SFG2807

VIETNAM: COASTAL CITIES SUSTAINABLE ENVIRONMENT PROJECT

EXECUTIVE SUMMARY

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENTS

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ABBREVIATIONS AND ACRONYMS

CEOHSP	Contractor's Environmental and Occupational Health and Safety Plan
CCESP	Coastal Cities Environmental Sanitation Project
CCSEP	Coastal Cities Sustainable Environment Project
DARD	Department of Agriculture and Rural Development
DOC	Department of Construction
DOLISA	Department of Labor, War Invalids and Social Affairs
DONRE	Department of Natural Resource and Environment
DOST	Department of Science and Technology
DPC	District People's Committee
ESIA	Environmental and Social Impact Assessment
ECOP	Environmental Codes of Practice
EM	Ethnic Minority
EP	Environmental Police
EPA	Environmental Protection Agency
ESMP	Environmental and Social Management Plan
GoV	Government of Vietnam
MONRE	Ministry of Natural Resource and Environment
PMU	Project Management Unit
PPC	Provincial People's Committee
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SA	Social Assessment
WB	The World Bank
T/d	Tones per day
cmd	cubic meters per day
VND	Vietnamese Dong (Vietnamese currency)
USD	United States Dollars, exchange rate 1 USD = 22.235 VND

CHAPTER 1: INTRODUCTION AND PROJECT DESCRIPTION

1.1. Introduction

Vietnam has made remarkable progress in economic growth and poverty in recent years, and has recently graduated to lower middle income country status. Over the last two decades, the country has recorded among the highest growth rates in the world, which in turn enabled poverty reduction at record pace. GDP growth, however, fell from an average rate of 7.3 percent during 2000-2007 to 5.8 percent during 2008-2012. Growth has subsequently recovered to around 6.0 percent in 2014, an estimated 6.7 percent in 2015, and a forecast 6.0% in 2016. The external sector has held up well despite the global situation, but domestic demand remains weak on account of subdued private sector confidence, overleveraged SOE and (undercapitalized) banking sectors, and shrinking fiscal space. The slowing of the growth rate has had limited impact in large cities which continue to attract domestic and foreign investment. An integral part of Vietnam's transition from low-middle income to advanced status has been its transition from a largely rural to urban economy. The country's economic progress has coincided with rapid urbanization, with Vietnam sustaining a 3 percent annual urban population growth rate from 1999 to 2011. The urban population is currently 35 percent of the total population and is expected to reach 40 percent by 2020. This growth has contributed to the significant challenges in service delivery and infrastructure in the cities, in general, and specifically, for sanitation management (wastewater, drainage and solid waste).

The Vietnam 2035 Report[1] noted that integrated approaches are needed to address Vietnam's burgeoning urbanization challenges, including transport, water supply and sanitation (including flooding), and environmental protection. The environmental quality of water is important not only for ecosystem health and the quality of life in general, but also for income growth. In urban areas, environmental pollution from urban wastewater has resulted in toxic waterways and polluted beaches/coastal waters with impacts on economic activities, and unknown – but likely severe – impacts on human health. The Report also noted the need to expand urban connective infrastructure, including the level and quality of urban transport services – addressing the challenges of limited capacity of bridges and roads and the overall condition of transport infrastructure - all of which increase congestion, reduce mobility and increase costs. All these urbanization issues serve to constrain sustainable urban economic development.

With this in mind, the project design seeks to respond to the project cities' demands for sanitation and connectivity investments as efficiently and effectively as possible. Taking an integrated approach, the project combines these investments where ever possible. Some of the proposed roads and bridges under the project will share alignments and spaces with the project's sanitation works - construction of these road/bridges will facilitate provision and operation & maintenance of the sanitation infrastructure. In return, provision of the Component 1's storm drain/culverts, canal embankments as a shared structure for roads will help save construction costs of these roads. In number of cases, the works of the two components (1 and 2) will complement each other, producing cost-effective integrated solutions meeting both transport and sanitation needs.

[1] Vietnam 2035 - Towards Prosperity, Creativity, Equity, and Democracy. World Bank and Ministry of Planning and Investment. 2016

This project will build on the success of the Coastal Cities Environmental Sanitation Project (CCESP) (P082295/P122940) which had the PDO: to improve the environmental sanitation in the project cities (Dong Hoi, Nha Trang and Quy Nhon) in a sustainable manner and thereby enhancing the quality of life for city residents. The CCESP was implemented from June, 2007 to November 30th, 2014. The design indicators of the CCESP were achieved and the following results were realized in the project areas: i) flooding decreased significantly and no wastewater was discharged onto beaches and into canals in the project areas; ii) lakes, canals and rivers were upgraded; (iii) public toilets and toilets at schools have been properly operated and maintained; and; iv) capacity of the PMUs and relevant authorities was strengthened. With the gradual increase of wastewater and solid waste tariffs cost recovery and project sustainability were improved.

1.2. Project objective and description

The Project development objective is to increase access to sanitation services and improve the operational performance of sanitation utilities in selected cities. Each city will implement its subproject activities through the following four components:

a. Component 1: Sanitation Infrastructure Expansion
b. Component 2: Urban Connectivity Improvement
c. Component 3: Compensation and Site Clearance
d. Component 4: Implementation Support and Utilities Reform

Project costs are estimated at USD273 million, inclusive of price and physical contingencies, but excluding interest during construction, commitment fee, and front-end fee. The Project will be financed by the proposed IBRD loan of USD46 million (about 17% of total project cost), IDA credit of USD190m (70%) and counterpart funding of USD37 million (13%) from mainly by the provincial budgets with some support from the central government. The WB amounts allocation is presented in the Table 1.1 below.

Table 1.1. Project cost and financing

Expenditure Category	Participating Cities (USD mil.)				
	Dong Hoi	Quy Nhon	Nha Trang	Phan Rang	Total
Comp. 1: Sanitation Infrastructure Expansion	35.86	44.94	44.22	60.79	185.81
Comp. 2: Urban Connectivity Improvement	14.34	5.12	16.38	10.15	45.99
Comp. 3: Compensation and Site Clearance	0	0	0	4.10	4.10
Comp. 4: Implementation Support and Institutional Reform	0	0	0	0	0
Total	50.2	50.06	60.6	75.04	235.90
Proposed IDA allocation (for Comp. 1 and 3)	35.86	44.94	44.22	64.89	189.91
Proposed IBRD allocation (for Comp. 2)	14.34	5.12	16.38	10.15	45.99
Total Project Cost (incl. counterpart fund)	**58.11**	**55.30**	**72.00**	**87.9**	**273.31**

All of the four participating cities are located along the central coastal line of Vietnam. Dong Hoi and Quy Nhon are about 500 km and 1060 km south of Hanoi, respectively. Nha Trang is 220 km south of Quy Nhon and Phan Rang-Thap Cham is 100 km south of Nha Trang. The locations of the four cities are shown in the map below.

Figure 1 – Location Map of CCSEP Cities

The proposed key investments of each city are summarised in the Table 1.1 below:

Table 1.1. Proposed Investments in each City

City/Component		Proposed Investments
	1	- Installation and construction of approximately 64 km of drainage and sewer pipes diameters from 150-1500 mm, six outfalls D1500 and five wastewater pumping stations (WPS), 16 m^2 each - Dredging of 475 m of the man-made Cau Rao river, demolish and rebuild Cong Muoi bridge (48.5 m long, 17 m wide) to improve

City/Component		Proposed Investments
Dong Hoi		drainage capacity. (This is for uncompleting the work proposed under CCESP) - Provision of 16 aerators for the Duc Ninh wastewater treatment plant (WWTP) (built under CCESP) to raise treatment capacity from 6,600 cmd to 14,400 cmd - Provision of solid waste management equipment including five garbage compactors, 500 garbage bins, 500 hand-push carts and one truck for biochemical spray at the landfill - Construction of 11 school toilets and install six public mobile toilets
	2	- Construction of a new road which is 1,44 km long, 36m wide including footpaths, drainage and sewers, and lighting - Construction of two bridges on the same road alignment: - + Le Ky bridge which is 212 m long and 30 m wide - + Tay bridge which is 24 m long and 21 m wide.
	3	- Compensation for the affected households
Quy Nhon	1	- Construction of approximately 4 km of box culverts and drainage dimensions up to 2x3000x2200mm - Rehabilitation of approximately 1 km of drainage in Bau Sen area, B = 1000-1500 - Installation of approximately 30 km of tertiary sewers - Build the second module to raising the capacity of the Nhon Binh Wastewater Treatment Plant from 14,000 cmd to 28,000 cmd - Expansion and upgrade the Long My landfill including the construction of a new sanitary disposal cell with land area of 8.51ha, construction of internal roads, drainage, leachate and gas collection systems, procurement of solid waste management equipment; Upgrade the leachate treatment unit - Repair /construction of 4 wastewater pumping stations - Construction of 12 new school toilets
	2	- Construction of Y-shaped and Huynh Tan Phat bridges, L = 90-112 m, B = 15m
	3	- Compensation for the affected households
Nha Trang	1	- Installation and construction of approximately 112 km of drainage and sewer pipes diameters from 90-1000 mm, one rainwater pumping station (1.6 ha) and CSO, 4 WPSs, each 45 m2 - Construction of a new WWTP capacity 15,000 cmd on 3 ha of land. Treated effluent meet QCVN 14:2008/BTNMT Column A - Construction of a balancing lake, area of 1.05 ha, 4.5 m deep, with sidewalk and lighting - Construction of 4 school toilets
	2	- Construction of approximately 2.5 km Chu Dong Tu road and Road no.4, 14-18.5 m wide; drainage, sewers, lighting and tree planting are included. - Construction of about 2 km of river bank embankments and approximately 2.5 km of riverside road which is 28 m wide

City/Component		Proposed Investments
	3	- Compensation for the affected households. The city's two resettlement sites namely Ngoc Hiep and Hon Ro 2 will be used for the project
Phan Rang	1	- Rehabilitation or expansion of approximately 14.4 km of existing canals (Tan Tai, Cha La, TH5, Nhi Phuoc, Dong Nam). Scope of works dredging, embankment lining and/or expansion for drainage improvements - Construction, installation of drainage and sewers and CSOs - Construction of 8 wastewater pumping stations - Construction of the Central lake, 17.7 ha water surface - Rehabilitate Dong Hai lake, 3.4 ha - Reparation of the treatment units and facilities to upgrade the existing wastewater treatment plant capacity from 5,000 cmd to 7,500 cmd - Construction of 3 school toilets and 4 public toilets
	2	- Expansion of the two existing roads (Huynh Thuc Khang and Alley 150) with total length of approximately 1.9 km, design speed is 50 km/h, B = 20-27 m
	3	- Construction of a new resettlement site, 6.7 ha with basic infrastructure such as road, power and water supply, drainage and sewers etc.

1.3. Environmental Assessment Process and Legal Framework

According to Government Decree No. 18/2015/ND-CP dated 14 February 2015 regarding regulation on strategic environmental assessment (SEA), environmental impact assessment (EIA), environmental protection plan (EPP), the project is required to prepare four ESIAs for the subprojects. As per the WB requirement, the CCSEP triggers the following four WB safeguard policies: (i) Environmental Assessment (OP/BP 4.01); (ii) Natural Habitats (OP/BP 4.04); (iii) Physical Cultural Resources (OP/BP 4.11); and (iv) Involuntary Resettlement (OP/BP 4.12). Most subprojects are expected to have moderate adverse impacts on the environment. A summary of the actions taken to address the applicable safeguards policies is given in Table 13 below.

Table 1.3. Summary of Safeguards Policy Actions Undertaken Under CCSEP

Safeguard Policy	Actions
Environmental Assessment OP/BP 4.01	**This policy is triggered.** - A Category A project. - Environmental Assessment Executive Summary prepared. - Full ESIA including an Environment Management Plan (ESMP) has been prepared for each participating city. - Social Assessments have been conducted; social impacts were also considered in the ESIA.
Natural Habitats OP/BP 4.04	**This policy is triggered.** - The project will not affect any protected area or any site having high biodiversity values. - River dredging and embankment sliding may have moderate impacts on natural habitats in the rivers. Impacts and

Safeguard Policy	Actions
	mitigation measures have been included in the relevant subproject ESIAs and ESMPs.
Forests OP/BP 4.36	**This policy is not triggered.** - The project will be implemented in urban areas. No forest will be affected. The project does not cover afforestation.
Pest Management OP 4.09	**This policy not triggered.** - The project will not involve the use, production, procurement, storage, handling or transportation of any pesticide.
Physical Cultural Resources OP/BP 4.11	**This policy is triggered.** - The project will not necessitate relocation of physical cultural resources (PCRs) such as monuments, temples, churches, religious/spiritual and cultural sites - The project however will involve relocation of graves and significant earthworks. A chance finds procedure has been included in the subproject ESMPs.
Indigenous Peoples OP/BP 4.10	**This policy is not triggered.** - There are no ethnic minority community living in the project area.
Involuntary Resettlement OP/BP 4.12	**This policy is triggered.** - Land acquisition is required for the construction of proposed investments. - Physical relocation is anticipated in Phan Rang and Nha Trang subprojects. - Project RPF have been prepared and approved by Government - Cities specific RAPs were prepared and will be approved by Provincial People's Committee.
Safety of Dams OP/BP 4.37	**This policy is triggered.** - The project does not involve construction of a new dam, nor will it affect or depend on the safety of any existing dam.
Projects on International Waterways OP/BP 7.50	**This policy is not triggered.** - The project is not implemented on any international waterways.
Projects in Disputed Areas OP/BP 7.60	**This policy is not triggered.** - The project is not implemented in disputed areas.

1.4. Safeguard Implementation Experiences and Lessons from Previous Bank-Financed CCESP

The project is the continuation of the Bank-financed Coastal Cities Environmental Sanitation project (CCESP) which was implemented from 2006 to 2014. The lessons on environmental management and supervision are drawn up for the new proposed project during implementation during implementation include: i) Full supervision of ESMP implementation by Construction Supervision Consultant (CSC); ii) Close coordination with local authorities and people in the project areas; iii) Good communication and provision of clear information on the subproject contents and construction schedule to the local authorities; iv) Close coordination between PMU and the Independent Environmental and Social Monitoring Consultant; v) PMU's regular coordination with the Consultants to carry out evaluation of the environmental and social compliance of the Contractors; vi) Use of the right methods for

sewer and drainage system construction including Counter measures for landslide and the likely damages to the existing structures included Larsen sheet piles; vii) Use of appropriate odor treatment technology at the influent and sludge treatment works; and viii) Landscape design of school toilets with a more green, vivid, and attractive architecture to enhance pupils' awareness of environmental sanitation.

CHAPTER 2: BASELINE CONDITIONS IN THE PROJECT AREAS

2.1. Dong Hoi City Subproject

Quang Binh is one of the poor coastal provinces in the North Central of Vietnam. Dong Hoi is a Class II city with total land area of 155.71 km^2, and a population of 113,722 people. Dong Hoi has 16 administrative units including 10 wards and 6 communes. The city is the political, administrative, cultural, economic, education and tourism centre of Quang Binh province. Dong Hoi is located along the National Highway 1A, Thong Nhat North-South railway and Ho Chi Minh National Highway. The CCSEP – Dong Hoi city sub-project will be implemented in 11 wards and communes.

Dong Hoi city is a typical coastal plain, which is low-lying and formed by accumulated marine sediments and river silt. The main formation is sandy soil and clay, and limited amount of gravel with different sizes intersects between different soil layers. The weather is governed by tropical monsoon climate. Dong Hoi city has been often suffered from serious typhoons and floods annually. The four main water bodies in Dong Hoi are Nhat Le, Phu Vinh, Cau Rao, and Le Ky rivers which originate and flow within Quang Binh territory.

Air quality in Dong Hoi is still good with all parameters being within the allowable limits. The main water bodies such as the Cau Rao, Le Ky, and Nhat Le rivers, Khe Duyen and Dong Son reservoirs, have the total suspended solids (TSSs), COD, and BOD5 higher than the national standards due to pollution by domestic wastewater. Salinity of the surface water in Nhat Le, Le Ky, and Cau Rao rivers varies from 7.5 to 16.3‰ because these water bodies are connected to the sea through the Nhat Le estuary. Groundwater quality is within the allowable limits of the national standard. The sediment in Cau Rao River is saline with salinity at 10.4 – 10.7‰, heavy metal contents are within allowable limits.

There are no important biological resources in the subproject area as the urban areas have been developed extensively by human interventions for long time.

The local people have access to good culture, healthcare, and education services. 97.36% of the population in Dong Hoi city has access to piped drinking water supply. Upon completion of the CCESP in 2014, 60 - 70% of the wastewater generated in the city has been collected and treated at the Duc Ninh WWTP, 85% of solid wastes has been collected, and 100% of local households have access to the national power grid.

There are no important physical cultural structures within or in close proximity to the subproject area that can be affected by the subproject.

2.2. Nha Trang City Subproject

Nha Trang City is a Class I city with a total area of 252.5km^2, and a population of 412,112 people. The city has 19 administrative wards and communes. The city is the political, administrative, cultural, economic, education and tourism centre of Khanh Hoa province. Nha Trang City is located on the Eastern coast of the country, 450km North of Ho Chi Minh City and 1,280km South of Hanoi, the country's capital. Nha Trang City is in the easternmost coastal part of Vietnam with a coastline of over 30km, conveniently linking it with other regions of the whole country and the world. The subproject will be implemented in 12 wards and communes of the city.

The typography of the city is relatively plain with the elevations ranging from 3-3.5m in the Northern part of Cai River, 3.9-4.2m in the Central part of the city, and 2.4-3.5m in the Southern part. The main water bodies are Cai and Quan Truong rivers flowing through the city. Cai river is the receptor of treated effluent of the Northern WWTP which is proposed

under the subproject. Quan Truong river receives treated wastewater from the Southern WWTP constructed under the previous Bank-financed project, the CCSEP.

The analysis results indicate that air quality of the subproject area is relatively good with the parameters of particulate matters, SO_2, CO, NO_2, H_2S, HC, and other hazardous substances lower than the national standards for ambient air quality. The surface water quality in Cai river and channels has Cl^- concentration significantly exceed the national standards. There are also signs of pollution by oil, iron, BOD5, ammonia due to untreated wastewater and solid waste from residential areas. The groundwater at the subproject sites shows signs of pollution by the elevated contents of Cl^-, NH_4^+, TDS, Mn, SO_4^{2-}. The soil and mud sampled at the subproject sites meet the national standards on heavy metal in the soil for residential land. However, the soil in some places is moderately saline.

There are a number of protected areas, mangrove forests and coral reefs in the province but are located far from the subproject area. These include: Nha Phu Lagoon area (16 km from the Project area), Cam Ranh Bay (40km), Van Phong Bay (85km), Nha Trang Bay (5km and 10km from the Northern WWTP), Hon Ba Nature Reserve (25km), Hon Mun Island (15km), and Thuy Trieu lagoon (15km). The rare plant and animal species most concentrated in these areas. Hence, the area is not an important natural habitat for aquatic creatures. There are no natural habitats of importance and Red Book species in the subproject areas which are urban settings significantly disturbed by urban development.

There are some physical cultural resources in the subproject area including the Po Nagar Cham Towers and Ba Lang parish located within 50m from the subproject construction sites.

2.3. Quy Nhon City Subproject

Quy Nhon City is located at the southernmost of Binh Dinh province, 1,060km from Hanoi to the North and 640km from Ho Chi Minh City to the South, along a section of the No. 1 National Highway and the trans-Vietnam railway. The city has an area of 78.9km^2, a population of 285,543 people, and includes 16 wards and 5 communes.

The city is located in the South of Ha Thanh river which currently is often dry with the very small flow in summer. In the rainy season, the river water flows very fast often causing flood in October to November.

The air quality in Quy Nhon city is within the national regulation limits for ambient air quality. Analysis of the surface water samples taken from the subproject area indicate pollution by Cl^-, NH_4^+, BOD_5, Fe and oil, and grease which exceed the allowable limits for water supply. The analysis results of ground water samples in the city are within the national standards. However, there were a few parameters exceeding allowable limit such as Cl^-, NH^4. Soil samples taken in Quy Nhon city area are within the national allowable thresholds.

The ecosystems within the direct influence of the subproject are urban and agricultural ecosystems with dominated by rice, shrubs, invasive plants, household livestock such as ducks, dogs, cats, and some crows and small birds searching food at Long My landfill. The aquatic species in Ha Thanh river are mainly some phytoplankton, zooplankton, and benthic species. The river fishes mainly are mainly common freshwater fish such as carp, catfish, eel, fish, loach, snakehead. There are no endemic aquatic species or species listed in the Red Book in the subproject construction area.

There are some physical cultural resources which are located within the direct area of influence of the subproject including Nguyen Hue pagoda, Truc Lam pagoda, Tay Ninh church, and Quy Nhon monastery.

2.4. Phan Rang City Subproject

Phan Rang – Thap Cham city is the administrative center of Ninh Thuan province, located 340km north of Ho Chi Minh city and 1,380km south of Hanoi. The city occupies 79,184km^2 with 170,720 people leaving in 15 wards and one commune. The city is located on a low hill terrain, with main slope direction from Northwest to the Southeast.

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

The results of air quality monitoring every 6-month period from 2011 to June 2015 show that the air of the city is relatively clean and has no sign of air pollution. Most of the air quality parameters met the allowable standards. The major sources causing air pollution in the city are from the traffic and construction activities. The surface water quality monitoring data in Dinh river conducted 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.

Quality of the groundwater in the city is quite good and meeting the national standards for domestic use and agricultural purposes. However, the concentration of Cl- in some locations close to the sea surpassed the allowable standards. In addition, the results of ground water quality analysis carried out during the EA process show that Coliforms concentration in the taken samples exceeded the allowable limits from 14.3 times to 367 times.

The ecosystems in the subproject area is poor representing an urban ecosystem with garden and agricultural ecosystems. Terrestrial flora and fauna are simply pets and cultivated plants of households or amusement park. Only one remarkable inland water source in the subproject area is Dinh river with common local fish species without significant biodiversity value.

There are no physical cultural resources within the subproject area of influence. However, there are some cultural/historical structures located near the subproject construction areas including Thien Hung Pagoda, Quan Thanh Temple, Phan Rang Provincial Pagoda, Tan Tai Parish Church which are located within 50m-100m of the construction sites.

CHAPTER 3: ANALYSIS OF ALTERNATIVES

The project proposed investments are in line with the cities' master plans which have been approved by the Government. Alternatives were considered in the preparation of the master plans, which are also subject to review by environmental authorities as per Vietnamese law.

Alternative analysis were carried out during the preparation of ESIAs in order to assess and compare the level of potential environmental and social impacts as well as opportunities between "with" and "without" the project scenarios, and the technical options considered.

Comparisons between the "with" and "without project" show that the existing social and environmental problems related to the existing drainage and sewerage infrastructure would be increased in the continued urbanization process of the participating cities. Wastewater generated would be increased but not collected and treated in some areas causing pollution (BOD_5, N, P, TSS, grease and oil, coliform etc.) to land, surface water bodies, groundwater, and the sea. Flooding issues would not be addressed, increased urban population would be suffered from environmental pollution and pressure from traffic conditions in city centers.

Alternative analysis were carried out for some specific work items as discussed below. The options selected were based on considerations of all the aspects together including technical, social and environmental, and economic dimensions.

3.1. Dong Hoi City Subproject

In Dong Hoi, two options were evaluated for the road proposed under component 2. Option 1 proposed a 1.8 km long alignment and option 2 proposed 1.44 km alignment. At km 1.3 of the alignment in option 1, there is a sudden right turn toward the northwest then west to the end point. In option 2, the turning section of section 1 has been replaced with a section smoothly turning southwest to another end point. Option 2 was chosen because the alignment is shorter and smoother with the following implications: i) less land to be acquired (14.2 ha instead of 18.3 ha) and fewer households to be affected (85 instead 94); ii) reduced amount of filling materials from approximate 198,200 m^3 to 119,000 m^3, resulting in lower investment costs. Traffic safety risks and greenhouse gas emissions from vehicles in operation phase in option 2 would be lower than in option 1.

3.2. Quy Nhon City Subproject

In Quy Nhon, two options on wastewater treatment technology were proposed to upgrade of the existing Nhon Binh WWTP from 14,000 cmd to 28,000 cmd. Option 1 proposed a treatment process that include preliminary treatment, chemical enhancement, Imhoff sedimentation, biofilter tricking filter and disinfection. Option 2 proposed to replace the trickling filter proposed in Option 1 with anaerobic biofilter and aeration pond. Option 1 was selected as it is compatible with the treatment module built under CCESP, and no additional human resources are required for the plant operation which is not the case of Option 2.

For leachate treatment technology at the Long My landfill in Quy Nhon, the first proposed option includes anaerobic biological treatment, discretionary, primary treatment, level 1 physiochemical treatment, biotreatment and level 2 physiochemical treatment, and finally chemical treatment. Option 2 proposed to replace physiochemical level 2 treatment with RO filter. In option 1, removal of BOD_5, NH_4^+, COD, etc. is efficient and electrical consumption is stable while in option 2, pollution load would be higher as the efficiency of level 1 biological treatment is limited. Operation of Option 1 technology is simpler than Option 2 thus the skills of operators required for Option 1 is not as high as option 2. In addition, treatment efficiency of option 1 is stable with variations of influent quality (due to rain).

Meanwhile, investment costs of option 2 is higher, RO membrane may be blocked during operation. Option 2 were selected.

3.3. Nha Trang City Subproject

For the proposed investments in Nha Trang, alternatives were considered for the proposed treatment technology of the WWTP of which the treated effluent is required to meet the national standard QCVN 14:2008/BTNMT column A. Regarding site selection, there is no alternative as the project comply with the detail construction plan scale 1/2000 prepared for the southern part of Hon Nghe area. Four wastewater treatment technologies were considered. In comparison to the other three options (trickling filter, sequencing batch reactor, UASB technology), the oxidation ditches technology was selected based on the following criteria: (i) capability to treat nitrogen, (ii) no additional requirements on chemicals; (iii) simple operation, resistance to overload shock, (iv) low investment cost; (v) no sedimentation tank is required, (vi) easy to combine with odor treatment system.

3.4. Phan Rang – Thap Tram City Subproject

In Phan Rang, maintaining water surface and green landscape were prioritised during the design of canals, and boxed drain option were selected only in cases where land acquisition would affect large number of houses. The shape of open canal cross-sections, trapezoid or rectangular, were also taken into account the level of social impacts, in addition to technical considerations. The selection of disposal sites in Phan Rang were also based on the characteristics of the excavated and dredged materials. Excavated soil will be disposed of in the planned urban area while the contaminated/saline dredged materials will either be disposed of on-site at the Dong Hai Lake, or transported to the Nam Thanh Solid Waste Treatment Complex.

CHAPTER 4: IMPACT ASSESSMENT AND IDENTIFICATION OF MITIGATION MEASURES

Impact assessments and mitigation measures for each subproject investment were developed based on document reviews, meetings with key agencies and stakeholders, field visits to project sites, collection of environmental data (air, noise, vibration, sediment, sludge analysis, etc), and household survey. In addition to the ESIA reports, Social Impact Assessments (SIAs), subproject Resettlement Action Plans (RAPs) have also been prepared in line with relevant WB's safeguard policies. These have all been taken into account in ESIA preparation.

4.1. Overview of the Project Impacts

Potential Positive Impacts

In general, the proposed Project would bring about significant positive impacts to the participating cities. Local people will be benefited from a healthier and sustainable living environment. Among others, specific positive impacts may include: (i) improved environmental conditions and urban landscape in many public and residential areas; (ii) increased wastewater collection and treatment; (iii) minimized discharge of untreated wastewater into the environment; (iv) reduction of public health risks associated with water-born diseases and related healthcare cost; (vi) improvements in solid waste collection service and communication activities, addressing uncontrolled garbage disposal issues; (vii) reduction of traffic jam or safety risks caused by inundation; (viii) increased the accessibility of local people to nearby areas.

Cities specific benefits of the project are highlighted below:

- **Dong Hoi.** The entire city will benefit from the subproject. 11,200 people will be benefited from significantly reduced flooding and improved street drainage. 7,576 households or 36,511 people will be connected to the wastewater collection system for wastewater treatment. Students in the project-supported schools will benefit from improved toilet and sanitary facilities. In addition, the city's population generally, and road users specifically, will benefit from improved road access and connectivity at intercity and regional level.
- **Quy Nhon.** By 2022 when the subproject is completed 163,600 people will benefit from the reduced flooding, 452,000 people will have their domestic solid waste collected regularly. In addition, 165,062 people will be provided with improved environmental sanitation facilities, and 32,755 school teachers and school children will benefit from improved school water and sanitation facilities.
- **Nha Trang.** Upon completion of the subproject, the number of people benefiting from reduced incidence and severity of flooding for a 10 year return period flood event will be 9,493 people. 109,089 people will be provided with access to improved sanitation facilities. 317,556 people, of which 51.27% is women, will be direct beneficiaries. In addition, 14,646 vehicles will be provided with access to improved urban roads networks. School children of the four primary schools will also enjoy improved water and sanitation conditions.
- **Phan Rang – Thap Cham.** The subproject is expected to bring about substantial benefit for the city including improved infrastructure for 56,700 people, reduced flooding for 3,200 people, and wastewater collection for 58,500 people. Each year

657 tons of BOD will be eliminated due to operation of the WWTP. In addition, 2,069 school children will enjoy improved water and sanitation in schools.

Overall, the project will result in better infrastructure services providing socio-economic benefits. Wastewater collection, drainage and wastewater collection will result in improved environmental conditions and health conditions. The extensive capacity building and technical assistance that is incorporated in the project will result in more efficient and effective management and sustainability of the cities' assets.

Potential Negative Impacts

The project will result in some negative impacts on the local environment and populations. Key direct impacts for all the four cities arise from (a) land acquisition and resettlement, (b) site clearance and construction, and (c) operation after completion. Section 4.2 below summarizes the key impacts due to land acquisition and resettlement. Sections 4.3 summarizes key impacts during site clearance, construction and operation, Section 4.4 addresses Physical Cultural Resources impacts, Section 4.5 deals with Natural Habitats, and Section 4.6 provides an overview of cumulative impacts.

4.2. Impacts during the Land acquisition and resettlement phase

During project preparation, many efforts has been done to minimize subproject's resettlement impacts. Various options of alignment and scale of each item have been discussed and considered. There are some principles that have been thoroughly applied in the discussion between resettlement and technical team:

- Resettlement team has organized meetings with technical team to identify the potential alignment and discuss the ways to minimize impacts during construction, including safety construction measures, installation of safety signs where appropriate, and a suitable construction schedule. At the point across residential area, technical solutions (road width reduction, design of T-junction) have been discussed and studied to minimize the number of relocated people. Priority has been given to the option having less or minor resettlement impacts.
- The resettlement team has consulted with households living along the road, calling for their support during the project implementation. In addition, temporary impact and community disturbance would be minimized thanks to the close collaboration between contractors and local people through the advanced disclosure of construction plan and its associated site and time specific mitigation measures.

The proposed project components (in component 1, 2, and 3) will involve the involuntary taking of land, resulting in physical relocation and impacts on livelihoods and resources. Specific activities that have potential impacts on land acquisition include (i) upgrading/expanding and/or constructing channels; (ii) construction of regulation lakes; (iii) construction/rehabilitation of secondary sewerage lines; (iv) construction of wastewater treatment and its associated networks; (v) landfill expansion; (vi) development of urban roads and connectivity; (vii) construction of resettlement site (in Phan Rang only). In four subprojects, it is estimated that 1,486 households (HHs) will be affected, including 605 HHs losing more than 20% of their total land holding (or 10% for vulnerable groups). Only in Nha Trang and Phan Rang subprojects, physical relocation may occur. It is estimated that 329 HHs will be relocated due to the construction of items in the mentioned cities. The total area of land to be permanently required is 798,933 m2 and 92,205 m2 will be temporarily affected during construction. The involuntary resettlement impacts caused by the implementation of 4 subprojects are presented in Table 4.1.

Table 4.1. Involuntary resettlement impacts of 4 subprojects in 4 cities.

Subprojects	Number of AHs	Relocated HHs	Severely Impacted HHs	Permanent Land Acquisition (m2)	Temporary Land Acquisition (m2)
Phan Rang	947	118	479	364,064	66,890
Nha Trang	448	211	40	178,024	11,555
Quy Nhon	6	-	5	115,149	13,760
Dong Hoi	85	-	81	141,655	TBC
Total	**1,486**	**329**	**605**	**798,893**	**92,205**

Rehabilitation and Relocation Arrangement. The results of socio-economic survey indicated that 83.3% of relocated HHs in Phan Rang (120 HHs) and 80.1% of relocated HHs in Nha Trang (169) have expressed their interest in moving to a resettlement site in the same commune/ward. Others expect to receive cash to self-arrange the relocation. In Phan Rang, a resettlement site of 6.699 ha will be developed specifically for this project. Costs associated with the construction of technical infrastructure for this resettlement site will be financed by the project. In Nha Trang, relocated HHs will be arranged in three resettlement sites, namely Hon Ro 2 (29.36 ha), Dat Lanh (5.9 ha) and Ngoc Hiep (13.45 ha). PMUs will apply the same resettlement policies to the land acquisition/compensation activities required for resettlement site in Phan Rang and Ngoc Hiep in Nha Trang. Dat Lanh resettlement site was developed since 2006 to serve the relocation needs the previous Bank funded operation (Coastal Cities Environmental Sanitation Project). Hon Ro 2 resettlement site was developed in 2011 and completed in March 2016. The consultant team have conducted appropriate due diligence assessment of land acquisition/compensation practices applied in Dat Lanh and Hon Ro 2 resettlement sites. As part of income restoration effort, a number of provisions, allowances, supporting livelihood program have also been included in the RAPs and will be implemented during project implementation.

4.3. Impacts and Mitigation during Site Clearance, Construction, and Operation

Potential Negative Impacts during Site Clearance and Construction

Key generic and site-specific impacts are highlighted in the following paragraphs, while more detailed specific impacts and mitigation measures are addressed in details in the subproject ESIA and RAP. The main social impacts/risks due to construction of civil works would include: (i) loss of crops, trees, livelihoods, and other properties due to permanent and temporary land acquisition and relocation of households; (ii) disproportionate impacts/benefits from project activities on the more vulnerable such as poor, and elderly, and (v) impacts on local pagodas, churches, and temples, and relocation of graves.

Typical and site-specific environmental adverse impacts during pre-construction and construction include: (i) safety risk due to UXOs; (ii) increased nuisance from dust and noise; (iii) water and soil pollution due to waste generation including dredged materials; (iv) temporary disturbance of urban landscape due to excavation and materials stockpiles; (v) interference with local street household business activities; (vi) interruption in utility services; (vii) risks to health and safety of local people and construction workers; (viii) disturbance of local road and waterway traffic. The specific adverse impacts during operation would include the impacts associated with the disposal of sludge generated by the WWTPs, incidental discharge of untreated wastewater of the WWTPs, and the adverse impacts related to operation of the landfills.

Some of these site-specific impacts during construction are detailed below.

Dust and exhaust gases, noise, vibration: The specific areas to be affected by increased dust and exhaust gases, noise, vibration due to construction activities such as excavation, dredging, loading and unloading of construction materials and wastes, transportation are as follows:

- Dong Hoi: Ly Thai To, Le Hong Phong, Huu Nghi, Phan Dinh Phung, Truong Phap, Hoang Sam, Tran Hung Dao, Thong Nhat, Le Loi, Quang Trung streets.
- Quy Nhon: Tran Hung Dao, Bach Dang, Xuan Thuy, Tran Quang Khanh, Vo Duy Duong, Nguyen Thai Hoc, Vo Nguyen Giap, Le Thanh Nghi streets.
- Nha Trang: April 2 Street, Nguyen Khuyen Street, Ha Ra bridge area, Xom Bong bridge, Tran Phu Street, Nguyen Xien Street, Pham Van Dong Street, Duong Hien Quyen Street.
- Phan Rang: 21/8 Street, 16/4 Street, Thong Nhat Street, Bach Dang Street, Hai Thuong Lan Ong Street, Nguyen Van Cu Street, the areas along the Tan Tai canal, Dong Hai and the Central Lakes.

Solid wastes: These include top soil removed from the construction sites, excavated and dredging materials, packaging materials, garbage from workers camps etc. It is noticeable that some of the excavated materials and all of the dredging materials from rivers in Dong Hoi and Nha Trang is saline at moderate levels. Therefore the total volume of solid waste generated by four subprojects is approximately 1.3 millions cubic meters. Some of them would be reused for backfilling, levelling, only the residuals are disposed off. The volumes of excavated and dredged materials in each city are listed below:

- Dong Hoi: 223,836 m^3, including 138,202 m^3 from pipeline and pumping stations, 380m^3 from the demolition of the existing Cong Muoi bridge, 13,214m^3 saline dredged materials at the Cau Rao river.
- Quy Nhon: 72,778m^3, including 70,861m^3 of excavated materials and 1,916 m^3 of top soil
- Nha Trang: 184,690m^3, in which there are 25,252m^3 and 93,800m^3 are saline excavated materials from the WWTP and dredged materials from the Cai river, respectively.
- Phan Rang: 818,021m^3 including 788,647m^3 of excavated soil and dredged materials, and 29,374m^3 of top soil.

Traffic safety: Traffic disturbance will happen and traffic safety risks would be increased when the road surface and footpaths are occupied, open trenches are created, trucks and other vehicles are mobilized to transport construction materials and wastes. The areas in each city where traffic would be affected are listed below:

- In Dong Hoi: the intersections between the proposed road under component 2 with Quang Trung street and NH1A, 23/8 bridge,
- In Quy Nhon: Tran Hung Dao and Bach Dang road
- In Nha Trang: April 2 street, Ha Ra bridge, Pham Van Dong street, intersection between Duong Hien Quyen Street and Dien Bien Phu Street, Hung Loc Hau Street, Nguyen Khuyen-railway interchange, Nguyen Xien-railway interchange
- In Phan Rang, traffic would be disturbed the most in 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.

For each type of common construction impacts discussed above, the causes, the nature, the duration and level of impacts, and receptors vary between by type of investments and the sensitiveness of receptors. Therefore, for effective management of the potential impacts and risks, the ESIAs have also identified the type-specific impacts and sensitive receptors in the Project area.

Potential Impacts and Risks during Operation Phase

During operation phase, the key potential environmental impacts and risks are related to the operation of the new WWTP in Nha Trang, upgraded WWTPs in Quy Nhon and Phan Rang, Long My landfill in Quy Nhon, and school toilets as discussed in the subsections below.

a) Wastewater Treatment Plants

With one WWTP will be newly build in Nha Trang and three others will be upgraded, one of the main concerns during the operation phase would be: i) the potential impacts of the treated effluent from WWTPs on the water environment, both qualitatively and quantitatively; ii) the WWTP sludge; and iii) air emission and odors. Detailed description of the impacts are provided in the subproject ESIA. The sections below only focus on the WWTP effluent and sludge.

WWTP effluent

Northern WWTP in Nha Trang (design capacity at 15,000 m^3/day): The receptors of the WWTPs are Cai river. The ESIA noted that in the driest condition, when receiving the treated wastewater, the values of some water quality parameters of Cai river will be increased or decreased, particularly NH_4^+ increases by 15.6%, BOD_5 decreases by 1.7%, and PO_4^{3-} increases by 16.2%. These values are still within the allowable limits set in national standard (QCVN 08:2015/BTNMT, column B2) applicable for water sources for waterway transport and other water use purposes.

Nhon Binh WWTP in Quy Nhon: With an increase of treatment capacity from 14,000 m^3/day to 28,000 m^3/day, the amount of BOD5, COD, Ammonia (N), Total nitrogen (T-N) and Total phosphorous (T-P) would be reduced 2.8 tons, 2.8 tons, 0.42 tons, 0.56, and 0.224 tons per day, respectively. Calculations carried out in the ESIA for Quy Nhon concluded that if the incident happen at the Nhon Binh WWTP, the Ha Thanh river is still capable of receiving the pollutants in 0.8 days for BOD5, 0.1 days for COD, 8.9 days for TSS, and 5.8 days for Fe before water quality parameters reach the allowable limits.

Upgraded WWTP in Dong Hoi: The ESIA assessed the capacity of Le Ky river as the receptor in receiving the pollutants from the upgraded WWTP. The calculations were carried out based on the guidelines given in Circular no. 02/2009//TT-BTNMT issued by DONRE in March 2009. The result indicates that after receiving the treated wastewater of the plant, the basic water quality parameters including BOD5, Total N, Total P, and TSS in Le Ky river are still below the allowable limits.

WWTP in Phan Rang: In case of emergency when the WWPT is not working, parts of the pollutants in the wastewater are still be removed while passing through the chains of lagoon in the WWTP before entering Dinh river as it would take 9.5 days for the wastewater to travel from the intake to the outlet while BOD5 would reduce naturally with time. In case of emergency, most water quality parameters in Dinh river still meet the national standard, except for NH4 which would exceed 15%.

WWTP Sludge:

Sludge generated from the new Northern WWTP in Nha Trang will be about 2.3 tons/day (correlates to treatment capacity of 15,000 m^3/day). The sludge will be collected every two years. The Duc Ninh WWTP (14,480m^3/day) in Dong Hoi generates 26.7 tons of sludge per year (using drying bed technology). The upgraded WWTP in Phan Rang Thap Cham (7.500m^3/day) will generate about 7,800 m^3 of sludge after 3-4 years. When the second module of Nhon Binh WWTP is completed the total amount of the sludge generated every three years the plant (28,000m^3/day) will be about 87 tons. The analysis of the sludge from the WWTPs indicates it to be non-hazardous waste and can be used as fertilizer as domestic wastewater normally does not contain hazardous substances and biotechnology without the use of chemicals has been applied for treatment. The sludge will be collected every 2-3 years.

b) Long My Landfill in Quy Nhon

The Long My landfill has occupies an area of 61.6ha. The landfill includes a disposal cell with a capacity of 0.9 million m^3, a leachate treatment unit, an incinerator capacity 200 kg/h for medical waste treatment), and a composting plant (closed down due to the unsatisfactory quality of products). The design capacity of Long My landfill is 250 T/d, the current average daily reception is 205 T/d. Operation of the landfill will exert negative impacts on the environment and human health due to generation of the leachate, sir pollutants from landfill, impacts to water environment, dust, bioaerosols and odors, workplace and traffic safety. These impacts and risks are identified and assessed as medium.

c) Public and School Toilets

Impacts on the surrounding landscape, wastewater and smell, unhygienic conditions, smell, safety for the users, water and energy consumptions, accessibility in unfavorable weather conditions, accessibility for vulnerable groups such as aged or disabled people would be the key operational issues that should be considered and addressed during the design and operation phases of public and school toilets. Some of the mitigation measures can be incorporated into the siting and engineering design, the others can be implemented by the users and operators of these toilets.

4.4. Potential impacts on Natural Habitats

The project is anticipated to have the potential impacts on the natural habitats of the rivers running through the cities excavation, dredging and other ground disturbance activities and the Thi Nai lagoon during operation. The impacts on the rivers are mainly positive due to improved quality of the wastewater being directly or indirectly discharged into them. The Thi Nai lagoon is a wetland with aquaculture and fisheries. The ESIA confirmed that the expansion of the Nhon Binh WWTP will not have significant impacts on the sensitive ecological systems in Thi Nai lagoon because: i) When the plant is constructed, it will improve the quality of the water receiving bodies because the total contaminant loading will be decreased; ii) The ecological systems locate in the north of the lagoon which is upstream of the lagoon, 3 km far from the Ha Thanh river outfall; and iii) The assimilation capacity of the lagoon is very huge because of its large area (3,200ha at low tide and 5,000ha at high tide, which are about 32,000,000 m^3 at low tide, and 60,000,000 m^3 at high tide). Provided the declined pollution loads from the current outlets of untreated wastewater from elsewhere in the catchment, to predict quality improvement of the lagoon water quality quantitatively, a regular monitoring of water quality in the lagoon would be needed. This impact would be largely positive.

4.5. Potential impacts on Physical and Cultural Resources

In all four cities there are temples, pagodas, and churches located within the area of direct influence by the project. These PCRs include: i) Phan Rang: Quan Thanh Temple (50 m from construction sites); ii) Nha Trang: Po Nagar Cham Tower (30-100m from construction sites), An Ton Church (10 m), Ngoc Thuy Vihara (20 m), Ba Lang Parish (20-50 m); iii) Quy Nhon: Nguyen Hue pagoda (5m from construction site), Quy Nhon twin tower and Tay Ninh church (5m from construction site); Truc Lam pagoda (2m from construction site), Ngoc Nhon monastery (5m); and iv) Dong Hoi: Dai Giac pagoda (200 m from dredging area). The potential impacts would be Decreased aesthetical values; Disturbance by workers' presence and activities, or noise from trucks; Traffic safety risks to local people, particularly at peak hours; and Increased traffic safety risks.

4.6. Cumulative impacts

Dong Hoi City subproject: Dong Hoi ESIA considered three projects including the CCESP, CCSEP and the ADB-financed Infrastructure Development for Climate Resilience Project (IDCRP) covering the Bao Ninh peninsular when assessing cumulative impacts. All three projects were and will be managed by the same PMU. As the Bao Ninh peninsular is connected to CCSEP project area by a bridge crossing the Nhat Le river only, the main VEC considered was water quality at the Le Ky river as the receptor of the Duc Ninh WWTP. All three projects would contribute untreated wastewater to the Duc Ninh WWTP with total capacity at 14,400m^3/day, in which the IDCRP would contribute 1,900m^3/day of municipal wastewater from the Bao Ninh peninsular. The assessment indicated the water quality in the Le Ky river still meet standard when being operated at the total capacity of 14,800m^3/day.

Quy Nhon City subproject: Cumulative Impacts Assessment in Quy Nhon ESIA considered CCESP Quy Nhon subproject and the on-going Hoa Lu street technical infrastructure project which expands the Hoa Lu street. The CCSEP is a continuation of CCESP, CCSEP would help to resolve some pending environmental issues, particularly odor from the Nhon Binh WWTP. For the Hoa Lu street project, cumulative impacts such as dust, noise will be arisen on Dong Da ward where the existing Y-shaped bridge will be demolished and a replacement bridge will be built at the same location, and Huynh Tan Phat bridge will be built. The cumulative impacts of dust and noise are short-term and localized.

Phan Rang City subproject: Cumulative impacts considered in Phan Rang ESIA are impacts together among the subproject's items during construction phase, and the related project is Phan Ran Thap Cham City Wastewater Collection, Treatment and Reuse System (funded by ORIO Netherlands). Although the subproject phasing has been limited the number of construction items implemented simultaneously, each project stage still has several items which have the overlapped construction progresses. Since many construction items are to be performed at the same time, there would be cumulative and interactive impacts on the environment and society. These cumulative impacts include increasing in the level and scale of environmental and social impacts, especially at some key materials transport routes such as National Highway 1A, National Highway 27, 21/8 Street and 16/4 Street; Also, the social impacts related to security and order, diseases and epidemics, conflicts between locals and migrant construction workers, and impacts linked to the use of social service infrastructure are also forecasted to take place at a higher rate and frequency. Design process of CCSEP has been considered carefully the technical linkages with the ORIO Netherlands project, however, due to that project has some items which may be implemented during the first implementing stage of CCSEP, thus more or less, the two projects would have definite cumulative impacts in their construction phase. In order to minimize these impacts, the two projects need to devise a plan for exchanging information and notifying each other on

construction plans so as to carry out most effectively the measures to mitigate impacts on the environment and society.

Nha Trang City subproject: The ESIA the cumulative impacts assessment of the following proejcts: i) Coastal Cities Environmental Sanitation Project (CCESP) - Nha Trang Sub-project; ii) Construction of infrastructure for Ngoc Hiep resettlement Project (2016-2018); and iii) Infrastructure for Hon Ro 2 resettlement Project. CCESP project has completed in 2014 which create no cumulative impact during construction work. However, CCSEP is the continual project of CCESP in which some work items are related to the project in order to completely solve the environmental problems to ensure future sustainable development. For those two resettlement projects, cumulative impacts are mainly social impacts due to the allocation of households from CCSEP project into these two areas. Other physical environmental impacts are almost eliminated because the construction phase are different and the distance is relatively large (about 5 km).

4.7. Mitigation Measures

a) Mitigation Measures during Preparation and Construction

During the detailed design of the project works, attention will be given to mitigating these impacts to the extent possible by incorporating into the designs, bidding documentation, and resulting contracts. Specifically, the bidding documents and the contracts will reflect (i) the provisions of the comprehensive Environmental Codes of Practice (ECOPs) for addressing common general impacts associated with construction works that have been prepared for the project (see Table 4.2 below); and (ii) site specific impact and mitigation measures that have been prepared for each of the project works where impacts and mitigation measures are beyond, or in addition to, the provisions of the ECOPs. contractors are required to prepare their own Contractor's Site-Specific Environmental Management Plan (CSEMP) which incorporates all construction-related measures in the ESMP and the World Bank Group Environment, Health and Safety Guidelines (EHS guidelines) and good practices, including good housekeeping at construction site, waste management, provision of adequate water and sanitation facilities, provision of safety corridors/passageways, installation of barrier fences around dangerous areas and wearing of PPEs. The CSEMP will be reviewed and approved by the PMUs before construction can commence in the site. Full details on the ECOPs and the site-specific mitigation measures are included in the subproject ESIAs.

Table 4.2: Common impacts, mitigation measures and instrument of implementation

Common Impacts	Typical Mitigation Measures	Instrument
Increased nuisance from dust	- Regular watering of affected areas during dry days. - Imposition of vehicular speed limits in residential areas.	ESMP CSEMP
Increased nuisance from noise	- Avoid construction activities at night. - Ensure all equipment are in good condition.	ESMP CSEMP
Temporary increase in sedimentation of receiving water channels and increased turbidity of surface water	- Reuse of non-hazardous construction spoils and disposal of construction spoils and excess soils into designated sites. - Stockpiling excavated materials from water channels and runoff. - Provision of perimeter canals around stockpiled materials.	ESMP CSEMP

Common Impacts	Typical Mitigation Measures	Instrument
	- Regular clearing of canals and drainage. - Practice of good construction site housekeeping.	
Increased health and safety risks for the local residents and workers due to exposure of hazards from construction activities, non-resident population and traffic	- Provision of barriers/fences and warning signs at dangerous areas. - Imposition of speed limits in residential areas. - Medical screening of workers by the contractors. - Provision of adequate water and sanitation facilities at campsite. - Wearing of personal protected equipment (PPE). - Provision of temporary safe passageways for residents. - Proper waste disposal and good housekeeping.	ESMP CSEMP
Interruption in utilities services	- Proper scheduling and timing of affecting repair activities. - Consultation with the utilities companies and users. - Provision of alternative sources.	ESMP
Damage to existing infrastructure due to construction traffic especially the hauling of embankment materials	- Contractor to undertake regular repairs of construction routes. - Construction of temporary detours to avoid weak bridges.	ESMP CSEMP
Loss of crops, trees and other properties due to permanent and temporary land use by the subproject.	- Conduction consultations with the affected households for an agreed compensation plan. - Implement the agreed compensation plan.	RAP
Possible land and soil degradation in the construction sites and vicinities include lands used for temporary easements and quarries due to compaction, litters, improper disposal of construction wastes and spoils.	- Contractor to practice good construction site housekeeping. - Avoidance of spillages of fuel, oil and grease. - Disposal of construction spoils into the designated landfill only. - Clearing and restoration of construction sites after completion. - Practice proper waste collection and disposal system.	ESMP CSEMP
Loss of land (land use rights) of some households due to permanent land use by the subprojects	- Undertake consultation with the affected households and agree a resettlement/compensation plan which is compliant with the World Bank OP/BP 4.12. - Undertake the process of land clearance. - Implement the resettlement plan.	RAP

Common Impacts	Typical Mitigation Measures	Instrument
Possible chance finds of archaeological sites, artefacts	- Adopt a Change Find Procedure.	Chance Find Procedure
Possible encounter of unexploded ordnance (UXO)	- Immediately stop activities, secure the site and contact authorities. Contact details of the authorities should be available. - Follow UXO procedure.	UXO Procedure
Lack of means for lodging complaints or claims for compensation of damage during construction	- Set up a Grievance Redress Mechanism for the sub-project	Grievance Redress Procedure in ESMP

Management of dredged materials. A sampling survey suggested that dredged materials from excavation during construction of sluice gates and dredging of canals are mainly silt and clay with high organic content and low levels of heavy metals. Therefore, the materials could be used for dikes, roads, construction of houses. However, other areas may contain acid sulfate soil and /or heavy metals and toxic chemicals and could be an issue. During detailed design PMU will prepare a Dredge Materials Management Plan (DMMP) containing: (a) detailed estimate of the nature and quantity of dredged materials; (b) chemical analysis of the dredged materials; (c) indicative lands for disposal; (d) communication plan for local residents informing the quality of the dredges and any restriction on the use for housing construction and gardening in case the materials found to be unsuitable; and (e) inventory of planned road and dikes to transport the dredged materials.

b) Mitigation Measures for Operation Phase

For the WWTPs in all the cities, the following key mitigation measures have been proposed:

- Manage and operate the WWTPs in compliance with operational manual and the Approved ESIAs.
- The quality of sample effluent from the WWTP must be analyzed once every 3 months.
- Domestic waste and sludge generated during the operation of the plant will be safely stored in a closed area before being transported away by URENCO to serve the planting of urban green trees or to be dumped at Luong Hoa landfill of the city. This will reduce bad odors generated from sludge.
- The waste (sludge and domestic solid waste) will be contained in standardized containers to minimize dispersion and gases and solid waste into the environment.
- The subproject owner will register as the owner of hazardous waste according to Circular No. 36/2015/TT-BTNMT dated 30 June 2015 on hazardous waste management.
- Monitor and check and maintain the treatment facilities periodically.
- Provide trainings on safety and health for the worker.
- Prepare an emergency plan for incidental discharge of untreated waste water and conduct emergency training for the operators.
- Inform the residents of the incident and mitigation measures.
- Periodically check and maintain odor treatment system of WWTP.
- Carry out periodic observation on air quality.

- In the case of arising incidents, it should be announced to community, locals and repair those incidents quickly.
- The sludge from the WWTPs will be collected by the Provincial URENCOs and dispose of in the cities' landfills, including Ly Trach landfill in Dong Hoi, Luong Hoa landfill in Nha Trang, Long My landfill in Quy Nhon, and Nam Thanh landfill in Phan Rang – Thap Cham city.

For the landfill and other project investments the mitigation measures are included in the subproject ESIAs.

4.8. Due Diligence Reviews

A due diligence review was undertaken by the Borrower for WWTPs, landfills, and the potential materials sources. A summary is provided below:

For Nha Trang, due diligence was conducted for Luong Hoa Landfill which will receive the sludge for the subproject WWTP. Periodic analysis results of effluent quality at leachate treatment station (every three months) monitored by Environmental monitoring center – Khanh Hoa DONRE show that the parameters pH, COD, BOD5, TSS, T-N, noise, dust, SO_2, NO_2, HC, CO, NH_3^+ and H_2S are within the allowable limits of national standards.

Wastes generated by Dong Hoi subproject will be disposed to Ly Trach landfill which has been improved through a number of internationally-funded project, including the CCESP. URENCO has also been supported with solid waste management equipment. Operation of Ly Trach landfill is under control, although there are rooms for improvement. The most recent environmental quality monitoring results show that most of the air, water and groundwater quality are within the allowable limits.

For Quy Nhon, due diligence review has also performed for the 14,000m^3 Nhon Binh WWTP which was constructed under the CCESP. The second 14,000m^3 module of the WWTP has been proposed under the CCSEP. The effluent monitoring results of Nhon Binh WWTP during operation indicate compliance with the national standards QCVN 40:2011/BTNMT, column B. The issue of the WWTP is offensive odor which will be addressed under the CCSEP. The environmental monitoring report of Long My landfill, which was constructed under the CCESP, shows that the monitoring result of air, surface, leachate and groundwater samples are within the national standards.

For Phan Rang, the waste generated by the subproject during construction and operation will be disposed to Nam Thanh solid waste treatment complex. The complex is in operation and in compliance with the government regulation. Due diligence review of the project 'Construction of the Wastewater Collection, Treatment and Reuse for Phan Rang – Thap Cham City Project" financed by the Netherland Goverment has been being implemented from 2016-2020 was also conducted. The EIA for the project was approved by the provincial authority, and the mitigation measures proposed under this EIA are in line with those proposed in ESIA and no conflicts with CCSEP ESIA were determined.

Due diligence review was also conducted for the materials sources of sand mines, borrow pits, and quarries which may be used by the project. The results of the review show that they are licensed and operated in line with the related national regulations.

CHAPTER 5: ENVIRONMENTAL MANAGEMENT PLAN

A total of four Environmental and Social Management Plans (ESMPs) were prepared as part of the subproject ESIAs for the subprojects. The objectives of the ESMPs are to: i) ensure compliance with the applicable provincial, national, laws, regulations, standards, and guidelines; ii) ensure that there is sufficient allocation of resources on the project budget for implementation of ESMP-related activities; iii) ensure that environmental risks associated with a project property managed; iv) respond to emerging and unforeseen environmental issues not identified in the subproject ESIA; v) provide feedback for continual improvement in environmental performance.

The ESMPs consist of the set of good practice mitigation measures to address common construction related impacts which referred to as Environmental Codes of Practices (ECOP), site-specific environmental and social measures to deal with the impacts specific to the subproject areas and activities. The ESMPs also include monitoring, and institutional measures to be taken during implementation and operation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. Each subproject ESMP includes a Compliance Framework which lays out the role and responsibilities of the contractor and a penalty system to address no-compliance cases of the contractor to the environmental management requirements of the subproject. Each subproject ESMP also includes a Grievance and Redress Mechanism (GRM) to provide the framework within which complaints about environmental and safety issues can be handled, grievances can be addressed and disputes can be settled quickly. The GRM will be in place before the subproject construction commences. Finally, the ESMPs include the budgets for their implementation including for capacity building in project environmental management.

5.1. Management Organization and Responsibilities

The subproject owners, which are the provincial City Project Management Units (PMUs), will include content of the corresponding ESMPs into the standard tender documents to be used as a basis for contractors to implement environmental management during construction phase. The PMUs will be responsible for overall supervision and monitoring of the subproject including implementation of the ESMPs and will provide safeguard training to the subproject staff.

To facilitate effective implementation of the ESMPs, the city subproject PMUs will: (a) establish an Environment and Social Unit (ESU) responsible for ensuring timely implementation of the ESMP, including monitoring, reporting, and capacity building related to safeguards; (b) hire the Construction Supervision Consultant (CSC) to be responsible for supervision of the contractor's safeguard performance as part of the construction contract and this requirement will be included in the CSC terms of reference (TOR); and (c) hire qualified the Independent Environmental Management Consultant (IEMC) to assist the ESU in performing these tasks.

The city water supply, drainage, and urban maintenance companies, as appropriate, will be responsible for implementing the mitigation measures during the operation stage of the project and they will ensure that the mitigation measures are implemented and adequate budget is provided. The Provincial Steering Committee (PSC) chaired by the Chairman or Vice Chairman of the Provincial People's Committee (PCP) of the respective province will provide the overall policy guidance and oversight of project implementation.

Safeguard management responsibilities have been defined in the ESIAs, RAPs. Social safeguard management include PMUs, PPC, DPC, independent monitoring consultant (please refer to city specific RAP for detailed arrangement).

5.2. Environmental Monitoring

It is essential to design the monitoring program and monitoring frequency appropriately to be able to demonstrate both the overall performance of the project works as well as the short-term impact due to peak construction activities. More specifically, as the integral and critical part of each subproject ESMP, the environment monitoring program has the following objectives: i) Determine the actual extent of the impacts; ii) Control impacts which are generated from construction process and mentioned in ESIA report; iii) Check environmental pollution standards applied to the project during construction; iv) Check and supervise implementation of environmental protection solutions during construction based on ESIA report; v) Suggest mitigation measures in case of unexpected impacts; vi) Suggest to the Client to coordinate with central and local environmental organizations to solve pending issues relating to environmental protection under the scope of the Project; vii) Assess the effect of mitigation measures in pre-construction, construction and operation stages; and viii) Confirm the impacts forecasted in the ESIA.

Monitoring will focus on compliance with the ESMP and CSEMP. This will be done by the project owner on a daily basis as part of the ground supervision of construction. Environmental quality monitoring will also be conducted by the project owner as part of the standard requirements of the national legislation.

- *The Subproject Owners,* the through their PMUs, has responsibility for ensuring that the ESIA is effectively implemented. The sub-project owner will carry out the task, but not limited to the following: (i) Assign a qualified staff to be responsible for taking actions related to environmental safeguard and ensuring effective and timely implementation of ESIA; (ii) Assign a Construction Supervision Consultant (CSC) and/or field engineer to be responsible for supervision of the contractor's safeguard performance as part of the construction contract; (iii) Include the subproject ESMP/ECOP, into bidding and contract documents and ensure that contractors are aware of these obligations; and (iv) Prepare monitoring reports to submit to WB.
- *Contractor Responsibilities:* Contractor is responsible for carrying out civil works and informs Subproject owner, local authority and community about construction plan and risks associated with civil works. As such, contractor is responsible for implementing agreed measures to mitigate environmental risks associated with its civil works as indicated in the ESMP and contractual documents.

5.3. Environmental Supervision

Environmental supervision during construction will be the responsibility of the CSCs, who will be required to include in their supervision teams personnel with experience in supervising the environmental aspects of projects financed by international agencies such as the World Bank. They must also be familiar with the environmental legislation requirements of the Government. In accordance with their supervision contracts, and with the provisions of the construction contracts, the CSCs will be responsible for supervising all construction activities, including the mitigation measures that have been incorporated into the contracts on the basis of the ESMPs, and more broadly for ensuring that any negative environmental impacts of the project are minimized.

5.4. Technical Assistance for the Implementation of Safeguards

Except Phan Rang PMU, other implementing agencies (PMUs of Nha Trang, Quy Nhon, Dong Hoi) have intensive experience in implementing the World Bank safeguard policies under the Coastal Cities Environment and Sanitation Project. All implementing agencies (PMUs of Phan Rang, Nha Trang, Quy Nhon and Dong Hoi), through their dedicated staff/unit, will be responsible for implementing and monitoring the safeguard instruments (ESMPs, RPF, RAP) as well as mitigation measures defined in the ESIAs, SIAs. The implementation of safeguard instruments will be internally monitored by the PMUs in close coordination with the respective Peoples' Committees, line departments at different administrative levels and externally supervised by independent monitoring agencies. Implementing agencies will ensure that activities related to environmental and social safeguards will be properly tracked, reported and documented. Independent monitoring will start around the same time as implementation of activities and will continue until the end of the project/sub-project.

During the project implementation, appropriate training will be provided to the PMUs, consultants and local community representatives on the safeguard instruments to be applied to the Project. Given the nature, locations, and scale of construction, it is anticipated that the safeguard technical assistance support and training will be provided at least during the first 3 years of the project implementation. WB safeguard specialists will participate in the capacity building in particular in the training activities as appropriate.

5.5. Independent Environmental Monitoring Consultant (IEMC)

The monitoring and related audit of the subprojects will be carried out by Independent Environmental Monitoring Consultants (IEMC) appointed by each of the city PMUs for their respective subprojects. The IEMCs will be responsible for carrying out environmental sampling and monitoring at least twice a year, on all environmental-related issues regarding the works. They will check, review, verify and validate the overall environmental performance of the respective subprojects through regular inspections and review. This review will provide confirmation that the results reported by the contractors to the construction management consultants and the PMUs are valid and that the relevant mitigation measures and monitoring programs provided in the subproject ESMPs are being fully complied with. The IEMCs will also supply specialized assistance to the PMUs and, if required, to the CSCs, on environmental matters.

On RAP implementation, an independent consultant will be retained by implementing agencies to periodically carry out external monitoring and evaluation of the implementation of RAPs. The independent agencies would be an academic or research institutions, non-Governmental Organizations (NGO) or independent consulting firms, all with qualified and experienced staff and terms of reference acceptable to the World Bank. Depending on the magnitude of project impact, borrower with consultation from Task's Team of the World Bank will decide the extent of using independent monitoring consultant. In addition to verifying the information furnished in the internal supervision and monitoring reports of the respective PMUs, the external monitoring agency will collect information from affected households. A Resettlement Plan could not be considered complete until a completion audit or survey confirms that all entitlements have been received by beneficiaries and livelihood restoration is progressing on schedule.

5.6. Costs of Environmental and Social Management Plan

The costs of land acquisition and resettlement are included in Table 1.1. The ESMP cost for each city will comprise: (a) cost for implementation of the mitigation measures by contractor, (b) cost for supervision by the CSC, (c) cost for the independent environmental monitoring

consultant (IEMC), (d) monitoring of environmental quality, and (e) PMU safeguard management costs. Costs for the implementation of the mitigation measures during construction will be part of the contract costs while the costs for monitoring by the CSC is provided for in the construction supervision contracts. Costs for PMU operations related to the ESMP are provided for in the project management budget of the PMU. None of these costs can be easily calculated separately. For each city the cost of (c) will be about US$100,000, of (d) will be about US$50,000. In addition each city has budgeted US$25,000 for a safeguards capacity building program to be implemented during the project.

The estimated budget for land acquisition, compensation, resettlement and support is approximately VND 474.5 billion VND (US$21.6 million). This estimated cost exclude the costs associated to the construction of resettlement site in Phan Rang which will financed from project fund. The involuntary resettlement impacts caused by the implementation of 4 subprojects are presented in Table 5.1.

Table 5.1. Involuntary resettlement impacts of 4 subprojects in 4 cities.

Subprojects	Budget (VND)
Phan Rang	211,196,322,455
Nha Trang	184,186,316,572
Quy Nhon	7,256,070,492
Dong Hoi	71,862,554,500
Total	**474,501,264,019 VND (or US$21,568,239)**

CHAPTER 6: PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

6.1. Public consultation during preparation of the ESIAs

Two rounds of public consultations have been conducted during the subproject preparation in early (Feb-Mar) and mid-2016 (Jun.-Jul.). The consultations have been organized at different levels from provincial down to the affected communities/communes level (01 consultation meeting/project commune). 2,642 persons have participated in those consultation meetings, and 34.8% of them are female participants (this rate could be higher if the gender disaggregated data is available in Dong Hoi subproject). The participants includes provincial agencies (such as DONRE, Center for Land Development, DOLISA, EPA, Urban Management Department, Fatherland Front, DOC), district people's committees, commune people's commune, and members of communities who are either beneficiaries or people affected by the project. The time and number of participants attended in each round of consultation are summarised in

Table 6.2.

Table 6.1. Public Consultation Activities Carried out

	Round 1			**Round 2**		
	Time	Total Participants	Female Participant	Time	Total Participants	Female Participant
Dong Hoi	May 2016	274	-	Jun. 2016	165	-
Quy Nhon	Feb. 2016	212	41.7	Jul. 2016	208	42.0
Nha Trang	Feb 2016	444	40.1	Jul. 2016	474	39.9
Phan Rang	Feb.- Mar. 2016	421	41.6	Jul. 2016	444	43.2
Total		**1,351**	32.9		**1,291**	36.7

During those consultation meetings, PMUs and consultant teams have presented the project components, potential environmental/social impacts and associated mitigation measures. Feedbacks from communities and other stakeholders have been used to finalize the safeguard instruments (ESIAs/SIAs, RPF, RAPs) as well as other aspects of project design. Summarises of received feedbacks/comments are presented in Table 6.2.

Table 6.2 – Feedbacks Received from Public Consultations

City	Key Comments/Questions
Dong Hoi	- Compensation should be adequate, based on market price - Inform local communities about construction schedule - Avoid damages to trees and other existing structures - Use local labours, particularly those from affected HH - Mitigation measures must be implemented during construction - HH affected with land acquisition interested in new job opportunities - Reinstate the area in front of Phu Hai cemetery and other disturbed areas - Replace contractors who violate social and environment requirements - Manage workers to minimize community/social disturbances - Minimise the impacts on business and tourism

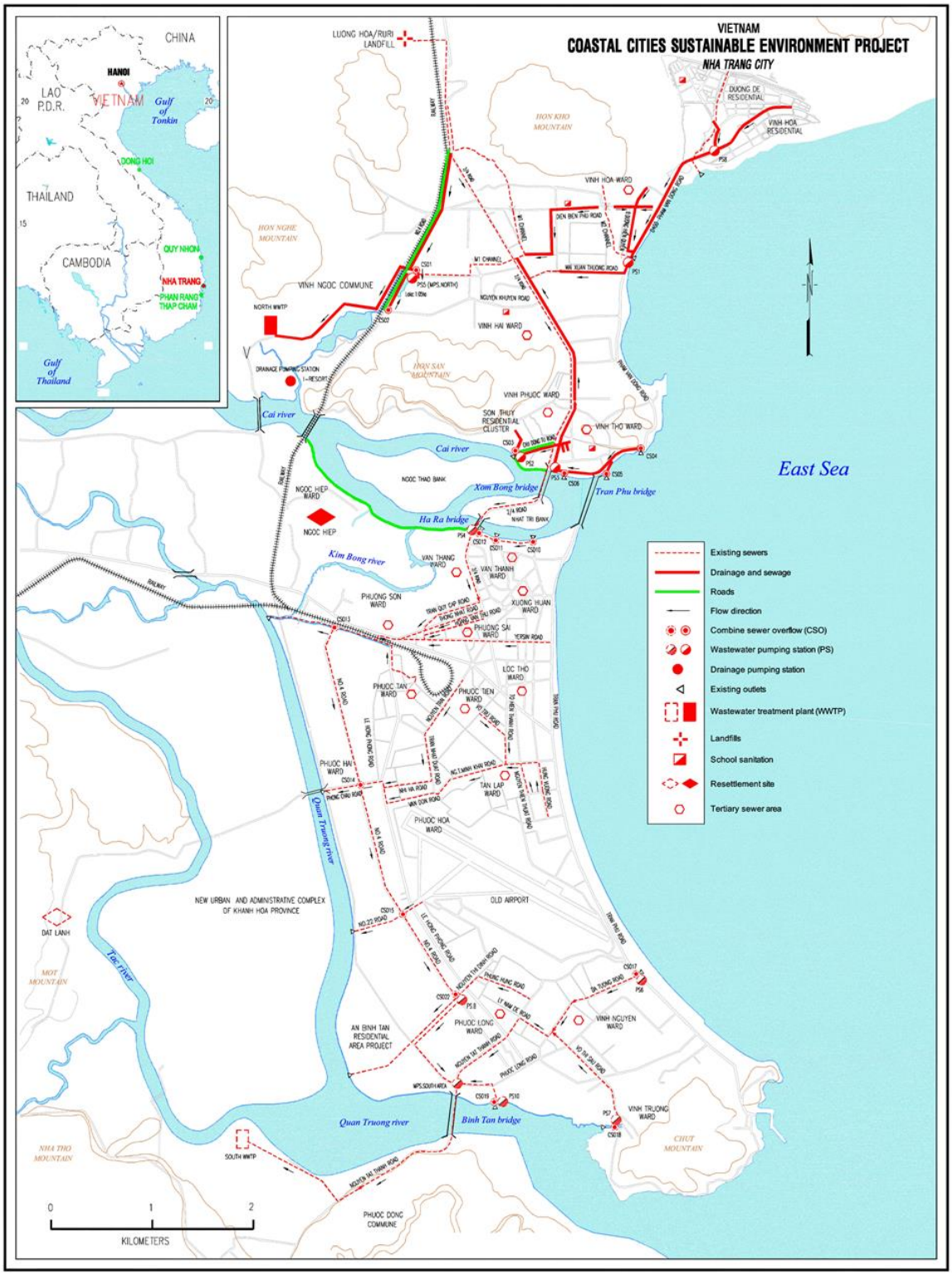
Quy Nhon	- Implement the project as quick as possible - Inform local people project implementation timeline and method - Minimize environmental pollution such as dust, construction debris and noise during the construction. - Ensure traffic safety by displaying signposts, construction signs to redirect vehicles to other roads. - Arrange adequate compensation for local people who lose their plants at the expanded area for landfill.
Nha Trang	- Mitigation measures should be carried out fully during construction phase - Compensation should be adequate, particularly for land acquisition at Ngoc Thuy monastic and Xuan Ngoc cultural house. Arrange fair compensation for affected HHs. - no species in Red book or endangered species were recorded in the construction area of project - Agree with impacts and mitigation measures mentioned in ESIA report - Ensure the surface restoration after construction. Avoid lengthy construction period. - Ensure the implementation of mitigation measures
Phan Rang	- Compensation should be higher than the rates regulated by PPC (at market price); interested in assistance for job change - Compensation package may not be sufficient to buy a replacement plot. - Water level in Cha La canal is low, not running in dry season. The canal is affected with garbage from upstream - The road in My Dong is very busy, thus should be expanded to 5m wide - Canal bed should be at least 1 m lower than the existing ground level - Garbage throwing into canals must be ended, management plan should be developed - Mitigation measures must be implemented - Garbage bins which allows waste separation should be placed in public areas - Reliability of treated wastewater - Public consultation should be continued during project implementation - Phuoc My ward has many locations suffering flooding. Is it necessary to build 20m-wide road? - Irrigation should be maintained during construction - Safety should be ensured, traffic jams must be avoided - Respect local traditions and customs - Alternative location should be selected for building a new lake instead of rehabilitating the existing one - For the affected graves, HHs prefer to self-arrange the relocation of graves

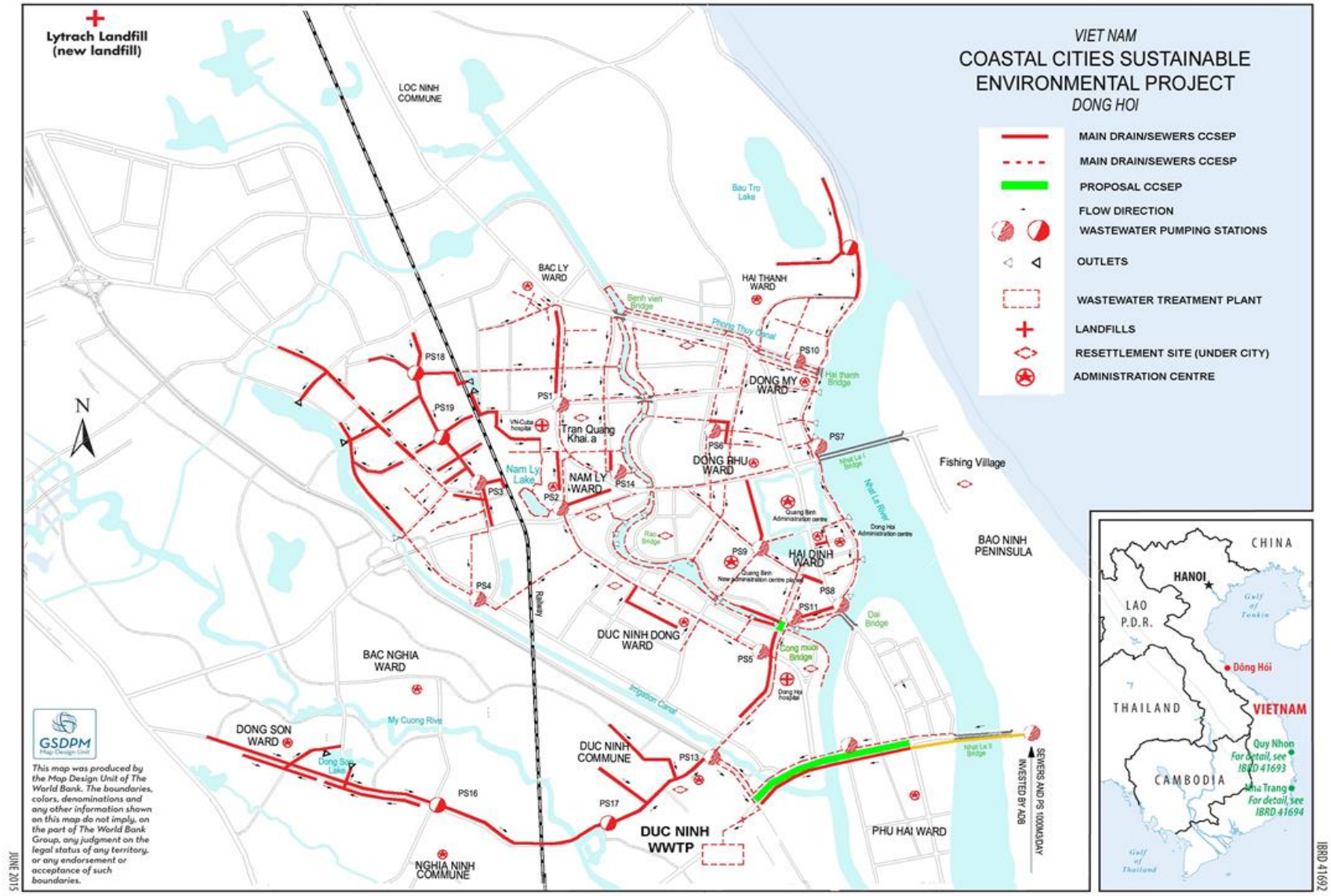
6.2. Information Disclosure

In compliance with EA process requirements of the Government and the World Bank, prior to project appraisal the draft Environmental Assessment Executive Summary, ESIAs, RPF, RAPs were locally disclosed at PMUs' offices and subproject sites on October 5, 2016. The draft English versions of these safeguards instruments have also been disclosed at the World Bank's Operation Portal on October 6, 2016. The final safeguard instruments in Vietnamese

will be finally disclosed locally at the subproject sites, and their final English versions will be also disclosed at the World Bank's Operation Portal.

ANNEX 1. Project Maps




Lytrach Landfill
(new landfill)
VIET NAM
COASTAL CITIES SUSTAINABLE ENVIRONMENTAL PROJECT
DONG HOI
MAIN DRAIN/SEWERS CCSEP
MAIN DRAIN/SEWERS CCESP
PROPOSAL CCSEP
FLOW DIRECTION
WASTEWATER PUMPING STATIONS
OUTLETS
WASTEWATER TREATMENT PLANT
LANDFILLS
RESETTLEMENT SITE (UNDER CITY)
ADMINISTRATION CENTRE
LOC NINH COMMUNE
BAC LY WARD
HAI THANH WARD
DONG MY WARD
DONG PHU WARD
NAM LY WARD
HAI DINH WARD
DUC NINH DONG WARD
BAC NGHIA WARD
DONG SON WARD
DUC NINH COMMUNE
NGHIA NINH COMMUNE
PHU HAI WARD
BAO NINH PENINSULA
Fishing Village
DUC NINH WWTP
Tran Quang Khai a
Nam Ly Lake
Bau Tro Lake
Phong Thuy Canal
Nhat Le River
Irrigation Canal
My Cuong River
Dong Son Lake
Railway
PS1
PS2
PS3
PS4
PS5
PS6
PS7
PS8
PS9
PS10
PS11
PS13
PS14
PS16
PS17
PS18
PS19
SEWERS AND PS 1000M3/DAY INVESTED BY ADB
CHINA
HANOI
LAO P.D.R.
THAILAND
VIETNAM
CAMBODIA
Dong Hoi
Quy Nhon
For detail, see IBRD 41693
Nha Trang
For detail, see IBRD 41694
Gulf of Tonkin
Gulf of Thailand
IBRD 41692
GSDPM
Map Design Unit
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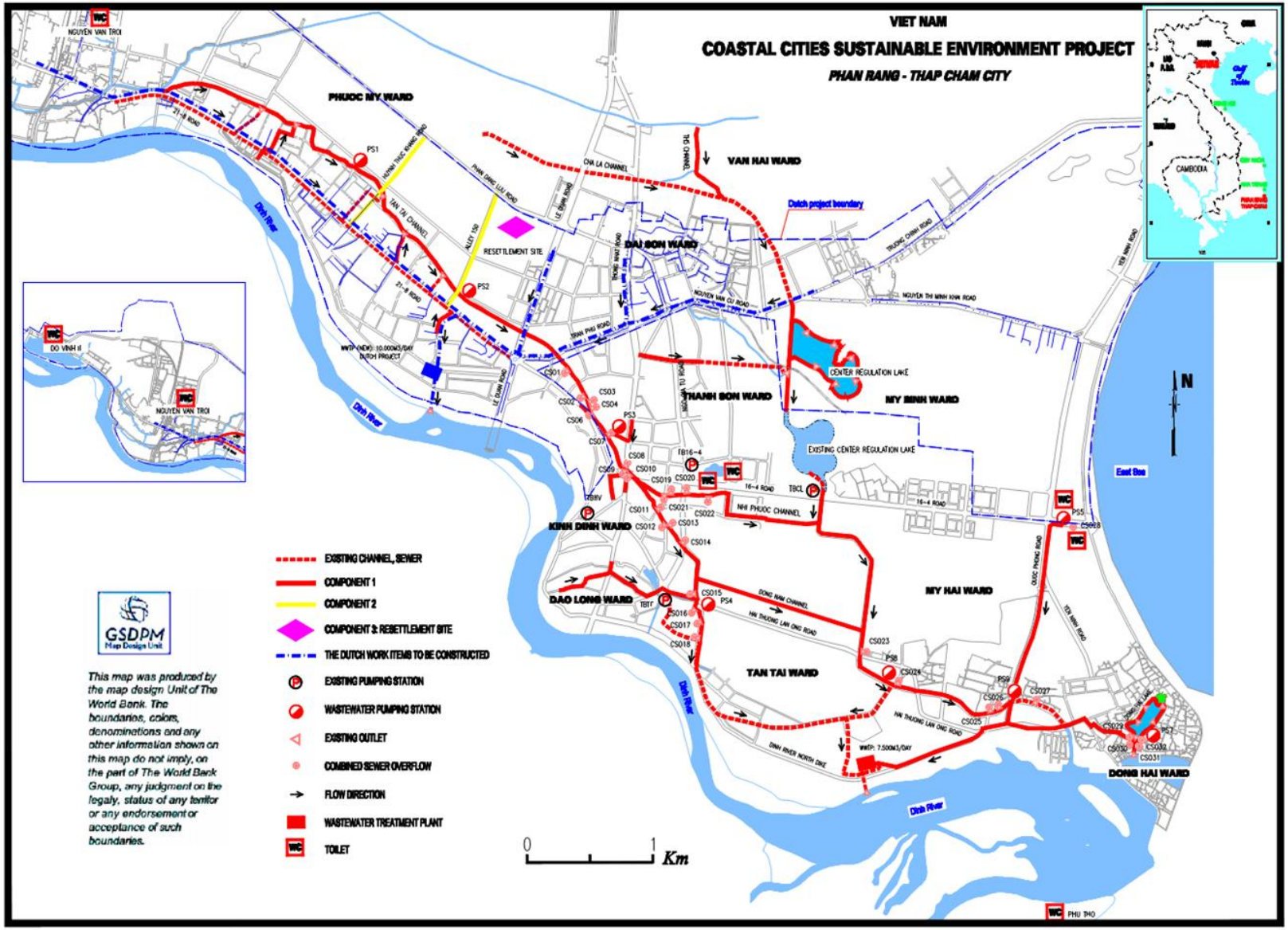
JUNE 2015


VIET NAM
COASTAL CITIES SUSTAINABLE ENVIRONMENT PROJECT
PHAN RANG - THAP CHAM CITY
PHUOC MY WARD
VAN HAI WARD
DAI SON WARD
THANH SON WARD
MY HAI WARD
MY SINH WARD
KINH DINH WARD
DAO LONG WARD
TAN TAI WARD
DONG HAI WARD
Dutch project boundary
RESETTLEMENT SITE
CENTER REGULATION LAKE
EXISTING CENTER REGULATION LAKE
NHI PHUOC CHANNEL
DONG NAM CHANNEL
HAI THUONG LAN ONG ROAD
DINH RIVER NORTH DIKE
Dinh River
East Sea
CAMBODIA
NGUYEN VAN TROI
DO VINH II
PHU THO
WWTP: 7,500m3/DAY
EXISTING CHANNEL, SEWER
COMPONENT 1
COMPONENT 2
COMPONENT 3: RESETTLEMENT SITE
THE DUTCH WORK ITEMS TO BE CONSTRUCTED
EXISTING PUMPING STATION
WASTEWATER PUMPING STATION
EXISTING OUTLET
COMBINED SEWER OVERFLOW
FLOW DIRECTION
WASTEWATER TREATMENT PLANT
TOILET
GSDPM
Map Design Unit
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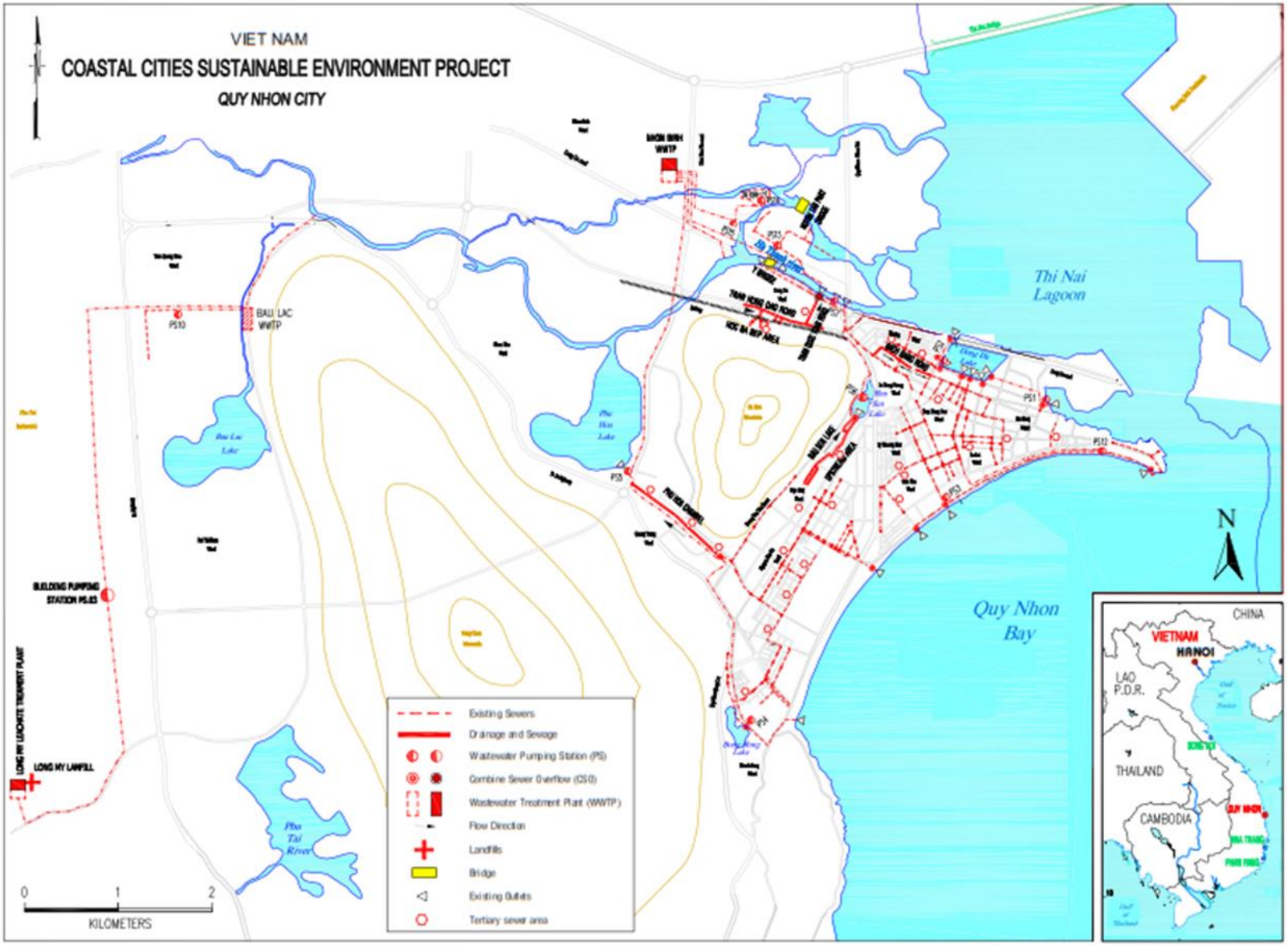
VIET NAM
COASTAL CITIES SUSTAINABLE ENVIRONMENT PROJECT
QUY NHON CITY
Thi Nai Lagoon
Quy Nhon Bay
BAU LAC WWTP
NHON BINH WWTP
LONG MY LANDFILL
BUILDING PUMPING STATION PS.E5
Existing Severs
Drainage and Sewage
Wastewater Pumping Station (PS)
Combine Sewer Overflow (CSO)
Wastewater Treatment Plant (WWTP)
Flow Direction
Landfills
Bridge
Existing Outlets
Tertiary sewer area
KILOMETERS
N
CHINA
VIETNAM
HANOI
LAO P.D.R.
THAILAND
CAMBODIA
QUY NHON