SFG2528 V4

NINH THUAN PROVINCIAL PEOPLE'S COMMITTEE

IMPLEMENTATION UNIT FOR CAPACITY BUILDING AND ODA WATER RESOURCES PROJECTS IN NINH THUAN PROVINCE

EXECUTIVE SUMMARY

ENVIRONMENTAL & SOCIAL IMPACTS ASSESSMENT

PHAN RANG - THAP CHAM CITY SUB-PROJECT

COASTAL CITIES SUSTAINABLE ENVIRONMENT PROJECT

(Draft for Consultaion)

PHAN RANG, October 2016

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PROJECT INVESTOR

CONSULTANTS

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TABLE OF CONTENTS

ABBREVIATIONS

CCESP	Coastal Cities Environmental Sanitation Project
CCSEP	Coastal Cities Sustainable Environment Project
CSC	Construction Supervision Consultant
CSO	Sewage Overflow Chamber
DN	Nominal Diameter
DONRE	Provincial Department of Natural Resources and Environment
ECOPs	Environmental Code Practices
ESIA	Environmental and Social Impacts Assessment
ESMP	Environmental and Social Management Plan
FS	Feasibility Study
HTLO	Hai Thuong Lan Ong
IDA	International Development Association
IEMC	Independent Environmental Monitoring Consultant
MONRE	Vietnam Minsitry of Natural Resources and Environment
O&M	Operation and Maintenance
ODA	Official Development Assistance
PAPs/APs	Project's Affected Persons/Affected Persons
PDO	Project Detail Outline
PMU	Project Management Unit
PPC	Provincial People's Committee
PR-TC	Phan Rang – Thap Cham
QCVN/TCVN	Vietnam National Technical Regulations/Standards
RP/RAP	Resettlement Plan
SA	Social Assessment
TOR	Terms of Reference
URENCO	Urban Environment Company
USD	United States Dollar
VND	Vietnam Dong
WB	The World Bank
WWTP	Wastewater Treatment Plant

CHAPTER 1. PREFACE AND PROJECT DESCRIPTION

A. PREFACE

1. The World Bank funded Coastal Cities Environmental Sanitation Project (CCESP) was implemented from 2007 to 2014 in three cities including Nha Trang in Khanh Hoa province, Quy Nhon in Binh Dinh province and Dong Hoi in Quang Binh province. The project focused on construction/upgrade or rehabilitation of the main drainage and sewerage systems, lakes and canals and solid waste collection and treatment facilities in order to reduce flooding and improve environmental conditions in the project's cities.

2. CCESP was implemented well and met the project's setup objectives. In order to maintain the investment efficiency of CCESP and to further promote efficiency facilities invested in the project and strengthening the institutional reforms in the field of environmental sanitation, the Government of Vietnam and World Bank have agreed to finance for a new project named Coastal Cities Sustainable Environment Project (CCSEP). The project will be implemented in 04 coastal cities, including Dong Hoi, Quy Nhon, Nha Trang and Phan Rang – Thap Cham (Ninh Thuan province) – a new city brought into this project.

   Project's name: Coastal Cities Sustainable Environment Project (CCSEP) – Phan Rang Thap Cham City Sub- project

   Project's owner: Ninth Thuan Provincial People's Committee (PPC)

   Investor: Implementation Unit for Capacity Building and ODA Water Resources Project in Ninh Thuan Province (the PMU)

   The Investor's Representative: Mr. Do Khoa Danh, Director of the PMU

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B. PROJECT DESCRIPTION

3. Project's objectives

   General project's objective is to sustain the efficiency of environment investment and strengthen the utility reform agenda concerning sanitation sector in the project cities.

   Specific objectives are

   - Improvement of the drainage capability and reduce number of flooded places.
   - Enhancement of wastewater collection and treatment capability, aiming to improve the water, soil and air environment.
   - Enhancement of capacity and efficiency of waste collection.
   - Improvement of school and public sanitary conditions.
   - Improvement of inner urban transport and drainage, sewerage infrastructure.
   - Improvement of the management, operation for the PMU, provincial departments, sector, public work institutions and project stakeholders.
   - Aiming to sustainability about technical and financial conditions of the project.
   - Mitigation of project impacts to the affected people, improvement and enhancement of the living conditions for the local residents and tourists.

4. Phan Rang Thap Cham City Sub-project of CCSEP is proposed with four (4) components, including: Component 1: Sanitation Infrastructure, Component 2: Urban Connectivity, Component 3: Resettlement and Site Clearance, and Component 4: Technical Assistance and Institutional Reform.

5. Total investment cost of the proposed CCSEP is USD 236 million; of which the fund for Phan Rang Thap Cham City Sub-project is estimated about USD 87.88 million. Summary of the sub-project financial structure is as follows,

- WB ODA fund USD 74.85 millions
- WB non-returnable fund USD 0.5 million
- VN counterpart fund USD 12.53 millions

8. Phan Rang Thap Cham City Sub-project has it's proposed investment items located widely in all over the 15 wards and 1 commune of the city areas, including: Bao An, Dai Son, Dao Long, Do Vinh, Dong Hai, Kinh Dinh, My Binh, My Dong, My Hai, My Huong, Phu Ha, Phuoc My, Tan Tai, Van Hai, Thanh Son wards and Thanh Hai commune. The main construction related investment contents (the components 1,2&3) of the subproject is shown in Table 1.1. The project layout is shown in Figure 1.1.

Table 1.1. Main construction-related items of the subproject

No	Investment Item	Phasing	Description
I	**Component 1**		
1	***Drainage system***		
a	Rehabilitation of Tan Tai canal (L=6,946m)	2019 to 2022	- Section TT1 (L=3,435), construction of vertical stone walls sized B*H=(3.0-7.0)x(2.3-4.0)m; 4m wide management road on the left bank, and 2m wide pavement on both sides. - Section TT2&TT3 (L=1,813), construction of new double box culvert sized 2xBxH=2x3.0x3.0m and road on the box culvert. Construct 6 DN600-sized outlets and CSOs. - Section TT4 (L=722m), construction of new box culvert sized BxH=2x3.0x3.0m and 5.5m wide road and pavement on the box culvert. - Section TT5 (L=416m), construction of vertical stone/concrete walls sized B1xB2xH=7.5x7.5x3.7m; construction of 5.5m wide management road on the left bank; 2.25m wide pavement on bith banks. Construct 3 DN600-sized outlets and CSOs. Construct a new pumping station PS4. - Section TT6 (L=516m), construction of new box culvert sized BxH=2.0x1.5m and 4.2m wide road and pavement on the box culvert.
b	Rehabilitation of Cha La canal (Investment in 3,739m of the total 7,567m long)	2017 to 2018	- Sections CL2&CL5 (total L=2,280m), rehabilitation of the canal by concrete embankment; constructing 4m wide management roads and 2m-wide sidewalks on both banks. - Sections CL3&CL4&CL6, dredging the canal; constructing 4m-wide roads and 2m-wide sidewalks on both banks for some segments where have not yet constructed.

c	Construction of Dong Nam canal (L = 1,379m)	2017 to 2018	The new construction proposal is to widen the canal with sizes of BxH=10.0x2.7m, and construct management roads on the banks and other supporting facilities.
d	Rehabilitation of Nhi Phuoc canal (L= 1,709m)	2017 to 2018	- Section NP1(L=83m), due to this canal's section has small cross section, the proposal is to construct a box culvert sized 2xBXH=2x2.5x2.5m; and remaining the existing 4.8-5.2m wide concrete road on the right bank. - Sections NP2, NP3& NP4 with a total length of 1,616m, the proposal is to construct a box culvert with sizes of BxH=3.0x3.0m under the right-bank road; and construct the embankment for the left bank to remain the open canal as it's existing.
e	Rehabilitation of TH5 canal (L= 662m)	2017 to 2018	The proposal is to embank the canal with sizes of B1xB2xH=0.6x1.4x1.58m and construct a 3m-wide earthen road on the left bank and a 1m-wide earthen road on the right bank. There will be 5 sluice gates which need to be repaired along the canal route.
f	Construction of Central regulation lake	2019 to 2022	The Central lake is planned on an existing agricultural land area of about 30.2ha. The proposal is to construct a new lake with water surface area of 17.7ha; the remained land areas will be constructed an on-bank green park.
g	Rehabilitation of Dong Hai regulation lake	2019 to 2022	Dong Hai lake has a total square area of 4.32ha. The proposal is to rehabilitate for using as a regulating lake of the area. The lake will be dredged and embanked to keep 3.4ha water surface. The remaining land area will be construction of management road, wastewater collecting sewers, green trees and lighting system. The project will also rehabilitate a canal connecting the lake and the nearby sea lagoon; construct a wastewater pumping station for Dong Hai ward.
h	Construction of secondary drainage sewers	2017 to 2022	Total proposed length for construction of secondary drains is about 76 km, with sizes from D600-1500mm.
2	***Wastewater collection and treatment system***		
a	Construction of tertiary sewers for wastewater collection	2019 to 2022	Total proposed construction length of tertiary sewers is 50.5km with pipe sizes of D150-500mm and concrete ditch B400mm. On the sewer routes CSOs would be constructed accordingly.
b	Construction and repairingWastewater pumping stations	2019 to 2022	Within the project investment, there will be eight new PSs to be constructed and other four existing PSs to be rechecked for repairing.
c	Upgrading the WWTP	2019 to 2022	Upgrade from the existing capacity of 5,000 m^3/day to a new capacity of 7,500 m^3/day
d	Public and school toilets		Construction of four public toilets in the city center and parks; and construction of toilets for pupils and teachers for three schools in the city
II	**Component 2**		

	Expaning and prolonging Alley 150 of 21/8 road		Total proposed construction length is 979.46m. The proposal is to construct a road with 2 vehicle lanes, 3.5m wide for each lane, and two 2m wide road edges, and two 4.5m wide sidewalks. Total width of designed cross section is 20.0m. Designed speed of the road is 50km/h.
	Expaning and prolonging Huynh Thuc Khang road		Total proposed construction length of the road is 979.46m. The proposal is to construct a road with 4 vehicle lanes, 3.5m wide for each lane, and two 2m wide road edges, and two 4.5m wide sidewalks. Total width of designed cross section is 27.0m. Designed speed of the road is 50km/h.
III	**Component 3**		
	Construction of new resettlement area		Total construction area of the resettlement area St = 6.7 ha. The area is located in Phan Dang Luu street, Phuoc My ward, limited to the boundary of Phan Dang Luu road and agricultural lands to the north; an existing residential area of Phuoc My ward to the east; agricultural lands to the south; and agricultural lands and Alley 150 of 21/8 road to the west. The area has a capacity of 358 land lots with a total area of 3,636 ha for resettlement. Construction items include levelling, road works, drainage works, waterworks, underground technical culverts, park and green trees, power supply and lighting system, traffic safety system.

C. LEGAL AND TECHNICAL BASIS FOR ESIA PREPARATION

9. The proposed project is implemented in Vietnam therefore all environmental and social related laws and legal regulations of Vietnam must be complied. In addition, this is a WB-funded project, thus the safeguards policies of WB must be satisfied.

10. This ESIA has been prepared basing on the following Vietnamese laws and regulations,

- Law on Environmental Protection No. 55/2014/QH13 dated 23 June 2014,
- Law of Land No. 45/2013/QH13dated 29 November 2013,
- Law on Occupational Safety and Hygiene No. 84/2015/QH13 dated 25June 2015,
- Law of Water Resources No. 17/2012/QH13 dated 21 June 2012,
- Law of Labor No. 10/2012/QH13 dated 18 June 2012,
- Law on Technical Standards and Regulations No. 68/2006/QH11 dated 29 June 2006,
- Decree No. 18/2015/ND-CP dated 14 February 2015, by the Prime Minister providing environmental protection planning, strategic environment assessment, environmental impact assessment and environmental protection plan;
- Decree No. 19/2015/ND-CP dated 14February 2015 by the Prime Minister detailing implementation of some articles of the Law on Environmental Protection;
- Decree No. 38/2015/ND-CP dated 24 April 2015 by the Government on management of wastes and scraps;
- Decree No. 03/2015/ND-CP dated 06 January 2015 stipulating determination of damages to the environment;

- Decree No. 179/2013/ND-CP dated 14 November 2013 by the Government on handling legal violations in the field of environmental protection;
- Decree No. 43/2014/ND-CP dated 15 May 2014 by the Government detailing the implementation of some articles of the Law on Land;
- Circular 27/2015/TT-BTNMT dated 29 May 2015 by the Ministry of Natural Resources and Environment on strategic environment assessment, environmental impact assessment and environmental protection plan;
- And other related legal documents.

11. The environmental and social screening for the subproject according to the criteria defined by the Bank's safeguards policies has been carried out, and the result shows that the WB policies on Environmental Assessment (OP/BP 4.01)[1], Physical Cultural Resources (OP/BP 4.11); and Involuntary Resettlement (OP/BP 4.12)[2] are triggered for this subproject. The subproject has also to comply with the WB's requirements on public consultation and disclosure of information required by the relevant safeguard policies and in accordance with the Bank's Policy on Access to Information. The implementation of the policy on OP/BP 4.12 is addressed in the Resettlement Policy Framework (RPF) of the CCSEP project, and the Resettlement Action Plan (RAP) of this subproject. The environmental and social screening and the detailed ESIA confirmed that the proposed subproject is classified as Category A because its potential significant adverse environmental and social impacts.

12. World Bank Group Environmental, Health, and Safety Guidelines[3]

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

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

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

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

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

Figure 1.1. Location map of Phan Rang Thap Cham city.

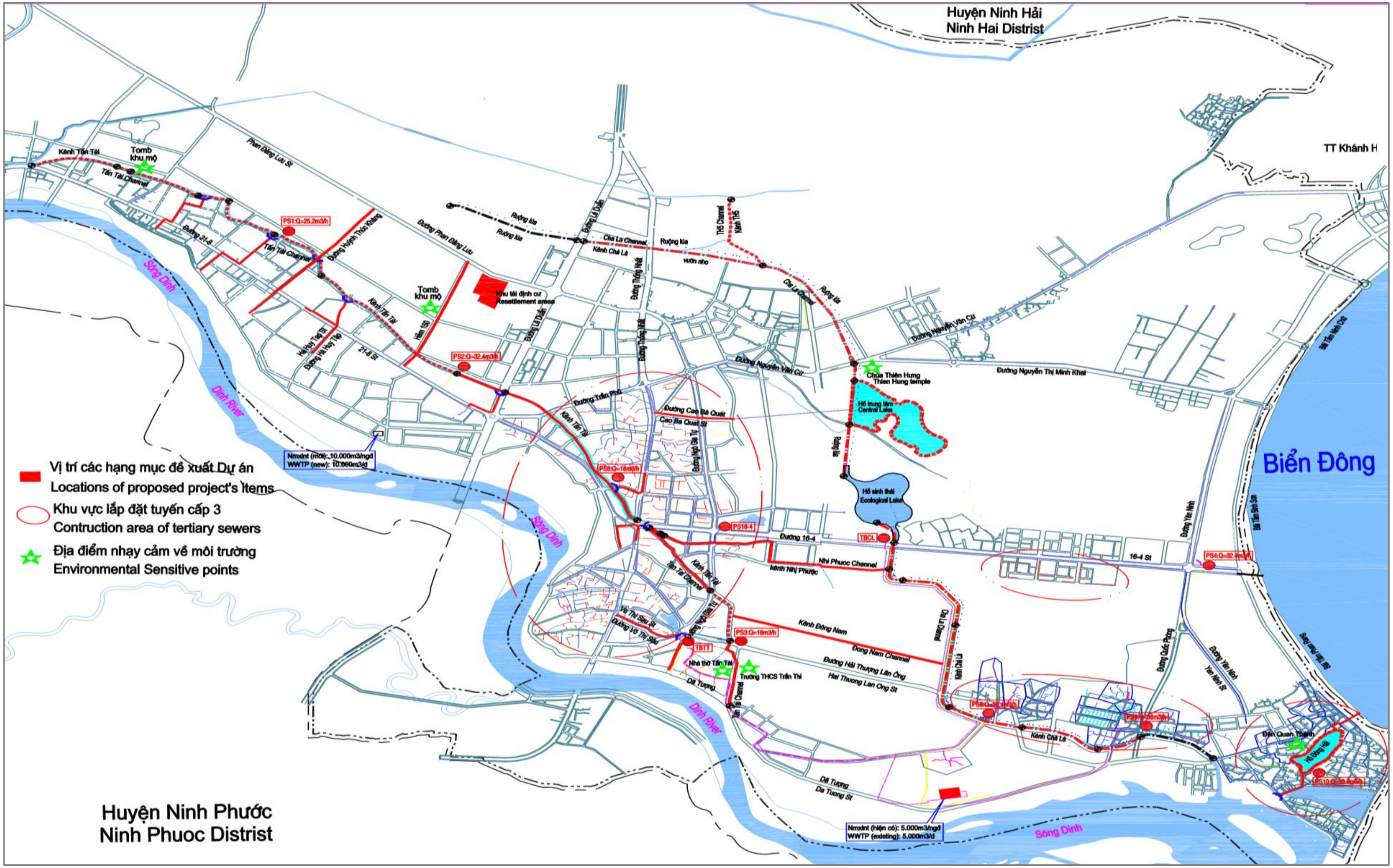

Figure 1.2. Project layout.

CHAPTER 2. NATURAL ENVIRONMENT AND SOCIO-ECONOMIC CONDITIONS

A. NATURAL ENVIRONMENTAL CONDITIONS

Project Location

15. Phan Rang – Thap Cham city is the administrative center of Ninh Thuan province, locates at about 340km north of Ho Chi Minh city, and about 1,380km south of Hanoi capital. The city borders with Bac Ai district and Ninh Hai district to the north, with Ninh Son district to the west, with Ninh Phuoc district to the south, and with the East Sea to the east.

16. Phan Rang Thap Cham City Sub-project of CCSEP is proposed undertaking entirely in all administrative units of 15 wards and 1 communes of the city, including: Bao An, Dai Son, Dao Long, Do Vinh, Dong Hai, Kinh Dinh, My Binh, My Dong, My Hai, My Huong, Phu Ha, Phuoc My, Tan Tai, Van Hai and Thanh Son wards, and Thanh Hai commune.

Topography

17. The city locates on the low hill terrain, with main slope direction from Northwest to the Southeast. The urban areas are mainly located on the North of Dinh River and surrounded by 10km dyke with the top height of 6.2m. In the inner city, the natural elevation is less than 20m, the construction elevation is ranging from 3.5m to 7.0 m. The paddy fields in the Northwest is a lowland area with elevation from 2.5m to 7.5m interspersed with sandbars. The highest areas are low hills near Thap Cham. The Southern area of Dinh River has not been developed into an urban area because there are no dykes with elevation from 1.5m to 3.5m. Hence the area is considered as the flood discharge area of the city.

Geotechnical Conditions

18. In general the geological conditions are favorable for construction, with load strength >1.5kg/cm2. The low elevated paddy field has the upper layers of topsoil and mud with poor load strength, lower layers consist of sandy silt, sandy clay, the load strength of 1.0 kg/cm2 ÷ 1.5 kg/cm2. The mountainous areas are composed of clayish gravel, rocks, weathered rocks mixed with fine grains and sandy silt, the load strength of that soil strata is good, however with stretching property.

Hydrogeology

19. The groundwater level in PR-TC city varies seasonally. In rainy seasons, the groundwater level in some regions are equal to the surface water level, it is yellowish in color and brackish as being influenced by sea water. Groundwater in Phan Rang delta located mainly in 02 aquifers of Holocene (Qh) and Pleistocene (Qp). Potential groundwater reserve exploited in the aquifers in city plain is 338,543m^3/day. In particular, the exploitation volume in Qh is 186,437 m^3/day; and in Qp is 152,106 m^3/day.

Hydrology

20. Phan Rang Thap Cham city is located on the northern bank of Dinh River. The river has been playing very important roles in supplying water for agricultural production irrigation, people's daily life, tourism and economic activities. The river is also important for drainage and flow

control. Dinh River has a total length of about 120 km, a total basin area of about 2050 km². The average flow is 39m³/s; and the lowest flow in dry season is about 3.35 – 8.0m³/s.

21. There are two water weirs named as Nha Trinh and Lam Cam constructed on the main Dinh river. These water weirs are all roughly low (<10m) water walls aiming to separate partly the river water aligning directly into the canal systems serving for agricultural irrigation in downstream areas. No water reservoirs were constructed here. Nha Trinh weir is a bock stone wall with a total length of 500m. The weir was originally constructed in the 12 century at a distance of about 25km from the river mouth. The river section passing through PR-TC city has a total length of about 16km. Lam Cam weir has a height of 7.4m, a length of 150m, were constructed of cement concrete at a distance of about 15km from the river mouth. The water flow separated from Lam Cam weir is aligned to the city through Tan Tai and Cha La canal systems serving water for agricultural irrigation.

Climate and Meteorology

22. The project area has a high and stable temperature baseline. The average temperature is about 27ºC. The highest temperature is usually from May to June and the lowest temperature is in December and January. Due to the wind direction of most time during the year is comming from the sea, the moisture in the air in the city is relatively high for most times of the year, with an annual average air humidity is about 77%. Ninh Thuan province is arid with an annual rainfall smallest in Vietnam. Meanwhile, the city is considered to have the lowest annual average rainfall in the province, with a value of about 763 mm. The rainy season is usually occurred in four months from September to December with a rainfall accounted equally about 65-75% of the total annual rainfall. The average number of annual rainy days is about 75 days.

23. The project area is affected by monsoon regime with two main windy season per year. Rainy monsoon season operates from October to April with the prevailing wind direction of northeast; the average wind speed is about 3 m/s. Summer monsoon season operates from May to October with the main wind direction of southwest; the average wind speed is 1.8 m/s. In May and June, there is also the southeast wind blowing from the sea to onshore.

24. Hurricanes occur around September to December, most concentrated in October and November. Statistically for every 4 to 5-year period, there could be one hurricane hitting the province. Due to the topographic characteristics of Ninh Thuan province, the effect of hurricanes in PR_TC city is usually not as serious as in other regions of the central provinces in Vietnam. However, the storms may cause heavy rains in the upstream areas of Dinh river causing floods for some areas locating along the river's banks, especially the sections without dikes.

B. EXISTING ENVIRONMENTAL QUALITY

Air Quality

25. Results of air quality monitoring implemented frequently every 6-month period from 2011 to June 2015 by DONRE show that the air quality in the the city in general is relatively clean, has no sign of air pollution. Most of the analytical parameters were meeting the allowable standards. According to DONRE, the major sources causing air pollution in the city are from transportation and construction activities, residential living activities and wastes treatment.

26. Results of the surveys on existing noise status and ambient air quality implemented during ESIA preparation process shows that all the analytical parameters TSP, SO2, NO2 and CO satisfied the allowable standards in accordance with QCVN 05:2013/BTNMT – National technical standards for ambient air quality.

Surface Water Quality

27. Surface water quality monitoring data in Dinh river conducted by DONRE from 2011 to 2015 on some basic criteria such as: pH, DO, Fe, NH4 +, NO2, NO3, BOD5, COD and coliforms shows that the river water quality is still relatively good and not contaminated. While the results of water quality monitoring Bac Canal and Nam Canal showed signs of organic pollution. For the five years period, surface water quality has seemly not changed much. Most analyzed parameters were meeting the allowable standards. However, in 2015, pollution level of organic matters and nutrients significantly increased and exceeded the standards.

28. Surveyed results of surface water quality implemented during ESIA process showed that the surface waters in the project areas had several indicators that went beyond the standard limits.

- Concentration of pollutants in surface water taken from the canals and ditches in the city increased from upstream to downstream. Especially with nutrient parameters.
- Coliforms concentration at the beginning of TH5 canal exceeded 32 times. In Dong Hai regulation lake, BOD5 and Cl- concentration outreached the standards 1.2 times and 51.9 times respectively. It was noticeable that salinity in surface water of Dong Hai lake was very high, at 24.7o/oo
- Surface water in Dinh river at a wastewater discharge sewer of the wastewater treatment plant was saline at 10 o/oo. Cl- and Coliforms concentration exceed the standards 32.1 and 1.2 times respectively.
- TSS, N-NH4+, Cl- and Coliforms parameters at the Sinh Thai lake exceed the standards 2.0, 1.4,8.2 and 10 times respectively.

Groundwater Quality

29. The DONRE's monitoring results revealed that quality of underground water samples in PR – TC city was quite good and met domestic use and agricultural purposes. Almost analyzed indicators met the standards of National Technical Regulations QCVN 09:2008/BTNMT. However, Cl- concentration in some locations close to the sea surpassed the allowable standards.

30. Results of ground water quality survey carried out during the ESIA process show that Coliforms concentration in all analyzed samples were exceeding the allowable limits regulated by QCVN 09-MT:2015/BTNMT4 from 14.3 times to 367 times. Chloride concentration in the analyzed ground water samples exceeded the allowable limits from 2.3 times to 44.3 times. Especially the sample from My Dong village had N-NH4+ concentration that doubled the allowable limits and KMnO4 concentration that outreached 1.6 times collated to the allowable limits. These results showed that almost samples in the Project areas were saline.

Sediment Quality

31. Surveyed results of the sediment quality in the Project areas implemented during ESIA process were show that almost all the sediment/soil samples taken in the project's areas were meeting the allowable standards for agricultural and residential soils in accordance with QCVN 03-MT:2015/BTNMT. Only 3 out of 14 samples including one sample in Tan Tai canal and two others from organic topsoil in the central lake area had As concentration slightly exceeding the allowable limits for agricultural soil from 1.1 to 1.2 times higher.

[4]QCVN 09-MT:2015/BTNMT: National regulations on ground water quality.

Biological Resources

a) Terrestrial Flora and Fauna

32. So far there has been no study in specific quantity of plant and animal species in the city. However the results of a field survey and according to information provided by local residents, the characteristics of terrestrial flora and fauna in the city is as follows:

- Generally ecosystem in the project area is poor due to the city only has urban ecosystem, garden and agricultural land ecosystems. Terrestrial flora and fauna are simply pets and cultivated plants of households or amusement park.
- The vegetation in the city is mainly agricultural crops (rice, corn, potatoes, grapes, etc.), home garden crops (fruit trees, ornamental plants, etc.), park trees, shrub. Animals in the area are mostly livestock animals and poultry, such as chickens, ducks, dogs, cats, pigs, goats, sheep, cows, etc.
- There is no area of biodiversity value which needs to be conserved in the city; no species found belonging to rare species, no genes needed to be protected and no species listed in the Vietnam's Red Data Book.
- The city has no area playing the important role as food or breeding area for animals which are needed to be conserved from Nui Chua and Phuoc Binh National Parks.

b) Aquatic Flora and Fauna

33. Water sources in the project's proposed investment items in the canals and Dong Hai lake are small-scale works artificially built for the purposes of agricultural irrigation and drainage, these works have no value in terms of biodiversity. Fish found in the canals are local popular species, they are adaptable and fast-growing species, without value in terms of biodiversity. Particularly, in Dong Hai lake at the moment, there is no valuable fish or aquatic species because of water and sediment contamination and shallow water level.

34. Only one remarkable inland water source in the project area is Dinh river. Up to now there has been no study in aquatic flora and fauna or ecosystem of Dinh river. The result of the interviews with people living in the local region showed that no public record of fish or other aquatic animals with rare and valuable genes needed to be conserved appears in Dinh river. Because there are two water weirs having been constructed on the main river's route including Nha Trinh and Lam Cam water weirs ,the river's flow has been divided into several segments. Therefore, the status of aquatic ecosystem of Dinh river is predicted to be relatively similar to the ecosystem of other large water reservoirs. Species of fish living in Dinh river would probably be locally common species, they live there and do not migrate.

C. SOCIO-ECONOMIC CONDITIONS

Population, Labor and Income

35. Phan Rang – Thap Cham city has a total population of 170,720people, of which 94.53% are living in the inner city and the remaining 5.47% are living in suburb areas. The average population density of the city in 2014 was 2,156 persons/km2, in which the population is mostly concentrated in Kinh Dinh Ward with the population density to 18,955 persons/km2 (around 5.0-8.5 times in comparison with the average density of the city) and the population density in Do Vinh Ward is the lowest, only 446 persons/km2.

36. The total number of the workforce in 2014 was 121,941 persons, consisting of 61,336 male workers, accounting for 50.3% and 60,605 female workers, accounting for 49.7%. Among the total number of the workforce, there are 115,234 workers in the urban areas accounting for 94.5% and 6,707 workers in the rural areas accounting for 5.5%.

37. The workforce being employed at the moment accounts for 94.3% of the total workforce in the city, mainly works in the non-public sectors with85,050 persons, accounting for 96.4% of the employed workforce, 2,918 persons working in the public sectors, accounting for 3.3% and 289 persons in the foreign investment organizations, accounting for 0.3%. The unemployment accounts for 5.7% with 3.48% in the urban area and 2.22% in the rural area.

38. A sociological survey was carried out in 12 wards/commune in the project area with a sample size of 2,276 households (1800 households are expected to have benefit directly and other 476 households are expected to be affected by the project). Results of the survey show that average size of the households is 4.2 persons/household, mostly nuclear families. A rate of 99.5% of interviewed persons were belonging to the Kinh ethnic group, the remaining percentage of 0.5% interviewed persons was belonging to the Hoa ethnic group. Although the Hoa ethnic people are not abundant, they live scattered, intermingled with the Kinh ethnic people. Due to a long-standing with the Kinh people, the Hoa people's customs and living habits in the project areas are the same as of the Kinh people. They all know how to read and write Vietnamese language. Most of the interviewees were completed secondary school, high school or higher levels.

39. Regarding the expenditure, total expenditure per household is VND 4,390,000 million household/month. In terms of economic households, this expenditure increases households with higher living standards, namely: VND 2,750,000 per month for poverty households; VND 4,630,000 million per month for average group; and well-off group with VND 7,490,000 million per month. In other words, the spending of poverty household is only about 37% of well-off households and 59% average households in the same month.

40. Like other similar surveys, the monthly expenditure of poverty households typically account for a significant proportion of their limited income. The same with this survey, the average rate of 92.6% compared to the total expenditures monthly income of poverty households. In particular, spending on food accounts for a high proportion (30.3%), followed by others such as family business... account for 18%. Meanwhile, with the average households, average expenditures account for 76.7% of total revenues, well-off households account for only about 68.7%. The table above also shows that most of the expenses for food of households accounted for the largest proportion of total income. On average of these households account for 28% of total revenue, followed by other investment costs (family business ...) accounted for 18.3%. Average expenditures for education accounted for 11%, expenditures for environmental fees are only 0.5% of the total revenue of the household.

41. The social vulnerable group is a concept to denote the communities, groups whose position on political, economic, social or lower than the majority, put them at higher risk of forgotten

or violated rights. Therefore, they need special protection than other groups, communities. In the survey programs, the identification of disadvantageous groups is an important work, which is the basis to develop a plan for compensation and resettlement (if any), especially in programs, livelihood recovery plan, the group has always been of particular interest.

42. Through the survey there are 61.9% of households that are not under disadvantageous/ vulnerable groups. Considering the structure, family group with female householder accounted for highest rate of the family group headed by women accounted for the highest rate with 22.5%, followed by poor households accounted for 9.1%, following is poverty households with elderly and disabled persons accounted for 6.5%, families of ethnic minorities (ethnic Hoa) is with just 0.5%.

43. Spitted by economical households, the proportion of households with ethnic minority groups accounted for 0% of poverty, while the average group is 0.4% and well-off group is 2.3%. This is explained by the ethnic groups, particularly ethnic Chinese, has lived for a long time due to the Kinh, so habits, living habits just Kinh. Even they use Vietnamese very proficiently. In their daily life, they immerse in the Vietnamese community, do not encounter any barriers whatsoever. It was thus developing their economy does not encounter difficulties over the ethnic business community.

44. For poor group, the rate of female householder is 18.6%, 27.9% are poor and 7.0% of households with elderly and disabled people. We can say the proportion of households in groups of vulnerable, disadvantaged have relatively high, this requires the compensation to the affected families, a project need to reduce negative effects, disrupt life; on the other hand it should have priority policies to reduce the difficulties disadvantaged by the impact caused by subproject.

Health Care

45. Phan Rang – Thap Cham city is the centre urban area of the province, having most of leading health diagnostics and treatment of the province, thus the health care system in the city area are diversified, having all the level of health care system from lowest level to provincial level, from state own to private bases. Health care bases in the city area are invested and newly built with modern equipment's, such as: Provincial general hospital of Ninh Thuan (600 beds), Hospital for treatment and functional restoration (60 beds), Social disease prevention centre (20 beds), traditional medicine hospital (50 beds), General clinic of Phan Rang – Thap Cham area (30 beds), General clinic of Thap Cham area (30 beds), city health care centre, health care station at wards/communes … The system of health care foundations are being increased and improved both in quality and quantity to meet the requirement of health diagnostics and treatment of people in the city as well as in the whole province.

Physical Cultural Recourses

46. There is no cultural structures located within the project's construction limits. However there are some cultural/historical structures located near to the proposed project items, therefore they could be temporarily affected during the project's construction phase. These structures include,

- **Thien Hung Pagoda:** The pagoda was constructed in 1927, locates Van Son village, Van Hai ward of PR-TC city, about 100m far to the north from the proposed construction site of the project's Central lake. Annually festive days of Thien Hung pagoda are on 01/01, 19/2, 8/4 and 15/7 (lunar calendar).
- **Quan Thanh Temple:** Quan Thanh temple locates in Alley 68, Bach Dang road, Dong Hai ward, PR-TC city, about 50m far to the north-west from the proposed construction site

of Dong Hai lake. Quan Thanh temple is a small temple constructed in Duy Tan King period (about the first half of 19 century). The temple worships Sir Bui Huy Tan, a mandarin under Nguyen Kings. Annually festive days are on 20/7 and 16/1 (lunar calendar).

- **Phan Rang Provincial Pagoda:** Phan Rang Provincial pagoda (other name Sung An pagoda) locates at No. 56, in 21/8 road, Phu Ha ward, PR-TC city, about 50m to the south from the proposed construction site of Tan Tai canal. The pagoda was constructed in 1947 with a total square area of 10,756m2. Annual festive days are on 16/01, 14-15/4, 12/5 and 8/12 (lunar calendar).
- **Tan Tai Parish Church:** The church locates in Tran Thi road, Tan Tai ward, PR-TC city, about 50m far to the west from the proposed construction site of Tan Tai canal.

CHAPTER 3. ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT

3.1. POSITIVE IMPACTS

47. As the name of "sustainable environment project", the Coastal Cities Sustainable Environment Project – Phan Rang - Thap Cham Subproject is expected to bring back many great benefits on the environment, such as improvement of traffic, drainage and sewerage systems; landscape environmental quality and ecological conditions... in a sustainable manner for the city.

- Improvement of drainage capability, reduction of floods and enhancement of freshwater storage
- Enhancement of wastewater collection and treatment contributing to improvement of the water, soil and air quality
- Enhancement of waste collection capability and efficiency
- Improvement of school and public sanitation
- Improvement of traffic, environmental sanitation and urban landscape conditions
- Improvement of the project management and operation capacity for the PMU, departments, agencies, public interest offices and other related units
- Mitigation of social and environmental impacts.

3.2. POTENTIAL IMPACTS AND RISKS

48. During preparation, construction and operation of the project's works, it is expected that there will be potentially negative environmental and social impacts. The summary of environmental and social impacts identified for different Project phases is presented in Table 3.1below.

Table 3.1: Identification of main negative environmental and social impacts of Project's Components

Phase	Natural environment										Ecosystem		Social environment												
	Air pollution	Surface water pollution	Soil& ground water	Solid wastes	Lake &canal sediment	Soil erosion	Landscape	Topography and geology	Hydrology	Meteorology	Terrestrial ecosystem	Aquatic ecosystem	Compulsory resettlement	Daily life of local people	Local socio-economic condition	Land use	Physical community division	Traffic system	Social infrastructure and service	Ethnic minorities	Local conflicts of interest	Water use	Sanitation, risks of epidemics	Risks of labour and fire safety	Historical and cultural structures
COMPONENT 1 – SANITATION INFRASTRUCTURE																									
Canals and lakes investment items under Component 1																									
Preparation	L	L	N	L	N	N	L	N	N	N	L	N	H	M	L	L	L	L	L	N	N	N	L	L	N
Construction	H	M	L	H	N	M	M	N	L	N	M	L	L	M	L	L	L	H	M	N	N	L	M	M	L
Operation	L	N	N	L	N	L	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	L	N
Investment items in drainage and sewerage systems and wastewater treatment under Component 1																									
Preparation	N	L	N	L	N	N	L	N	N	N	L	N	N	N	N	L	N	L	L	N	N	N	L	L	N
Construction	M	M	L	M	M	H	H	N	N	N	L	L	N	M	L	L	M	H	M	N	N	L	M	M	L
Operation	L	N/L	N	L	N	L	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	L	N
Public and school toilets under Component 1																									
Preparation	N	N	N	L	N	N	L	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Construction	M	L	N	M	L	N	M	N	N	N	L	L	N	N	N	N	N	L	N	N	N	L	L	L	N
Operation	L	N/L	N	L	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

COMPONENT 2 – URBAN CONNECTIVITY																								
Preparation	L	L	N	L	L	N	L	N	N	N	L	N	H	L	N	L	L	L	L	N	L	N	L	L	N
Construction	H	M	L	H	M	N	M	N	N	N	L	L	N	H	L	L	L	H	M	N	L	L	M	M	L
Operation	L	N	N	L	L	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	L	N
COMPONENT 3 – RESETTLEMENT AND SITE CLEARANCE																								
Preparation	L	L	N	L	L	N	M	N	N	N	L	N	H	M	L	L	L	L	L	N	L	N	L	L	N
Construction	H	M	L	M	M	N	M	N	L	N	L	L	N	M	L	L	L	M	L	N	L	L	M	M	L
Operation	L	L	N	M	N	N	N	N	L	N	N	N	N	N	N	N	N	N	N	N	N	L	L	N	N

Remarks:

N – no negative impacts;

L – low negative impacts occurred in locally small scopes and temporally short time;

M – medium negative impacts occurred in locally medium scopes and temporally, could be mitigated;

H – high negative impacts in large scopes and levels, irreversible and must be compensated.

Scope of Land Acquisition

49. Total square area of permanent land acquisition would be about 517,085m^2. Of which: 25,936m^{2}residential land; 389,663m^2 agricultural land; 101,486m^2 traffic and irrigation lands; and other 1,418 m^{2}grave land.

50. There are totally 969 households with 3,985 persons to be affected by the land acquisition for construction of the proposed project's work items, which include 144 households needed to be displaced, 449 households seriously affected by acquisition of equally or more than 20% of production land, and remaining partly affected. There are about 35 graves which need to be relocated. The detail land acquisition scopes of every work item are shown in Table 3.2.

Table 3.1. Scope of impacts by land acquisition

Component	Acquired square area (m²)					Affected structure			Affected trees		Affected households/ institutions			
	Total	Residential land	Agriculture land	Traffic, irrigation	Grave	House	Other Structure	Grave	Annual tree	Long-term tree	Total	Of which		
												Serious impact	Business	Relocation
Component 1	407,660	9,410	306,898	91,352	0	9,055	3,467	0	104,886	261,370	737	369	15	84
Component 2	42,435	11,577	25,551	5,307	1,418	5,700	635	35	10,731	14,820	177	50	2	52
Component 3	66,990	4,949	57,214	4,827	0	800	125	0	24,030	33,184	55	30	0	8
Total	517,085	25,936	389,663	101,486	1,418	15,555	4,227	35	139,647	309,374	969	449	17	144

51. The project would not only have the impacts on permanent land acquisition, but also some other impacts on temporal land occupation during the construction phase. It is estimated that there would be a total land area of about 113,872 m^2 along Tan Tai, Dong Nam, Cha La, TH5 and Nhi Phuoc canals, and along secondary drains and tertiary sewers in Dong Hai ward and in north and south of 16/4 road which would be temporally occupied during the project construction.

52. The potential impacts caused by the project during construction and operation phases have been assessed in details in Chapter 4 of ESIA. Summary of the key impacts are shown in Table 3.3 below.

Table 3.2.Summary assessment results of the project's potential negative impacts

Type of impacts	Summary assessment results of key potential impacts
KEY POTENTIAL NEGATIVE IMPACTS DURING CONSTRUCTION PHASE	
Air Pollution	
Dust	The assessed results show that in general the dust concentration generated on transportation roads normally does not exceed the permissible standards. The dispersion distance of dust is not very great with dust concentrations quickly decreasing over travelling distances. At a distance of 20m from the road edge, the dust concentration calculated for all construction items under the Project was many times lower than the permissible standards. However, the calculations were for only the dust amounts generated by the vehicle engines and did not include dust brought up from road surfaces by moving wheels and dust from materials or waste dropping/spilling out of vehicle bodies during transportation. These amounts of dust would be much dependent on weather conditions, road surface quality, hygiene of vehicles and roads, wind strength. In addition, the calculations were based on agreed cases where there were only transportation vehicles for each work item under the Project circulating on such roads without considering cumulative impacts from other vehicles travelling on the same roads. Therefore, impacts from dust generated on these roads would be bound to be higher with these additional factors. 21/8 Street, 16/4 Street, Thong Nhat Street, Bach Dang Street, Hai Thuong Lan Ong Street, Nguyen Van Cu Street are the main routes for transporting materials and also the arterial roads in the City. Such roads will be more affected by dust from higher flows of traffic means. The impacts of dust from Project activities will be significant. Nevertheless, such impacts would be only temporary during the construction phase and can be mitigated. The affected subjects would be road users and households living along the roads. Dust pollution can contribute to hindering business and service activities as customers would be more willing to choose cleaner places for eating, drinking or buying goods.
Exhaust Gases	Toxic substances dispersed in the air from vehicle exhaust gases such as CO, SO2, NO2 and VOC along transportation routes and within a dispersion distance of 80m from the design point (edges of roads) would be all within permissible standards in conformity with QCVN 05:2013/BTNMT. Similar to the mentioned case for dust, the calculations are based on the assumption that there are only Project vehicles travelling along the routes for each of the Project construction works without taking into consideration cumulative impacts from other road using means. In reality, the concentrations of pollutants are bound to increase substantially in comparison with the calculated results; especially, such routes as 21/8 Street, 16/4 Street, National Highway 1A and National Highway 27 (main routes for transporting backfilling materials and construction waste into/from the city); and 16/4 Street (main route for transporting excavated materials to the disposal site at the new urban areas of Dong Bac and Dong Nam) are expected to be highly affected by cumulative impacts from the construction items of the Project. 21/8 Street, 16/4 Street, Thong Nhat Street, Bach Dang Street, Hai Thuong Lan Ong Street, Nguyen Van Cu Street and local traffic roads to the South of the city are the main routes for transporting materials and also the arterial roads in the City. Such roads will be more affected by exhaust gases from higher flows of traffic means.

Type of impacts	Summary assessment results of key potential impacts
	The affected subjects will be road users and households living along the roads. These are impacts of high levels but will take place temporarily during the construction phase and can be partially mitigated by maintenance and cleaning of transportation means in conformity with standard procedures and by complying with speed limits on the said routes.
Bad Odour	The dredging of canals and Dong Hai lake and the repair & replacement of 413 and 215 damaged manholes respectively in the wastewater collection systems in the new urban areas, the central part of the city & coastal urban areas, and of the secondary sewer pipelines can give rise to bad odours affecting surrounding areas. Such bad odours – from gases as methane, H2S, NH3, etc. – are generated from the anaerobic decomposition of organic sludge. The impacts from bad odours during construction were assessed to be medium level and temporary during the short time of dredging organic sludge dredge.
Noise	The calculation results have shown that noise generated by construction machines and equipment on site basically meets the permissible standards if construction equipment is operated at a distance of at least 100m. Therefore, upon construction at places near residential areas, planned distances of construction equipment from residential areas need to be properly considered for the sake of safety. In case construction operations must be carried out close to residential areas (as for Tan Tai canal, Dong Hai area, Alley 150, Huynh Thuc Khang Street, areas for the installation of drainage and sewerage lines along urban roads, school sanitation facilities and public sanitation facilities), mitigation measures are to be applied to cut down noise from construction.
Water Pollution	
Surface Water Runoff	The preliminary calculations obtained only for some areas for the construction works of resettlement sites, roads and lakes. Meanwhile, data for the work items related to the construction of secondary sewer lines, wastewater collection systems (planned to be successively constructed on each route) and school and public sanitation facilities have not been calculated. Therefore, stormwater runoff through construction sites would be relatively high. Unless suitable drainage regulation measures are taken, it would cause negative impacts and decrease the quality of surface water bodies in the area. In addition to the said impact on surface water quality, stormwater run could bring along soil, sand and waste causing sedimentation, thus blocking the combined drainage system of the area. The impacts from stormwater runoff during construction could be considered as medium level and require strict management measures.
Domestic Wastewater	According to the calculation results, the total daily amount of domestic wastewater generated during the construction phase would relatively high but distributed on many different construction sites in the whole city. The amount of domestic wastewater generated at each main construction site of the Project would be on average about 0.9 to 1.6m^3/day. Impacts by domestic wastewater generated during construction phase could be considered at low level, possibly mitigated by strictly management measures.
Construction Wastewater	The construction wastewater is generated from such activities as washing of materials and cleaning of machines & equipment, concrete curing, etc. The composition of construction wastewater normally comprises soil, sand, high amounts of suspended materials and possibly even oil and grease. The generated amount of construction wastewater type is estimated not much since the sites are managed properly.

Type of impacts	Summary assessment results of key potential impacts
	In general, the greatest amount of construction wastewater comes from the washing wheels of transportation trucks before they get out of the construction sites. According to forecasts, wastewater from wheel washing at the construction site would contain only soil, sand and suspended materials and no oil. The calculated generated volume of this wastewater type would range from zero to 2.22 m^3/day for each construction site. The impacts could be considered as being medium level for construction sites of larger investment items such as resettlement area, canals, lakes and roads
Solid Waste Generation	
Dredged and Excavated Materials	Ground levelling and excavation operations for the construction of the project items would be expected to generate a total of about 29,374 m^3 of organic sludge and 788,647 m^3 of excavated soil to be disposed off. Since the quality of sludge and soil at the construction sites was analyzed meeting the permissible standards on the content of heavy metals in the soil. These volumes of sludge and excavated soil could be used as backfill at new urban areas of the city. As recommended by Ninh Thuan DONRE, the volume excavated materials generate the Project can be transported to use as backfill in Dong Bac and Dong Nam new urban areas in the city, as these areas are showing very great demands for ground-levelling soil. Analyses show that sludge samples from Dong Hai lake and downstream (Segment CL5) Cha La canal have high levels of salinity. To prevent salinity from encroaching onto agricultural land and affecting the surface water quality and groundwater quality in other areas, the volume of sludge and excavated soil from the construction of Dong Hai lake is proposed to be re-used in place for the construction of a landscaping park around the lake. However, there would be a volume of residual saline sludge/excavated soil of 54,650 m^3 from Dong Hai lake and downstream Cha La canal segment, which would have to be dumped at Nam Thanh landfill of solid waste. The impacts from dredged materials and excavated soil generate from construction operations could be considered at high level and require strict and suitable management measures.
Landslide Risks	The construction of pumping stations at depths of 5-12m creating taluses along the bank can also give rise to risks of landslides. With the geological features of a drift sand base , landslides risks from deep excavation would also present serious and direct threat to construction workers on site. Such risks can also result in labour accidents in case workers may be buried at great depths by landslides. The impacts from landslides could be considered as medium level and require strict management measures.
Traffic Disturbance and Increased Traffic Safety Risks	The most affected routes during the construction phase would be those for the construction of box culverts (with relatively long construction time), those for the installation of secondary sewer systems with big sizes (DN600-1200mm), those for the extension and lengthening of roads, canal side roads and areas around the central regulating lake and Dong Hai lake. In addition, the roads with a large number of truck trips of transporting construction materials and waste for disposal, especially road sections passing through densely-populated areas such as markets, schools, hospitals, etc. are also highly impacted in terms of traffic. List of the roads significantly impacted during the construction phase includes 21/8, Truong Dinh, Hai Thuong Lan Ong, Truong Chinh, Nguyen Van Cu, Nguyen Thi Minh Khai, 16/4, Yen Ninh, Da Tuong, Tran Thi and Thong Nhat streets, and National Highway 1A and National Highway 27. The impacts on traffic system in the area could be considered as medium level.
Community Disturbance and Social Impacts	

Type of impacts	Summary assessment results of key potential impacts
Impacts on Business Environment and Income	Besides such impacts as disrupted traffic, air pollution and noise, local people living near the construction site of the Project are also economically affected, especially for those who run their business in front of their houses. According to statistics, the Project would temporarily affect to the business activities of 30 households with the most affected being restaurants and shops along the construction routes of Alley150 of 21/8 Street, Huynh Thuc Khang Street, and drainage sewer construction areas.
Risks on Social Order and Security	The large amount of workers concentrated for operations during the construction progress at peak time in the city area could be up to 500-600 people. This would cause certain impacts on the security of the area. Contradictions and conflicts may arise owing to disparities of lifestyle and habits or to workers' involvement in social evils. Upon living in the construction area, workers would get in touch with local people and their movement would entail business with locals, probably including social evils as prostitution, drug use, thieving, etc. as most of the workers are males living far from home. Additionally, temporary land appropriation of part of local people's land during construction for material and waste gathering would cause certain difficulties to locals' living conditions such as dust and noise, difficult traffic, temporary flooding, affected business activities, etc.. These impacts would be of a higher level with construction items close to residential areas such those near the construction of secondary and tertiary sewer lines, traffic road extension, Dong Hai lake and Tan Tai canal rehabilitation, and school and public sanitation facilities. These impacts could be considered as medium level.
POTENTIAL IMPACTS DURING OPERATION PHASE	
Impacts by Solid Wastes	Sludge generated from periodic dredging of drainage manholes and the WWTPs in the operation phase would need to be treated and disposed properly.
Risks of WWTP Indident	During the operation phase, wastewater generated from catchments in the city will be collected to the WWTP for treatment till meeting the permissible standards in accordance with QCVN 14:2008/BTNMT (Column B) before being discharged to the receiving Dinh river. In case of arising incidents to the WWTP, the systems of aeration and circulating pumping would stop working, and the wastewater which would not thoroughly treated to meet the permissible standards would be discharged into Dinh river, causing water pollution. However, based on the calculation results, it could be concluded that (i) in case the facilities and equipment of the WWTP encounter incidents and do not operate, the WWTP would still be able to treat part of pollutants in wastewater after passing it through the system of ponds with a total water retention time in ponds of up to 12 days; (ii) the receiving water body of Dinh river could still be capable of receiving the flow rates of emergency discharge, equivalent to the WWTP capacity (7,500 m3/day).

CHAPTER 4. ALTERNATIVES ANALYSIS

53. The contents in Chapter 4 have analyzed in details in environmental and social aspects for the cases of "WITH" or "WITHOUT" the project, and also so for different project's technical proposed alternatives, including,

- Three options for Section TT1 of Tan Tai canal have been proposed and the option 1 (open canal, embanking with vertical stone wall) has been selected.
- Two options for Section TT2 of Tan Tai canal have been proposed and the option 2 (double concrete box culvert, creating a new road on the culvert) has been selected.
- Two options for Section TT3 of Tan Tai canal have been proposed and the option 1 (double concrete box culvert, creating a new road on the culvert) has been selected.
- Two options for Section TT4 of Tan Tai canal have been proposed and the option 1 (single concrete box culvert, creating a new road on the culvert) has been selected.
- Two options for Section TT5 of Tan Tai canal have been proposed and the option 2 (open canal, embanking with vertical stone wall) has been selected.
- Two options for Dong Nam canal have been proposed and the option 2 (open canal) has been selected.
- Two options for Cha La canal have been proposed and the option 2 (open canal, embanking with vertical stone wall) has been selected.
- Two options for Dong Hai lake have been proposed and the option 1(construction of one onsite dumping cell for generated excavated saline materials) has been selected.

54. The results of alternatives analysis are entirely satisfactory with the project's selected options as proposed by the technical team.

CHAPTER 5. MITIGATION MEASURES OF NEGATIVE IMPACTS AND RISKS

Mitigation of Impacts by Land Acquisition and Resettlement

55. Technical alternatives such as selection of site and route direction, construction solutions, etc. have been taken into consideration in order to minimize impacts from land acquisition and resettlement during the design process of the Project. However, for unavoidable impacts by land acquisition by the project, a Resettlement Plan (RP) has been separately prepared and would be approved by both Vietnam and WB sides, at the same time with this ESIA. The RP has assessed in details all key potentially social impacts from land acquisition and resettlement, and proposed mitigation measures of the impacts and monitoring plans.

56. The main contents of the RP are including the scope and levels of social impacts from land acquisition and resettlement; survey and analysis results of the socio-economic conditions of households affected by land acquisition; assessment of social impacts; analysis of the legal provisions of Vietnam and the World Bank's policies; survey on replacement unit prices; proposed compensation rates for affected land and property on land; proposed resettlement plan; proposed measures to recover livelihood and income; consultation from affected households; and budget estimation, and monitoring of the implementation of the resettlement plan of the Project.

Mitigation Measures for the Key Project's Potential Impacts

57. Summary of the proposed measures to mitigate the potential key impacts of the project during the construction and operation phase are presented in Table 5.1 below

Table 5.1. Mitigation measures for the key impacts of the project

Project activities	Environmental impacts	Proposed mitigation measures
Construction phase		
Construction, transportation and storage of materials and wastes	Impacts on air, noise and vibration	- Only construction machines with the emission level of exhaust gases meeting TCVN 6438-2005 may be used; - Only transport vehicles with valid vehicle registry may be used; - Loads of vehicles transporting construction materials and waste must not exceed the loads permissible for the route and for the vehicles; - bodies of trucks transporting construction materials and waste must be tightly covered, allowing no dropping off along the route; - Watering to keep the road surface moist within the 200m distance on roads from the construction sites; - Temporary sites for gathering material or storing soil larger than 20m3 must be enclosed or covered; - Never burning wastes/garbage onsite - Specific gates of each site should be designated for entering and exiting transport vehicles. Vehicles must only use these gates; - Wheels washing stations are to be established at the entrance of major construction sites; - Transport vehicles for waste and materials must be periodically washed (expectedly every 5 days, depending on the weather and the hygiene of vehicles);

		- Speed of trucks is to be kept at 40 km/h or lower on inner-city roads and when traveling through residential areas. - Noise generating machines should be deployed at suitable distances so that noise emitted to residential areas is no greater than 70dBA; - Inspection, maintenance and cleaning of the machines must be performed periodically; idle operation of machines and equipment should be avoided; - Reasonable transportation plans must be formulated; - For long construction routes as those for canals, secondary drains/sewers, and tertiary sewers, a successive construction method should be carried out section by section; - 2.5-metre high fences enclosing construction sites must be set up at the sites; - Set up night lighting system at the site
Construction; transportation and storage of materials and wastes; workers' camp	Impacts on water due to overflowed rainwater	- Construction materials are to be stockpiled in elevated sites to avoid being flooded. The piles of materials must be carefully covered to prevent bust and stormwater. - The amounts of construction materials should not be gathered in extremely large quantities or stored too long at construction sites; construction materials should be gathered in logically distributed parts suiting the construction schedule. Maintenance and oil replacement for transportation vehicles should not carried out on site; - At the contractors' warehouse of materials at the site, there will be a safe area (highly elevated, dry, distant from away from surface water bodies, roofed) for temporary storage of plastic trays containing waste oil and other hazardous waste; - Strict management measures to be applied at workers' camps on site. - The Contractor will build a temporary drainage system on the site to prevent stormwater runoff from overflowing the site. - Periodically inspect, dredge, and clear the temporary drainage system on site and the surrounding area.
Dredging and embanking canals	Disturb the canal water	- Canal dredging and embankment will be carried out in a successive manner for each half canal of each 200m canal segment.; - Make impounding dam of Larsen iron sheets for construction of every half of each canal segment. - Avoid to construct in rainy season and stop construction in case of heavy rain
Construction; camp activities; truck wash on site	Construction and domestic wastewater	- Water for daily use of works at the site will be provided by tank trucks. - Use local workers - Domestic wastewater required preliminary treatment through the excavation and installation of sand sedimentation manholes before reuse for dust prevention watering or discharging into the receiving drains in the general drainage canal system of the region - Such car wash station require preliminary treatment system for car wash wastewater by sand sedimentation manholes and oil separation tank.
Canal and lake dredging;	Solid waste from dredging	Used as filling material in the Dong Nam and Dong Bac new urban areas in the city

excavation and backfilling work	sludge and excavation materials	
Construction of works	Construction solid waste	- Classify construction residues at source. Place the waste at least 20m away from the surface water source - Reuse, recycle (corrugated bins, carton, etc.)
	Domestic solid waste	- Contractor needs to set up waste management regulations on site - Equip and arrange 100-liter domestic solid waste bin.
	Hazardous waste	- Set up temporary hazardous waste storage - Do not maintain and change oil for transportation vehicles at site - Transport and treat hazardous waste every 6 months
Construction activities	Impacts on ecological system	Limit the tree cutting in case of not compulsory
Transportation of materials, residues; stock of machinery and equipment; stockpiling of materials and residues	Impacts on the traffic system and infrastructure	- Coordinate to exchange information among contract packages - Coordinate with local government and traffic police - Inform the construction schedule to the local people - Apply for road bed excavation permit - Separate traffic flow - Speed sign, construction site sign - Assign staff in charge of traffic guide - Do not transport excessive load as regulated - Arrange reasonable transportation time - Educate the consciousness of complying with traffic rules - Arrange mobile pumps to suck water from holes and grooves - Clean the site and tidy the stockpiling - Repair damaged road sections due to the project activities
Construction activities; transportation of materials and residues, etc.	Impacts on people's life	- Do not absolutely prohibit the traffic - Carry out the construction as fast as possible - Regularly consult and timely receive comments - Stock materials neatly and safely within the construction site - Ensure social security and order
Construction activities	Impacts on safety and health of workers	- Provide sufficient labour protection clothing - Limit the speed of vehicles in the site - Equip fire extinguishers, first aid kits, medicine cabinets - Workers' area is required to be cleaned regularly and kept hygienic.
Construction of canals, lakes; Transportation of materials and residues	Impacts on cultural and historic works	Limit the transportation of materials on the on the fifteenth days and first days in lunar calendar and the first two week of the lunar new year.
Construction; Transportation	Resonance impacts	- Contractors are required to well coordinate in information exchange about construction schedules among contract packages - Exchange information with other projects in the area

of materials and residues		- Closely coordinate with the local government
Construction; Transportation of materials and residues	Environmental impacts at the disposal site	Identify exact locations in preferential need of receiving leveling materials
Construction; Camp activities	Risks of fire and explosion	Prepare fire and explosion fighting and prevention plan in compatibility with actual conditions
Operation phase		
Operation of wastewater treatment plan, wastewater pumping station and drainage system; school and public sanitation	Impacts on air	- Fully implement trees planting and caring - Fully install signs, traffic control signals, road markings, etc. - Sewage collection drain system will have smell proof manholes and be dredged periodically - School and public toilets are required to be provided with sufficient water. - Conduct communication campaigns in the community on the environmental protection consciousness.
Operation of drainage and wastewater treatment work items	Impacts on water and sediment	- Carry out dredging work annually - Online monitoring system is required to be installed for wastewater treatment plant - Prepare plans for incident recovery
	Environmental impacts of solid waste	- Collection, landfill
	Risks and incidents of wastewater treatment plant	- Prohibit people who are not on duty to enter the pumping station and wastewater treatment plant - Operation unit will have to mobilize maximum resources to address and set right the incidents as quickly as possible.

CHAPTER 6. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

Implementation Arrangement, Roles and Responsibilities

58. Contractors will beresponsible for implementing mitigation measures. These measures will be included in bidding documents and their costs are to be included in construction bid packages;

59. CSC will be responsible for monitoring the day-to-day implementation of mitigation measures. Related costsare included in the CSC service contract;

60. IEMC will be responsible for overall environmental monitoring which includes support to the PMU in implementing environmentalsupervision and monitoring, and responsible for reporting on the implementation through monitoring reports.

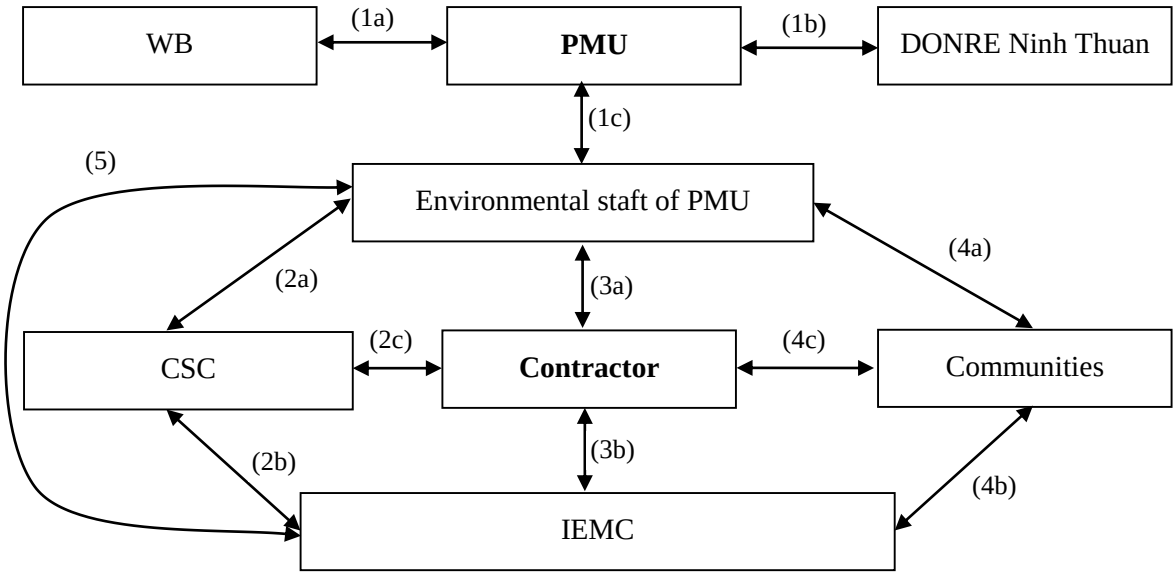

Figure 6.1. Organization chart for EMP implementation.

Reporting Arrangement

61. The PMU will prepare reports twice per year for submission to the World Bank and Ninh Thuan DONRE, including the compliance with the ESMP. The report will contain the monitoring results and assessments of the IEMC that show project progress and the state of implementation of the ESMP.

Cost Estimation

62. The costs of EMP5 implementation will include (i) costs of implementing mitigation measures by the contractor, (ii) expenses supervised by CSC, (iii) costs of IEMC, (iv) the costs of environmental quality monitoring, and (v) the cost of safety management for the

[5]Excluding costs for RP implementation and independent monitoring the performance of RP/EMP

PMU, including both technical assistance in implementing safety policies and training programs.

63. The cost of implementing mitigation measures during construction will be a part of the value of construction contracts, while the costs for a site-specific environmental monitoring plan (SEMP) by the construction supervision consultant (CSC) will be provided in construction supervision contracts. The costs of the PMU operations relating to EMP are allocated from the project management budget of the PMU, including safety training programs, and basic allowances to participants in the monitoring programs. After the project has been completed, the costs of environmental monitoring of constructed works will be taken from the operation and maintenance budget of the city.

64. Therefore, the following table only provides the estimated costs for environmental quality monitoring and IEMC package (in accordance with national practices) for reference purposes. However, final costs will be updated in the detailed design phase.

Table 6.2. Estimated cost for IEMP package

No	Content	Unit	Quantity	Unit price (mil. VND)	Cost (mil. VND)	Cost (USD)
1	Experts salary (4 persons * 5 years)	Person-month	68	28	1.904	85.190
2	Management cost (50%*(1))	LS	1	50%*(1)	952	42.595
3	Allowance	Person-day	435	0,55	240	10.738
4	Travelling	Person-trip	105	6	630	28.188
5	Training	Course	6	7	42	1.879
6	Office materials and communication	LS	1	350	350	15.660
7	Environmental quality monitoring	Table 6.8			380	17.002
8	Other costs	LS			50	2.237
9	SUM				4.548	203.490
10	VAT tax				455	20.349
	Total cost for IEMC				**5.000**	**223.840**

CHAPTER 7. PUBLIC CONSULTATION AND DISCLOSURE

65. During ESIA study, the PMU and Consultants have conducted two public consultation stages with local ward/commune level authorities and local communities in the affected areas of the Project. Accordingly the local affected residents and authorities in entire 15 wards and on commune in the project area were consulted twice for the comments/ideas contribution. Summary of the public consultation process and results are presented in the following sections.

First Public Consultation

66. From 23 February to 3 March 2016, under the chairmanship of the ward/commune level People's Committee (PC), the consultation meetings have been held in the above mentioned 16 wards/communes. Total number of participants was 421 people; of which women accounted for 41.6%.

67. The purpose of the first public consultation stage was to disseminate information about the proposed project, to present the scope of the ESIA of the project, and to collect suggestions/advices for the ESIA's TOR.

68. The meeting participants included:

- Representatives of thePMU.
- Representatives of thelocal authorities.
- Representatives of thelocal organizations.
- Representatives of thehouseholds in and around the project areas.
- Representatives of the ESIA consultants.

69. Contents of the meetings:

- To present briefly information and proposed contents of the project and it's benefits.
- To present the main expected impacts of the project and the the scope of project's ESIA.
- To consult with the local residents and authorities for their comments/ideas about the local environmental issues that need to be considered during ESIA process.
- The participants were encouraged to provide comments, advices and questions.

(Minutes of the consultation meetings were recorded and attached to the ESIA)

Second Public Consultation

70. The second public consultation stage was conducted from 5 to 12 July 2016. Total number of participants to the meetings was 444 people; of which women accounted for 43.2%.

71. The purpose of the second stage public consultation meetings were to present in detailed the proposed project's investment components and briefly the contents of draft ESIA to the local residents, organizations and authorities for their providing comments. All comments, opinions from the meetings on project's proposals and ESIA contents were collected for sufficient consideration during finalization of the project's proposals and ESIA.

72. The meeting participants included:

- Representatives of the PMU.
- Representatives of thelocal authorities.

- Representatives of thelocal organizations.
- Representatives of thehouseholds in and around the project areas.
- Representatives of theESIA consultants.

73. Contents of the meetings:

- Present briefly information and proposed contents of the project and it's benefits;
- Present in detailed about the proposals, implementing plans and progress of the project's items in the specific local ward/commune where the meeting taken place of the project.
- Present briefly the draft ESIA (potential impacts and proposed mitigation measures of the impacts).
- Discuss on the specific environmental issues in the locality.
- The participants were encouraged to provide comments, advices and questions.

(Minutes of the consultation meetings were recorded and attached to the ESIA)

CONCLUSIONS

1) In accordance with the name "Project on Environmental sustainability", Project on Environmental Sustainability in Phan Rang - Thap Cham City is expected to bring enormous benefits of improvement in sanitation and environmental landscape in a sustainable way for the city after being put into operation. The main environmental benefits that the project will bring about include:
   - Improve surface water drainage capacity, minimizing the number of flooding spots and enhancing freshwater storage for the city;
   - Strengthen waste water collection and treatment capacity, contributing to improve water, soil and air;
   - Strengthen waste collection capacity and efficiency;
   - Improve the sanitation of schools and public areas;
   - Improve traffic conditions, environmental sanitation and urban landscape;
   - Improve project control, management and operation capacity for PMU, government departments, public institutions and project stakeholders; and
   - Mitigate environmental and social impacts on affected people due to the implementation of the project.
2) This is one of environmentally-friendly projects among investment projects of Phan Rang - Thap Cham city contributing to the improvement of living conditions, awareness raisingof environmental protection of the people. Therefore, the project meets the expectation of the people for a clean living environment and contributes to beautifying the urban landscape.
3) In the design stage of the Project, technical plans were proposed for analysis and selection of the best one to minimize the social and environmental impacts during the implementation stages. However, it is impossible to avoid certain negative impacts of the project on the naturual and social environment during the site clearance and construction phases.
4) Chapter 4 of the report basically identified and fully evaluate potential impacts on the natural and social environment in all stages including preparation, construction and operation of the Project. Major negative environmental impacts of the project mainly occur in the site clearance and construction phases. Chapter 5 of the report proposed effective and feasiblemitigation measures respectively.
5) Environmental problems arising in the site clearance process is not big; however,the arising permanent land acquisition of many households could lead to potential social negative impacts. Mitigation measures for such impacts were proposed through satisfactory compensation according to replaced unit prices; construction of new settlement areas with full technical, environmental and social infrastructure at a convinient location to address the relocation and resettlement needs of the project; support in the relocation implementation; design and implementation of programs to support career change and recovery of income and so on.
6) Main environmental problems arising during the site clearance and construction phases are mostly temporary and mitigable, including:
   - Impacts on surface water due to overflowed rainwater, domestic sewage and constructionw wastewater;
   - Impacts on greenery due to tree cutting and site clearance;
   - Impacts due to the generation of construction solid waste and domestic solid waste;

- Impacts on traffic environment due to increase in transportation vehicles on routs and generation of dust, exhaust and noise;
- Negative impacts on people's daily activities, business, social security and order at the construction site;
- In addition, during the construction phase of the project,some risks related to landslides, traffic safety and labor safety may come up, some social problems may arise and affect cultural and religious activities at some sensitive locations.
- Possible resonance impacts of the Project mainly relate to traffic conflicts and overuse of power and water supply and security and order services.

7) Environmental impactsin the operation phase are generally beneficial to the environment. However, at the location of wastewater treatment plants and sewage pumping stations, there are risks of negative impacts on the air and water and generation of sludge and solid waste. Risks of impactsare not at high level and can be managed and mitigated.

8) ESIA report also proposed a reasonable environmental and social management and monitoring program for implementation stages of the Project. The report also identified the responsibilities of stakeholders, funding sources for the implementation of mitigation measures, management and environmental protection in implementation stages of the Project..

9) With strict adherence to the laws and regulations on environmental protection and strict implementation of management and mitigation measures proposedin this report, negative environmental impacts will be controlled and the Project will bring many great benefits for the local environment, health, and socio- economy.