance (UXO), clearance must be done by qualified personnel and as per detailed plans approved by the Construction Engineer. | - Decree No. 22/2010/TT-BXD on regulation of construction safety  
- Instruction No. 02/2008/CT-BXD on safety and sanitation issues in construction agencies  
- TCVN 5308-91: Technical regulation on safety in construction  
- Decision No. 96/2008/QD-TTg on clearance of UXO. |
### Environmental-social issues

<table>
<thead>
<tr>
<th>Mitigation measure</th>
<th>Vietnam regulations/standards</th>
</tr>
</thead>
</table>
| 14. Communication with local communities | ✷ Maintain open communications with the local government and concerned communities; the contractor shall coordinate with local authorities (leaders of local wards or communes, leader of villages) for agreed schedules of construction activities at areas nearby sensitive places or at sensitive times (e.g., religious festival days).  
✦ Copies in Vietnamese of these ECOPs and of other relevant environmental safeguard documents shall be made available to local communities and to workers at the site.  
✦ Reduced playground space, loss of playing fields and car parking: The loss of amenities during the construction process is often an unavoidable source of inconvenience to users in sensitive areas. However, early consultation with those affected, provides the opportunity to investigate and implement alternatives.  
✦ Disseminate project information to affected parties (for example local authority, enterprises and affected households, etc.) through community meetings before construction commencement;  
✦ Provide a community relations contact from whom interested parties can receive information on site activities, project status and project implementation results;  
✦ Provide all information, especially technical findings, in a language that is understandable to the general public and in a form of useful to interested citizens and elected officials through the preparation of fact sheets and news release, when major findings become available during project phase;  
✦ Monitor community concerns and information requirements as the project progresses;  
✦ Respond to telephone inquiries and written correspondence in a timely and accurate manner;  
✦ Inform local residents about construction and work schedules, interruption of services, traffic detour routes and provisional bus routes, blasting and | ✷ Decree No. 73/2010/ND-CP on administrative penalization security and society issues |
<table>
<thead>
<tr>
<th>Environmental-social issues</th>
<th>Mitigation measure</th>
<th>Vietnam regulations/standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>demolition, as appropriate;</td>
<td>Provide technical documents and drawings to PC’s community, especially a sketch of the construction area and the EMP of the construction site; Notification boards shall be erected at all construction sites providing information about the project, as well as contact information about the site managers, environmental staff, health and safety staff, telephone numbers and other contact information so that any affected people can have the channel to voice their concerns and suggestions.</td>
<td>Vietnam regulations/standards</td>
</tr>
</tbody>
</table>

15. Chance find procedures

If the Contractor discovers archeological sites, historical sites, remains and objects, including graveyards and/or individual graves during excavation or construction, the Contractor shall:

- Stop the construction activities in the area of the chance find;
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities or the Department of Culture and Information takes over;
- Notify the Construction Supervision Consultant who in turn will notify responsible local or national authorities in charge of the Cultural Property of Viet Nam (within 24 hours or less);
- Relevant local or national authorities would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values; |

- Law on cultural heritage (2002)
- Law on Cultural Heritage (2009) for supplementary and reformation
- Decree No. 98/2010/ND-CP for supplementary and reformation
### Mitigation measure

- Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration and salvage;
- If the cultural sites and/or relics are of high value and site preservation is recommended by the professionals and required by the cultural relics authority, the Project’s Owner will need to make necessary design changes to accommodate the request and preserve the site;
- Decisions concerning the management of the finding shall be communicated in writing by relevant authorities;
- Construction works could resume only after permission is granted from the responsible local authorities concerning safeguard of the heritage.

### Vietnam regulations/standards
4.4. MEASURES TO MITIGATE SITE-SPECIFIC IMPACTS OF PROJECT ADDITIONAL WORKS DURING CONSTRUCTION

4.4.1. Measures to mitigate site-specific impacts for construction of Luong Khanh Thien secondary school

Potential impacts of this investment is considered small, temporary and localized. Almost these kinds of impacts can be mitigated by typical mitigation measures identified in ECOPs. Particularly main impacts in this area include risks of accident for students of two schools next to construction area and risk of traffic congestion and the impacts to school campus’s poinciana trees:

- In construction process, contractor is required to ensure the covers fully by tarpaulins, set up fence/barrier around construction area to avoid affecting to two schools. Construction materials will be transported according to a route along riverside to avoid affecting to traffic situation and it will be gathered in school campus.

- Announce to teachers and administrative board of primary school and preschool for management of students in two schools not coming near construction fence area of Luong Khanh Thien secondary school

- Arrange safeguard man to prohibit the pupils entering construction site

- In construction process, students of Luong Khanh Thien secondary school will be arranged the study at a new place that hired by school administrative board in Minh Khai ward

- Contractor have hired Ha Nam urban environment JS Company to relocate two trees. After construction is completed, Ha Nam Company will replant them in the school campus.

4.4.2. Measures to mitigate site-specific impacts for construction component of North embankment of Chau Giang river side

Potential impacts of this investment are considered moderate, temporary, and localized. Most of them can be mitigated through the typical mitigation measures identified in ECOPs. Key site-specific impacts include (a) disposal of about 20,000m$^3$ of non-contaminated dredged mud; (b) Water quality of Chau Giang river during construction period; (c) Occupational safety in embankment construction process; (d) Damage of construction work near embankment area such as routes, households and Dinh Trang temple. In order to mitigate this risk following measures will be carried out by PMU:

- According to analysis results, quality of soil, mud samples is no sign of pollution, therefore, it can be used for leveling or selling to the gardening households.

- Construction materials aren’t gathered near riverside and it must be covered cautiously.

- Ensure that the construction contracts include a requirement that before commencing the work, to provides a construction plan that set out how to maintain flow in the river,
reinforce timber pillars to ensure safety about household’s work structure along riverside and against erosion caused by river’s flow.

- Contractor has responsible to compensate the damages, restoring damaged traffic works and people’s houses caused by in construction process.

- Carry out construction in dry season to ensure occupational safety because it is very dangerous when constructs in flood season and to protect lakes and works avoiding inundation in construction process.

4.4.3. Measures to mitigate site-specific impacts for construction component of North route of medical basis - Bach Mai hospital connects to D4-N7 road

Potential impacts of this investment are considered moderate, temporary, and localized. Most of them can be mitigated through the typical mitigation measures identified in ECOPs. Site-specific environment issues in construction process of route are the influences to agricultural irrigation ditch and people’s rice fields. In order to mitigate this risk following measures will be carried out by PMU:

- Cover and fence construction area, to avoid the influence to people’s rice fields.

- Create shore made by sandbags to prevent construction soil, rock spilling into people’s rice field

- Warrant flow circulation of irrigation ditch

- Ensure that temporary culverts installed to protect flow circulation when construction works cut across in construction process.

- Ensure that before construction starts, drainage on site is one of first priority activities, including channels, mud sedimentation tanks, flow control works and wastewater collection system on site don’t flow into agricultural irrigation ditch

4.4.4. Measures to mitigate site-specific impacts for construction component of DT491 detour

Potential impacts of this investment are considered moderate, temporary, and localized. Most of them can be mitigated through the typical mitigation measures identified in ECOPs

Key site-specific impacts include: (a) impacts to traffic activities in area; (b) influence to local traffic works and Me Noi pagoda

In order to mitigate this risk following measures will be carried out by PMU:

- Ensure that contractor preparing and carrying out a site-specific environmental management plan for each aspect of ground clearance includes excavation, embankment, temporary and permanent drainage, and works of sidewalk, traffic, and safety on site. Specifically, in addition to the general requirements specified in ECOPs should:

- Ensure that there is no any ground clearance outside specified construction boundaries.
- Ensure that before construction starts, drainage on site is one of first priority activities, including channels, mud sedimentation tanks, flow control works, etc.

- Ensure that equipment reparation stations, temporary material gathering areas and production equipment; example: concrete and asphalt production stations need to be located far away rivers, residential areas and other sensitive areas.

- Ensure that all drivers, operators have to get specialized certificates in accordance with assigned duties and all this unit need to be trained and abode by the traffic management plan on site

- Planning for traffic management, avoid transporting construction materials on peak hours

- Waste soil can be used for filling ponds which are belong ward’s management near project area.

- Arrange machineries which have large noise and vibration far from households, pagoda to avoid affecting this works.

- Ensure that the construction plan takes into account the festival day of the pagoda

4.5. MITIGATION MEASURES FOR OPERATION STAGE

4.5.1. Mitigation measures in operation stage of Luong Khanh Thien secondary school

During operation, the overall impacts will be positive however, there are some risks that may cause negative impacts on the local environment and/or local residents during school’s operation process (a) arising wastewater (b) the risk of explosion. To address these risks, the following measures will be carried out by the city.

- Rain drainage system: Rain drainage system outdoor uses box culverts system B300 and B400 with manholes made by brick and cement 75 (reinforced concrete caps);

- Wastewater drainage system: Wastewater drainage system uses PVC D200 pipelines to drain wastewater from septic tank to manholes then discharging into general drainage system of city;

- Domestic wastewater of students and teachers will be treating through a septic tank. Area of three-floor buildings constructs a septic tank with length x width x depth = 5.06m x 3.08m x 1.66m. Area of two-floor building for headmaster and subject teachers constructs a septic tank with length x width x depth = 3.08m x 2.20m x 1.45m.

- School management will put some bins with different capacities on appropriate locations for littering. After that, an environmental sanitation team of school will coordinate with local environmental sanitation team of Luong Khanh Thien ward dumping with Phu Ly city’s garbage together.

- Equip initial fire extinguishing systems such as fire extinguishers, fire safety regulations, fire water supply system, and water storage tank with capacity of 20m³.
4.5.2. Mitigation measures in operation stage of North Chau Giang embankment

Operation process of North Chau Giang embankment is no arising environmental negative influences significantly. However, it appears several risk as following: (a) incident of breaking embankment, (b) people littering into river.

In order to mitigate this risk following measures will be carried out by PMU:

- Local authority should set up regulations, and environmental propagandas to people about environmental protection awareness.
- Arrange public bins along embankment
- Checking and repairing time for broke embankment segments to avoid situation of heavy rain causing erosion, embankment landslide seriously.

4.5.3. Mitigation measures in operation stage of road connecting from medical basis of Bach Mai hospital to D4-N7 road and DT491 detour

After construction has been under completion, there appears a big traffic flow of vehicles on this routes. Short-term main impacts include the increases of traffic flow and traffic accident; surface road, earthwork, drainage system will be quickly damaged due to maintenance is not carry out regularly.

In order to mitigate this risk following measures will be carried out by City maintenance unit:

- Ensure traffic safety regulations such as signboards, lighting system, painted lines have been carried out in construction process, remain for a long time and maintain them when get damaged
- Warrant city’s operation and maintenance plans, allocated budget should include necessary works and human resources to maintain this routes as in original condition
- With the support of traffic control unit, overload vehicles wouldn’t get participate traffic
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

5. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Based on the assessment of the potential negative impacts discussed in the Environmental Management Plan (EMP) for the item of embanking of Northern Chau Giang riverside. It includes environmental monitoring program and the implementation arrangements, taken into necessary terms to carry out Government’s EIA regulations and the World Bank (WB)’s safeguard policies.

5.1. Environmental Codes of Practice (ECOPs)

The full ECOPs are set out in the table below. Below are the broadly defined impacts that the ECOPs are intended to mitigate.

- Dust generation
- Air pollution
- Impacts from noise and vibration
- Water pollution
- Drainage and sedimentation control
- Management of stockpiles, quarries
- Solid waste
- Management of dredging materials
- Disruption of vegetative cover and ecological resources
- Traffic management
- Interruption of utility services
- Restoration of affected areas
- Public and labour safeties.
- Communication for Local communities
- Chance find procedures

5.2. Site-specific impacts

Table below presents relevant specific impacts and mitigation measures that haven’t been introduced yet in ECOPs.

<table>
<thead>
<tr>
<th>School construction at Luong Khanh Thien ward</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-construction</strong></td>
</tr>
<tr>
<td><strong>Impacts</strong></td>
</tr>
<tr>
<td>Restoration of Elder Poinciana trees in School campus (02 trees need removing in total of 15 trees)</td>
</tr>
<tr>
<td><strong>Mitigation:</strong></td>
</tr>
<tr>
<td>Hire Ha Nam urban environment JS Company to move and take care</td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) for additional items
Medium urban development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>Implementation Mechanisms:</th>
<th>Contract conditions, specifications, and the ECOPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibility</td>
<td>PMU</td>
</tr>
<tr>
<td>Fund source</td>
<td>Counterpart fund</td>
</tr>
<tr>
<td>Monitoring</td>
<td>PMU</td>
</tr>
</tbody>
</table>

**Construction**

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Traffic and occupational safety; temporary relocation of pupils to new site</th>
</tr>
</thead>
</table>
| Mitigation: | The mitigation measures proposed in ECOPs. In additional, several issues also should be carried out:  
- Covering construction area, transporting construction materials by the road along river’s embankment  
- Announce to teachers and administrative board of primary school and preschool for management of students in two schools not entering construction site of Luong Khanh Thien secondary school.  
- Arrange safeguard man to prohibit the pupils entering construction site  
- In construction process, students of Luong Khanh Thien secondary school will be arranged the study at a new place that hired by school administrative board |

<table>
<thead>
<tr>
<th>Implementation Mechanisms:</th>
<th>Contract conditions, specifications, supplementing those of the ECOPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibility:</td>
<td>Contractor/PMU</td>
</tr>
<tr>
<td>Fund source:</td>
<td>IDA credit</td>
</tr>
<tr>
<td>Monitoring:</td>
<td>Construction Supervision Consultant/PMU</td>
</tr>
</tbody>
</table>

**Operation**

<table>
<thead>
<tr>
<th>Impact:</th>
<th>Wastewater, fire-explosion incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitigation:</td>
<td>Set up fire extinguishing systems, anti-lightning system, septic tank for temporary wastewater treatment before discharging into general sewer system, sludge dredged periodically</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Implementation Mechanisms:</th>
<th>School maintenance and operation plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibility:</td>
<td>School Management Board and city</td>
</tr>
<tr>
<td>Fund source:</td>
<td>School operation budget</td>
</tr>
<tr>
<td>Monitoring:</td>
<td>Managers of school and city</td>
</tr>
</tbody>
</table>

**Embankment to prevent landslide of North Chau Giang riverside**

<table>
<thead>
<tr>
<th>Impact:</th>
<th>Land acquisition and resettlement, the relocation of 19 graves</th>
</tr>
</thead>
</table>
### Mitigation:
Implementation of the approved updated Resettlement Plan (RP) in accordance with its provisions.
Publicizing information to people
Ensure that grave relocation will be carried out in accordance with the approved updated RP before construction

### Implementation Mechanisms:
Approved updated resettlement plan

### Responsibility:
PMU

### Fund source:
City

### Monitoring:
Independent Monitoring Consultant

### Construction

#### Impacts
- Management of 20,000 m$^3$ non-contaminated dredging material, labor safety during construction
- Local disturbance; and damage to residential houses and nearby temple
- Obstruct river flow
- Risk of subsidence

#### Mitigation:
As required in ECOPs
Detail design: Study on hydraulic, hydrology, geological surveys to ensure sustainable and stable designs.
Construction process:
+ Reinforcement of piles in process of dredging, embanking along river
+ No gathering material near river bank,
+ Ensure flow circulation
+ When carry out construction have to include safety measures for households and compensate the damages if any damage to buildings, roads, houses.
+ Cement mixers and other construction equipment will be operated at a distance from the temple. Construction materials will not be stored near the temple.
+ Construct in the dry season to ensure safety.

#### Implementation Mechanisms:
Contract conditions, specifications, supplementing those of the ECOPs

#### Responsibility:
Contractor/ Detailed design consultant

#### Fund source:
IDA credit

#### Monitoring:
CSC/PMU, IEMC

### Operation

#### Impact:
The incidents of cracking/breaking embankment
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>Mitigation:</th>
<th>Checking, repairing, maintaining frequently and timely</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Implementation Mechanisms:</strong></td>
<td>Plans for operation and maintenance set up by Urban Works Company, Phu Ly city and the dyke managing team.</td>
</tr>
<tr>
<td><strong>Responsibility:</strong></td>
<td>Embankment management unit, Urban Construction Company Phu Ly city</td>
</tr>
<tr>
<td><strong>Fund source:</strong></td>
<td>City</td>
</tr>
<tr>
<td><strong>Monitoring:</strong></td>
<td>City</td>
</tr>
</tbody>
</table>

**27m-width-road connecting from Medical basis to D4-N7 road**

*Pre-Construction*

<table>
<thead>
<tr>
<th>Impact:</th>
<th>Land acquisition</th>
</tr>
</thead>
</table>
| **Mitigation:** | - Implementation of the approved updated Resettlement Plan (RP) in accordance with its provisions.  
- Publicizing information to people |
| **Implementation Mechanisms:** | Approved updated resettlement plan |
| **Responsibility:** | PMU |
| **Fund source:** | City |
| **Monitoring:** | Independent Monitoring Consultant |

*Construction*

<table>
<thead>
<tr>
<th><strong>Impacts</strong></th>
<th>The influences to agricultural irrigation ditch and people’s rice field</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mitigation:</strong></td>
<td></td>
</tr>
</tbody>
</table>
- Detail design: Design culverts through road to ensure ditch’s flow circulation  
- In construction process:  
- Ditch’s flow circulation, reduction of flow clogging,  
- Repair ditch when it get damaged,  
- Material and solid waste management on site  
- Set up fence/barrier at construction area |
| **Implementation Mechanisms:** | Detailed design and construction Contract’s terms, supplementary of measures mentioned in ECOPs |
| **Responsibility:** | Detailed design consultant/Construction Contractors. |
| **Fund source:** | IDA credit |
| **Monitoring:** | PMU, IEMC, CSC |

*Operation*

<table>
<thead>
<tr>
<th>Impact:</th>
<th>The increase of traffic flow and risks of traffic accident</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mitigation:</strong></td>
<td>Traffic and speed limit signboards</td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>Plans of operation and maintenance of City</td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

| Mechanisms: | 
| Responsibility: | Traffic police, City |
| Fund source: | City |
| **DT491 detour** | 
| **Pre-Construction** | 
| Impact: | Land acquisition and Resettlement |
| Mitigation: | Correctly carrying out regulations, policies of Province and updated resettlement plan. Publicizing information to people |
| Implementation Mechanisms: | Approved updated resettlement plan |
| Responsibility: | PMU |
| Fund source: | City |
| Monitoring: | Independent Monitoring Consultant |
| **Construction** | 
| Impacts | - The influences to traffic,  
- Noise and dust and vibrations to the Me Noi pagoda |
| Mitigation: | As proposed in ECOPs, in addition:  
In construction process:  
- Set up drainage system on site  
- Traffic management, establish construction signboards fully  
- Avoid transporting material in the peak hours  
- Arrange the concrete mixing stations and construction machineries having big vibration far away people’s house, temple.  
- The pagoda will be temporarily fenced off. In so far as possible, cement mixers and other construction equipment will be operated at a distance from the temple. Construction materials will not be stored near the temple.  
- Waste soil, rock can be used for filling pond, which belonged to Liem Chinh ward’s management (according to ward’s opinion).  
- Construction plan shall take into account the festival day of the temple and pogoda. |
| Implementation Mechanisms: | Contract conditions, specifications, supplementing those of the ECOPs |
| Responsibility: | Contractor |
| Fund source: | IDA credit |
| Monitoring: | CSC/PMU, EMC |
| **Operation** | 
| Mitigation: | The increase of traffic flow and risks of traffic accident |
| Implementation | By the maintenance and operation of the city |
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>Mechanisms:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibility:</td>
<td>Traffic and speed limit signboards</td>
</tr>
<tr>
<td>Fund source:</td>
<td>Traffic police, City</td>
</tr>
<tr>
<td>Fund source:</td>
<td>City</td>
</tr>
</tbody>
</table>

### 5.3. ENVIRONMENTAL MONITORING PROGRAM

#### 5.3.1. Supervising contractor’s safety implementation

3 level supervising contractor’s safety implementation will be carried out by consultant: frequent supervising, periodic supervising and community supervising.

- **Frequent supervising**: will be carried out by Construction Supervisor Consultant (CSC) under the designation of PMU. CSC will present supervising results in report of project progress.

- **Periodic supervising (6 months/times)**: is a part of Environmental Management Plan, environmental-social safety staff and Independent environmental monitoring consultant (IEMC) monitor contractor’s construction implementation 6 months/times and this results will be submitted to PMU, WB and Ha Nam Department of Natural Resources and Environment.

- **Community supervising**: Supervision by community will be carried out according to Government’s regulations with a technical assistance and management of PMU

#### 5.3.2. Environmental quality monitoring

**Table 19. Environmental monitoring scale in construction process**

<table>
<thead>
<tr>
<th>No</th>
<th>Monitoring item</th>
<th>Construction stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Noise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Parameters</td>
<td>Noise</td>
</tr>
<tr>
<td></td>
<td>2. Frequency</td>
<td>6 months/time, 2 positions</td>
</tr>
<tr>
<td></td>
<td>3. Location</td>
<td>2 positions: residential area along riverside and near Luong Khanh Thien secondary school</td>
</tr>
<tr>
<td></td>
<td>4. Standard to compare</td>
<td>QCVN 26/2010/MONRE</td>
</tr>
<tr>
<td>II</td>
<td>Air quality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Parameters</td>
<td>TSP, CO, NO₂, SO₂, HC, microclimate</td>
</tr>
<tr>
<td></td>
<td>2. Frequency</td>
<td>6 months/time, 2 positions</td>
</tr>
<tr>
<td></td>
<td>4. Location</td>
<td>2 positions: residential area along riverside and near Luong Khanh Thien secondary school</td>
</tr>
<tr>
<td>III</td>
<td>Surface water quality</td>
<td></td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) for additional items
Medium urban development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>No</th>
<th>Monitoring item</th>
<th>Construction stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Parameters</td>
<td>pH, temperature, DO, TSS, BOD5, COD, DO, oil and grease, Coliform</td>
</tr>
<tr>
<td>2.</td>
<td>Frequency</td>
<td>6 months/time, 2 positions</td>
</tr>
<tr>
<td>3.</td>
<td>Standard to compare</td>
<td>QCVN 08:2008/MONRE;</td>
</tr>
<tr>
<td>4.</td>
<td>Location</td>
<td>Sampling at the North embankment area (upstream and downstream according to the flow direction)</td>
</tr>
<tr>
<td>IV</td>
<td>Mud/soil</td>
<td>Taking 1 sample before dredging. Sampling if there are doubts</td>
</tr>
<tr>
<td>V</td>
<td>erosion monitoring</td>
<td>During embanking process</td>
</tr>
</tbody>
</table>

**Table 20. Estimation table of total samples in environmental monitoring process**

<table>
<thead>
<tr>
<th>Total construction time</th>
<th>Monitoring frequency</th>
<th>Total monitoring phase</th>
<th>Air and noise samples</th>
<th>Total surface samples</th>
<th>Soil/mud sample (take one time before construction)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Luong Khanh Thien school</strong></td>
<td>15 months</td>
<td>6 months/time</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td><strong>Northern embankment of Chau Giang river</strong></td>
<td>24 months</td>
<td>6 months/time</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td><strong>Northern road of medical basis – Bach Mai hospital connects to D4-N7 road</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No propose the monitoring because construction area is desert area, uninhabited with sparse traffic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Detour DT491</strong></td>
<td>24 months</td>
<td>6 months/time</td>
<td>4</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total samples</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

**Table 21. The cost of sampling (Exchange rate: 1 USD = 21,000 VND)**

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Price unit (VND)</th>
<th>Quantity (Sample)</th>
<th>Total (VND)</th>
<th>Total (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TSP</td>
<td>75,708</td>
<td>10</td>
<td>757,080</td>
<td>36.1</td>
</tr>
<tr>
<td>2</td>
<td>CO</td>
<td>447,223</td>
<td>10</td>
<td>4,472,230</td>
<td>213.0</td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) for additional items
Medium urban development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th></th>
<th>NO2</th>
<th>430,848</th>
<th>10</th>
<th>4,308,480</th>
<th>205.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>SO2</td>
<td>503,446</td>
<td>10</td>
<td>5,034,460</td>
<td>239.7</td>
</tr>
<tr>
<td>5</td>
<td>HC</td>
<td>1,223,239</td>
<td>10</td>
<td>12,232,390</td>
<td>582.5</td>
</tr>
<tr>
<td>6</td>
<td>noise</td>
<td>62,125</td>
<td>10</td>
<td>621,250</td>
<td>29.6</td>
</tr>
<tr>
<td>7</td>
<td>Micro climate</td>
<td>175,815</td>
<td>10</td>
<td>1,758,150</td>
<td>83.7</td>
</tr>
</tbody>
</table>

**II Surface water sample**

<table>
<thead>
<tr>
<th></th>
<th>Temperature</th>
<th>84,630</th>
<th>8</th>
<th>677,040</th>
<th>40.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>pH</td>
<td>101,041</td>
<td>8</td>
<td>808,328</td>
<td>48.1</td>
</tr>
<tr>
<td>3</td>
<td>DO</td>
<td>115,240</td>
<td>8</td>
<td>921,920</td>
<td>54.9</td>
</tr>
<tr>
<td>4</td>
<td>TSS</td>
<td>192,275</td>
<td>8</td>
<td>1,538,200</td>
<td>91.6</td>
</tr>
<tr>
<td>5</td>
<td>BOD5</td>
<td>297,782</td>
<td>8</td>
<td>2,382,256</td>
<td>141.8</td>
</tr>
<tr>
<td>6</td>
<td>COD</td>
<td>334,547</td>
<td>8</td>
<td>2,676,376</td>
<td>159.3</td>
</tr>
<tr>
<td>7</td>
<td>Oil/Grease</td>
<td>1,419,905</td>
<td>8</td>
<td>11,359,240</td>
<td>676.1</td>
</tr>
<tr>
<td>8</td>
<td>Coliform</td>
<td>1,352,767</td>
<td>8</td>
<td>10,822,136</td>
<td>644.2</td>
</tr>
</tbody>
</table>

**III Soil/sludge samples**

<table>
<thead>
<tr>
<th></th>
<th>As</th>
<th>382,480</th>
<th>1</th>
<th>382,480</th>
<th>18.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Cd</td>
<td>375,174</td>
<td>1</td>
<td>375,174</td>
<td>17.9</td>
</tr>
<tr>
<td>3</td>
<td>Cu</td>
<td>380,342</td>
<td>1</td>
<td>380,342</td>
<td>18.1</td>
</tr>
<tr>
<td>4</td>
<td>Pb</td>
<td>379,197</td>
<td>1</td>
<td>379,197</td>
<td>18.1</td>
</tr>
<tr>
<td>5</td>
<td>Zn</td>
<td>380,474</td>
<td>1</td>
<td>380,474</td>
<td>18.1</td>
</tr>
</tbody>
</table>

**Total cost of sample analysis**  62,267,203  3,337

5.4. ROLES AND RESPONSIBILITIES FOR EMP IMPLEMENTATION

5.4.1. Organization arrangement

Table and figure below summarize roles and responsibilities of the key parties and their relationships regarding the implementation of the EMP.

- Contractors are responsible for implementing mitigation measures. Measures will be included in bidding documents and costs are to be included in construction bids;
- CSC is responsible for monitoring the day-to-day implementation of mitigation measures. Cost included in CSC service contract;
- IEMC will be responsible for environmental monitoring which includes support to the PMU for implementing supervision and monitoring, and reporting on the implementation through monitoring reports
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

Figure 9. Organization Diagram for EMP Implementation

Table 22. Roles and responsibilities of key parties (explanation for figure above)

<table>
<thead>
<tr>
<th>Description</th>
<th>Roles/Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1a) (1b)</td>
<td>Based on quarterly reports of IEMC, PMU is responsible for preparing periodic reports to submit to WB and to the Ha Nam Provincial DONRE</td>
</tr>
<tr>
<td>(1c)</td>
<td>PMU assigns the safeguard staff (ESU) to review and check the related sections in the Contract Documents on the bidding packages for construction items of the project to ensure compliance with EMP</td>
</tr>
<tr>
<td></td>
<td>PMU assigns the safeguard staff (ESU) to supervise, manage and carry out EMP activities and also assigns CSC to closely supervise/monitor safeguard performance of the contractor, including undertaking the environmental monitoring program.</td>
</tr>
<tr>
<td></td>
<td>PMU/ESU establishes a hotline communication with local community to be responsive to the complaints, comments, and/or recommendations from local people and/or the public throughout the site clearance and construction period.</td>
</tr>
<tr>
<td>(2a)</td>
<td>CSC submits periodic monitoring report of environmental mitigation measures to PMU; Recommends to the PMU to suspend in part or completely, construction works if it does not meet labor safety and environmental protection requirements of the contract.</td>
</tr>
<tr>
<td></td>
<td>PMU reviews CSC’s periodical reports to ensure compliance with mitigation measures.</td>
</tr>
<tr>
<td>(2b)</td>
<td>CSC: Support, collaborate with IEMC to establish, collect and point out information about essential environmental parameters in the field and information for construction implementation;</td>
</tr>
<tr>
<td></td>
<td>IEMC: Monitor the implementation of the EMP every 3 months including submission of the field report. Create database of results from environmental supervision and monitoring and train PMU in using such</td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) for additional items
Medium urban development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>(3a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Contractor: Before construction, with assistance from IEMC, prepare a site-specific environment management plan (SEMP) during site clearance and construction process as part of their construction method statement, then submit it to CSC and/or PMU for review and approval;</td>
</tr>
<tr>
<td>- During construction, the contractor has to submit a monthly report on safeguard issues, mitigation, and results throughout the construction period. In case of unexpected problem, the contractor will consult CSC/PMU.</td>
</tr>
<tr>
<td>PMU/CSC: reviews the SEMP and can propose change as deemed necessary to be in line with the legal obligations as well as appropriate to each specific site. Daily supervision and monitoring of contractor’s safeguard performance will be responsibility of the CSC.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(3b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Contractor: Carry out the EMP required during site clearance and construction, including conduct self-monitoring and submission of report.</td>
</tr>
<tr>
<td>IEMC: periodically supervise and monitor the overall project EMP implementation including provision of safeguard training to PMU/ESU staff, community, CSC, and contractors as needed. The training will be designed to enhance the effectiveness of the EMP implementation and reporting.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(4a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>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/or PMU. In case of unexpected problems, they will report to CSC/PMU and/or call the hotline.</td>
</tr>
<tr>
<td>PMU: Encourage, support and create good conditions for local community to participate in the environmental supervision and monitoring activities. PMU/CSC will review and response to the requests and/or recommendations made by community to ensure that the potential negative impacts are adequately mitigated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(4b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community: Support and collaborate with IEMC during periodic monitoring and provide inputs to the overall safeguard issues that require attention and/or mitigation.</td>
</tr>
<tr>
<td>IEMC: Strengthen local community’s capacity and relevant agencies through preparation of relevant documents necessary for monitoring, supervision, and reporting including preparation of a database for the activities.</td>
</tr>
<tr>
<td>IEMC: assist PMU and communities for the implementation of Information-Education-Communication (IEC) activities within Component 4 with regard to environmental hygiene, sanitation, road safety, etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEMC supports PMU/ESU to implement the EMP in line with Government’s environmental regulations as well as the WB safeguard policies. In consultation with DONRE, IEMC will establish specific environmental monitoring program</td>
</tr>
</tbody>
</table>
for the project to be implemented by CSC at key locations as shown in detailed design documents.

PMU is responsible for preparation of the 6-month progress reports to be submitted to WB and DONRE, based on quarterly reports submitted by IEMC.

5.4.2. Specific responsibilities of PMU, CSC and IEMC

Project Management Unit (PMU)

- PMU is responsible for implementing the EMP during the detailed design and construction stages. EMP implementation during operation stage is the responsibility of the facilities operators. PMU will set up an Environmental and Social Unit (ESU) to ensure timely and effective implementation of the EMP, including preparation of reports on safeguard compliance as required by Government and WB.

- PMU/ESU is responsible for ensuring that the related sections in the Contract Documents on the bidding packages for construction items of the project are in compliance with the EMP.

- PMU/ESU is responsible for communicating with relevant local, provincial and national departments; and with parties responsible for implementing and supervising EMP, especially with the provincial Department of Natural Resources and Environment (DONRE) and the concerned wards/communes during planning, monitoring, operation, and management.

- PMU/ESU will coordinate with community organizations to encourage them to actively participate in the planning, management, and implementation of the project, including monitoring of the contractor’s performance.

- To ensure effective monitoring and timely implementation of the EMP, PMU/ESU will hire national environmental consultants to assist in carrying out and monitoring the EMP implementation. Responsibilities of the Independent Environmental Monitoring Consultant (IEMC) will be described below.

- For supervision and monitoring of contractor’s performance, PMU will be responsible for: (a) Checking project implementation indicators relating to environment; (b) Unannounced inspections to ensure that mitigation measures are being implemented as presented in construction contract by contractor; (c) Reviewing periodic report of construction supervision consultant (CSC) to ensure compliance with mitigation measures; and (d) Based on the periodic reports by CSC and IEMC, PMU will prepare report on environmental compliance of subproject to submit to WB and DONRE (This is part of the submission of a 6-month progress report to WB).

- PMU will coordinate closely with relevant enterprises on water supply, environmental sanitation, solid waste collection and to monitor operation and maintenance during project implementation

Independent Environmental Monitoring Consultant (IEMC)

The IEMC will be responsible for assisting the PMU in EMP implementation. This also includes advising the CSC, contractors and communities on environmental compliance, and carrying out
Environmental management plan (EMP) for additional items
Medium urban development project – Phu Ly city subproject

the monitoring program in accordance with regulations and procedures of the Government and World Bank. Once the detailed operational implementation of the environmental monitoring program is discussed by PMU and World Bank, the IEMC will be responsible for quarterly checking, and supporting the PMU staff to supervise overall project activities to ensure that unified environmental protection policies of the Government and World Bank are applied and supervised during project implementation. The IEMC will be responsible to: (1) provide training and capacity building for construction management for PMU/ESU staff, including field engineers and/or consultants (CSC) in supervising the EMP implementation of the contractor; (2) ensure active participation of the local communities and schools in the project areas, (3) monitor environmental parameters to assess the overall impacts of the project, and (4) establish environmental training program to be included in Component 4.

Specifically, the IEMC’s responsibilities include:

- Ensuring that the approved EMP and all project loan agreements related to environmental safeguards are fully applied and complied during project implementation.

- Assessing the effectiveness of mitigation measures which are provided by contractor and CSC in implementation process; providing proposals and recommendations to the PMU on necessary improvement and supplementation to meet the safeguard requirements.

- Reporting periodically (every 3 months) to the PMU on actual EMP performance during project implementation.

- Establishing standard procedures, methods and forms to assist the PMU and CSC to assess contractors’ progress in implementing required impact mitigation and monitoring measures.

- Assisting the PMU’s environmental staff to review and check the related sections in the Contract Documents on the bidding packages for construction items of the project to ensure compliance with environmental protection policies and impact mitigation and monitoring requirements.

- Measuring, taking samples and monitoring periodically environmental parameters (once per 3 months) during the time of environmental monitoring contract.

- Assistance in the preparation of documents and implementation of training program on environmental monitoring and supervision for contractors, CSC and relevant staffs of PMU (environmental staffs and coordinators of packages).

- Via PMU, discussing with relevant enterprises (if necessary) to find suitable solutions for unexpected risks relating to environmental sanitation;

Construction Supervision Consultant (CSC)
The CSC is responsible for monitoring the safeguard performance of the contractor during site clearance and construction, including oversight of the self monitoring to be conducted by contractor. With regard to safeguards, the CSC’s main responsibility will include, but not be limited to, the following:

- Assist IEMC to establish, collect and provide information about both essential environmental indicators on-site and construction work.
- Ensure that construction work complies with approved EMP, relevant indicators and standardized operation in documents for environmental impact mitigation and monitoring.

- Monitor the mitigation measure implementation of contractor, propose and deploy supplementary measures in time to complete mitigation measures and to meet the environmental management safety requirements of project.

- Make action plans/urgent solutions to cope with environmental problems, urgent situation and damages happening in construction

- Recommend PMU to suspend partially or completely construction work if labor safety and environmental protection requirements of the contract are not complied with.

- Organize regularly discussions with relevant enterprises and other stakeholders to provide information about implementation plans and necessary working program to enhance people’s awareness of environmental protection during construction process

**Construction Contractor**

- The construction contractor’s responsibilities in respects of all aspects of the works, including the environmental aspects, are set out in the contract between it and the PMU.

- Construction contractors have their own responsibilities for both carrying out environmental impact mitigation measures and compliance with approved EMP during assembling construction of project packages. In the preparation of technical method statement, contractor will study the project’s approved EIA report and propose a construction method that includes environmental mitigation and protection measures that are aligned with the recommendations of the approved EMP.

- Contractor’s method statement will be submitted to PMU and CSC for review, as well as to IEMC as deemed necessary. Changes, if there are any, will be evaluated for feasibility and for legal issues (laws, decrees, circulars and other regulations) before suitable adjustments are approved for specific cases on-site.

- During construction work, construction contractor will be closely supervised by PMU, CSC, IEMC, environmental authorities and local community on EMP observation.

### 5.4.3. Reporting arrangement

The PMU will prepare reports twice per year for submission to the World Bank including the compliance with the EMP. The report will contain the monitoring results and assessments of the IEMC that show project progress and the status of implementation of the EMP.

### 5.5. TRAINING PROGRAMS PROPOSED

Table below will supply a specific training program about safe policies to strengthening capacity, knowledge on environmental supervising of contractors, communities and local authorities

**Table 23.** Training Program for Capacity Strengthening on Environmental Supervision and Management

<table>
<thead>
<tr>
<th>I. Object</th>
<th>CSC, CONTRACTOR, COMMUNE/WARDS AUTHORITIES, COMMUNITY REPRESENTATIVES</th>
</tr>
</thead>
</table>
Environmental management plan (EMP) for additional items
Medium urbans development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>Training course</th>
<th>Implementation of mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participators</td>
<td>CSC; on-site construction management staff; environmental staff of contractor; commune/ward/group authorities</td>
</tr>
<tr>
<td>Training Frequency</td>
<td>After bidding, update based on requirements</td>
</tr>
<tr>
<td>Time</td>
<td>One day</td>
</tr>
<tr>
<td>Content</td>
<td>Overview of environmental monitoring; Requirements of environmental monitoring; Role and responsibilities of contractors and CSC; Content and methods of environmental monitoring; Response and risk control; Propagate monitoring forms and guide how to fill in the forms and risk report; Other areas to be determined; - Preparation and submission of report</td>
</tr>
<tr>
<td>Responsibilities</td>
<td>PMU, IEMC with support of the Technical Assistance team for the implementation of safeguards</td>
</tr>
</tbody>
</table>

5.6. ESTIMATED EMP COST

Cost estimate of EMP implementation of additional works is a part of the cost for EMP implementation of the whole Phu Ly MCDP Subproject.

The EMP cost will comprise (i) cost for implementation of the mitigation measures by contractor, (ii) cost for supervision by the CSC, (iii) cost for environmental monitoring consultant (IEMC) including cost for monitoring of environmental quality (iv) PMU safeguard management costs, including technical assistance support for the implementation of safeguards and training. Costs for the implementation of the mitigation measures during construction will be part of the contract cost while cost for monitoring of SEMP by the CSC is provided for in the construction supervision contracts. Costs for PMU operations related to EMP are provided for in the project management budget of the PMU, including basic safeguards training and allowances for people who participate in the monitoring program. After project completion, the cost for environmental monitoring of the constructed facilities will be funded by the cities’ operations and maintenance budgets.

It is noted that the attendance of community representatives in EMP implementation is voluntary, and without salary. Hence, to encourage the participation of community members, the cost for materials, equipment used for monitoring and rewards for people who are voted to implement monitoring are taken into account. Following decision No. 80/2005/QĐ-TTg dated 18/4/2005 of Prime Minister on regulations of community investment monitoring and joint circular for guidelines of decision implementation No. 80/2005/QĐ-TTg
Table 24. Estimated Cost for EMP implementation for Phu Ly (million USD)

<table>
<thead>
<tr>
<th>Source of funds</th>
<th>Original Phuly Subproject (millions of $US)</th>
<th>Additional Work (millions of $US)</th>
<th>Total Cost (millions of $US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Mitigation during construction</td>
<td>Part of contracts</td>
<td>Part of contracts</td>
<td>Part of contracts</td>
</tr>
<tr>
<td>(b) Supervision of safeguards during construction</td>
<td>Part of CSC costs in Comp. 4</td>
<td>Part of CSC costs in Comp. 4</td>
<td>Part of CSC costs in Comp. 4</td>
</tr>
<tr>
<td>(c) Environmental Safeguards unit (ESU) of PMU</td>
<td>Part of PMU costs in Comp. 4</td>
<td>Part of PMU costs in Comp. 4</td>
<td>Part of PMU costs in Comp. 4</td>
</tr>
<tr>
<td>(d) Environmental quality monitoring</td>
<td>0.0333</td>
<td>0.03</td>
<td>0.0033</td>
</tr>
<tr>
<td>(e) Independent Environmental Monitoring Consultant (IEMC)</td>
<td>0.0936</td>
<td>0.08</td>
<td>0.0136</td>
</tr>
<tr>
<td>(f) Safeguards capacity building program</td>
<td>0.25</td>
<td>0.25</td>
<td>WB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No</th>
<th>Content</th>
<th>Unit</th>
<th>Quantity</th>
<th>Price unit (VND)</th>
<th>Total (VND)</th>
<th>Total (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Specialist salary</td>
<td>Man_month</td>
<td>5</td>
<td>35,000,000</td>
<td>175,000,000</td>
<td>8333.3</td>
</tr>
<tr>
<td>2</td>
<td>Local stays and allowance</td>
<td>Man_day</td>
<td>30</td>
<td>500,000</td>
<td>15,000,000</td>
<td>714.3</td>
</tr>
<tr>
<td>3</td>
<td>Travelling expenses</td>
<td>Man_Trip</td>
<td>20</td>
<td>400,000</td>
<td>8,000,000</td>
<td>381.0</td>
</tr>
<tr>
<td>4</td>
<td>Training course</td>
<td>Course</td>
<td>1</td>
<td>5,000,000</td>
<td>5,000,000</td>
<td>238.1</td>
</tr>
<tr>
<td>5</td>
<td>Office supply</td>
<td>Monitoring Stage</td>
<td>4</td>
<td>5,000,000</td>
<td>20,000,000</td>
<td>952.4</td>
</tr>
<tr>
<td>6</td>
<td>Environmental quality monitoring</td>
<td></td>
<td></td>
<td></td>
<td>62,267,203</td>
<td>3,337</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>285,267,203</td>
<td>13,584</td>
</tr>
</tbody>
</table>
6. PUBLIC CONSULTATION

6.1. Objects of community consultation:
In order to share all information of construction items in project, collect community’s opinions and concerns, especially take opinions of directly affected objects by construction and operation process of this items. In this case, community proposes appropriate solutions to carry out environmental mitigation measures.

6.2. Conducted methods
The methods of public consultation are often used including quick assessment method having the participation and consultation of stakeholders, using techniques such as:
- Community meetings, group meetings and focusing group discussions
- Also conducting investigation and interviewing quickly some households along assessment route, finding out thoughts, aspirations and their ideas about the project by issuing questionnaires.

6.3. Consultation results
The public consultation with local authorities, community, was carried out from 20 to 21 July 2015 and 26 to 27 August 2015. About 7 days before the public consultation, the consultant informed the local authorities on the proposed additional investments and coordinated with local authorities to invite affected people and representatives of affected groups. The public consultation was carried out by the form of questionnaires, communities and group meeting on the content of the draft EMP. The communities and groups meeting were held at the meeting halls of communal people committees. The results of the public consultation is presented in the Table below.

<table>
<thead>
<tr>
<th>Time, location</th>
<th>Content</th>
<th>Public consultation</th>
<th>Feedback of PPU and consultant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lam Ha commune PC</td>
<td>21, July, 2015:</td>
<td>- In materials transportation process, contractor should spray water to mitigate dust, avoid influence to the residential area.</td>
<td>- These issues have been considered in the EMP draft report.</td>
</tr>
<tr>
<td>21, July, 2015 and 26, August, 2015 (Northern Embankment of Chau Giang riverside and Northern road of medical basis – Bach Mai hospital)</td>
<td>- Local authority representatives</td>
<td>- Waste is not be indiscriminately pouring into agricultural irrigation ditch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 3 households in project area</td>
<td>- Recommendation in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>26, August, 2015:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Local authority representatives</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Head of street population group, Woman Union, and 34 affected</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 26. Consultation results
Environmental management plan (EMP) for additional items
Medium urban development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>Content</th>
<th>Public consultation</th>
</tr>
</thead>
<tbody>
<tr>
<td>connects to D4-N7 road)</td>
<td>households in project area</td>
</tr>
<tr>
<td></td>
<td>construction process, contractor should spray water to mitigate dust, avoid affecting to people</td>
</tr>
<tr>
<td></td>
<td>Luong Khanh Thien ward PC 20, July, 2015 and 26, August, 2015 (Construction of Luong Khanh Thien secondary school)</td>
</tr>
<tr>
<td></td>
<td>21, July, 2015:</td>
</tr>
<tr>
<td></td>
<td>- Local authority representatives</td>
</tr>
<tr>
<td></td>
<td>- 3 households in project area</td>
</tr>
<tr>
<td></td>
<td>26, August, 2015:</td>
</tr>
<tr>
<td></td>
<td>- Local authority representatives</td>
</tr>
<tr>
<td></td>
<td>- Head of street population group, Woman Union, and 19 households in project area.</td>
</tr>
<tr>
<td></td>
<td>- In construction process: the contractor should transport construction materials along riverside to avoid affecting to traffic</td>
</tr>
<tr>
<td></td>
<td>- In school’s campus has poinciana trees that over forty years will be affected by this construction. In the opinion of the ward and the people, it need to be retain, before construction, this trees should move to a different location to take care and after construction done, it will be bring back to school. (by Ha Nam urban environment JS Company)</td>
</tr>
<tr>
<td></td>
<td>- Carry out measures to ensure environmental hygienic in construction process</td>
</tr>
<tr>
<td></td>
<td>- These issues have been considered in the EISA draft report.</td>
</tr>
<tr>
<td></td>
<td>- Completely agree with participant’s opinions</td>
</tr>
<tr>
<td></td>
<td>Liem Chinh ward PC 20, July, 2015 and 27, August, 2015 (Construction of)</td>
</tr>
<tr>
<td></td>
<td>21, July, 2015:</td>
</tr>
<tr>
<td></td>
<td>- Local authority representatives</td>
</tr>
<tr>
<td></td>
<td>- 3 households in project area</td>
</tr>
<tr>
<td></td>
<td>27, August, 2015:</td>
</tr>
<tr>
<td></td>
<td>- In construction process of DT491 detour will affect to local people’s movement. Traffic flow in this area is high, so appropriately arrange</td>
</tr>
<tr>
<td></td>
<td>- This issues have been considered in the draft EMP report.</td>
</tr>
</tbody>
</table>
Environmental management plan (EMP) for additional items  
Medium urbans development project – Phu Ly city subproject

<table>
<thead>
<tr>
<th>Content</th>
<th>Public consultation</th>
<th>Feedback of PPU and consultant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time, location</td>
<td>Participant</td>
<td>Participant’s opinion</td>
</tr>
<tr>
<td>DT491 detour)</td>
<td>- Local authority representative</td>
<td>traffic lines to avoid traffic congestion</td>
</tr>
<tr>
<td></td>
<td>- Head of street population group, Woman Union, pagoda caretakers and representative of households in project area. (33 households)</td>
<td>- The construction will have to use rollers and compactors (near Me Noi pagoda). Noise and vibration can affect to this works. In construction process, contractor need carry out measures to mitigate vibration and noise.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Frequently water to reduce dust on site and transport routes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Excavating soil (managed by ward) can be used for filling ponds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Ensure lighting system</td>
</tr>
</tbody>
</table>

6.4. Dissemination of information

The draft EMP has been disclosed at the Office of the Phu Ly CPC and Ward People’s Committee on 06, October, 2015. Information on dissemination activities of this draft was put on the web portal of Phu Ly CPC. Should there be additional concerns raised among stakeholders, based on the content of the final EMP, then another consultation will be held. Final draft of this report will be sent to World Bank and be published in the InfoShop.

Environmental management plan for additional items will be placed at the office of Lam Ha, Luong Khanh Thien, Liem Chinh People’s Committees.
APPENDIX 1. LEGAL DOCUMENT
APPENDIX 2. ANALYZING RESULT
APPENDIX 3. CONSULATION MINUTES
APPENDIX 4. DRAWINGS