

CAN THO URBAN DEVELOPMENT AND RESILIENCE PROJECT

Executive Summary

**ENVIRONMENTAL AND SOCIAL
IMPACT ASSESSMENT (ESIA)**



**PEOPLE COMMITTEE OF CAN THO CITY
ODA PROJECT MANAGEMENT UNIT, CAN THO CITY**

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**PROJECT OWNER
PEOPLE COMMITTEE OF
CAN THO CITY**

**CONSULTANT
JOINT VENTURE OF IAC VIETNAM
AND SINH THAI CICE**

I. INTRODUCTION AND PROJECT DESCRIPTION

1.1. Background

Vietnam is among the countries most seriously affected by climate change and sea level rise. Can Tho city in particular, and the Mekong Delta region in general, are forecast to be most affected by the negative impacts of climate change. According to the Mekong Delta Plan – Long-term vision (Netherlands – Vietnam in November 2013), sea level in the Delta will rise from 57 to 73cm (average scenario) and from 78 to 95cm (high scenario) by 2100.

The proposed Can Tho Urban Development and Resilience Enhancement Project (CTURP) will enhance climate change resilience and promote sustainable city development for Can Tho city through: (i) both physical and non-structural investments for flood risk management; (ii) investments in ensuring safety and accessibility, and provision of public transport activities through an integrated corridor management approach; and (iii) enhancement of financial management capacity and integrating transport with land use.

A full Environmental and Social Impact Assessment (ESIA) report, a detailed resettlement and compensation plan report, and a development plan report for ethnic minorities have been prepared to ensure the project will be implemented in accordance with the requirements of the World Bank (WB) and applicable national legislation and regulations of Vietnam. The Environmental and Social Impact Assessment provides an overview of the environmental and social baseline conditions on the direct impacted areas, summarizes the potential impacts associated with the proposed project and includes an Environmental and Social Management Plan (ESMP) which sets out the management measures required to mitigate any potential impacts. The ESMP is to be utilized by the contractor to be commissioned by ODA PROJECT MANAGEMENT UNIT, CANTHO CITY and will form the basis of site-specific management plans that will be prepared by the contractor and sub-contractors as part of their construction methodology prior to works commencing. These ESMPs will be approved and disclosed by the World Bank and the relevant Vietnamese authorities prior to the start of civil works.

1.2. Basis of Law, Legislation and Regulation

The project is required to comply with the prevailing environmental laws in Vietnam, which include the Law on Environmental Protection No. 55/2014/QH13 passed by the National Assembly on 23 June 2014 and in effect since 01 January 2015; Decrees, Circulars, Decisions, standards and regulations of Vietnam on Environment; Circular No. 27/2015/TT-BTNMT of 29 May 2015 of the Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment and environmental protection plans and guidelines. Relevant World Bank environmental and social policies as summarized below.

Environmental assessment OP/BP 4.01

Physical Cultural Resources (BP/OP 4.11)

Involuntary Resettlement (OP/BP 4.12)

Indigenous Peoples (OP/BP 4.10)

Natural Habitats (OP/ BP 4.04)

Projects on International Waterways (OP/BP 7.50)

The ESIA will also apply WBG 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 (GIIP).

1.3. Project Description

The Project will be located in 20 wards in four inner districts -Ninh Kieu, Cai Rang, O Mon and Binh Thuy- in Can Tho city.

Critical flood control and urban development works will take place in the Ninh Kieu – Binh Thuy traditional urban area, located in center of Can Tho city, adjacent to intersection of Hau River and Can Tho River, and bordering Can Tho airport to the North.

The proposed Project components and main investment items are described in tables 1 and 2 below:

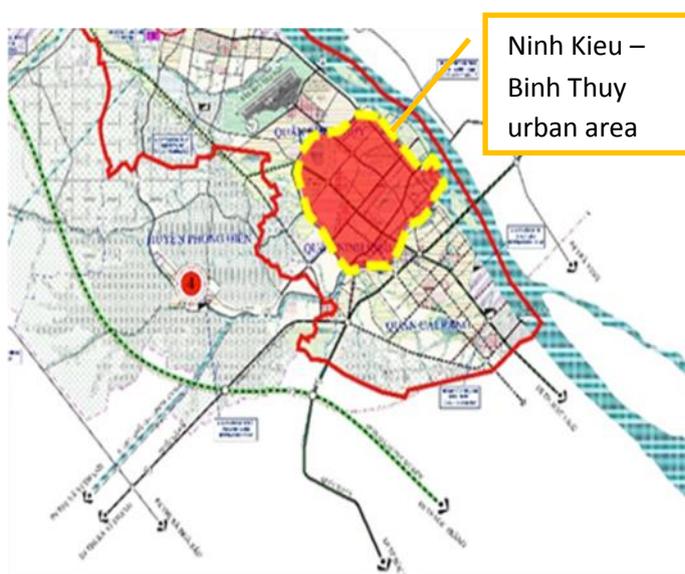


Table 1: Components of the CTUDR

Components	Activities	Investment cost (US.\$)
Component 1	Flood control and environmental sanitation - Sub-component 1.1: Flood control system - Subcomponent 1.2: Environmental sanitation	120,910,261
Component 2	Urban corridor development	78,912,252
Component 3	Strengthening urban management for climate change resilience	6,800,000

Table 2: The main investment items of the project

No.	Item	Detailed description
1	Component 1	Component 1: Flood control and environmental sanitation with the total investment is USD 120.91 million. This component will support Can Tho city to implement the structure and non-structure measures to control flood and ensure environmental sanitation for the core urban area.

No.	Item	Detailed description
1.1	Proposed flood control systems	
	1. Can Tho river embankment (section from Ngo Duc Ke to Cai Son ditch)	<p>Embankment at the right bank within Ninh Kieu district with the length of 6.14 km, and height from 2.8- 3m. Type of embankment: gravity concrete embankment wall + reinforcing embankment roof by pre-cast concrete</p>
	2. Construction road and park behind embankment	<p>- Building green park, square, art lighting system. Arranging tourism areas interlaced on embankment, such as tourism area - food court - local trading center - recreation area - festival area.</p> <p>- Building road behine embankment with roadbase section of 23m throughout the route with road pavement of 15m and 6m sidewalk near households. Sidewalk in the side of embankment will combine with green park behind embankment in minimum of 2m width</p> <p>+ The start point of route Km0+00 at interchange between Ngo Duc Ke road and Hai Ba Trung road (in the area of the Guest House No.2) of Ninh Kieu District, Can Tho City. The ending point: Km 5 + 604.68 at interchange between the motorway after the park of river embankment under studying and the planned Hau Giang road (now local road) in Ninh Kieu District, Can Tho City.</p> <p>+ Alignment: The road is upgraded based on the existing and newly-built routes in the region with the width of 4-6m, including Hai Ba Trung, Nguyen Thi Minh Khai, Tam Vu and local earth roads. Pavements of road have been degraded and most of road has no infrastructure in two sides.</p>
	3. Develop sluice gates and shiplocks for core urban area	<p>a) Cai Khe sluice gate <i>combined with shiplock</i>: Cai Khe sluice gates is located in Cai Khe ditch between Ninh Kieu bridge and pedestrian bridge. Culvert width of B=40m (nozzle of 2x20m). Width of tidal sluice gate of B=5.0 m (Grade VI-classified according to grade of waterway).</p> <p>b) Dau Sau sluice gate <i>combined with shiplock</i>: Located in Dau Sau ditch, 200m far away Dau Sau ditch to the side of Can Tho river. Culvert width of B=20m (one nozzle of 20m). Width of tidal sluice gate of B=5.0 m (Grade VI -classified according to grade of waterway).</p> <p>c) Hang Bang tidal sluice gate combine with shiplock: Located Hang bang ditch. Culvert width of B=20m (one nozzle of 20m). Width of tidal sluice gate of B=5.0 m (Grade VI-classified according to grade of waterway).</p> <p>d) 09 ship locks on flood control corridor: Building uncomplicated, no need electricity, control water level at a certain elevation. Width of valve gate varies from 5 to 20m.</p>
	4. Improvement of watercourses in the central area, dredging,	<p>Cai Son ditch anti-landslide embankment: Located in Cai Son ditch to Ninh Kieu district side; Length of L=3.9 km; Elevation of embankment coping: suitable with flood control and higher than highest water level, with P=1%.</p>

No.	Item	Detailed description
	upgrading protective embankments, roads, relocation of encroached canals	<p>Type of embankment: Gravity concrete embankment wall + reinforcing embankment roof by precast concrete</p> <p>Auxiliary works include protective handrail and road behind embankment:</p> <ul style="list-style-type: none"> - Section 1 from 923 to Cai Son bridge (Nguyen Van Cu): road pavement of 4m built by cement concrete M300. - Section 2 from Cai Son bridge to road CMT8: Road pavement of 7m built by asphalt concrete.
	5. Renovation of canals/ditches in the core urban area	<ul style="list-style-type: none"> - 14 canals will be improved which include: Dau Sau canal, Nga Bat canal, Muong Cui canal, Xeo Nhum canal, Muong Lo canal, Hang Bang canal, Tu Ho canal, Sao canal, Ba Bo canal, Le canal, Xeo La canal, Ngong canal, Ong Ta canal, Ong Dao cannal. - Soft embankment: Reinforce foundation by cajeput pile with a density of 16 piles/m², each pile is driven 4m deeply. The top of pile is concreted with pillar of 0.8x0.4m. From reinforcement of +1.00 and up, retaining current reinforcement and supplement some green trees to create surrounding landscaping and trees to keep soil and embankment.
	6. Develop regulatory lake, and pump station in urban core areas	<p>a) <i>Regulation Lake of University Campus</i>: locates at Long Tuyen ward, Binh Thuy district, expansion of existing canal and ditch for building ecological lake, planting trees at the center of the university.</p> <p>Dredging lake with an area of 10.57 ha. Dredged depth from 2 m; total volume of 256,000 m³ dredged materials; Soft embankment; Water surface area: 51,931 m²; Green and landscape area: 37,771 m², area of playground and walkway: 8,167 m²; Area of service land: 4,261 m², providing road protected embankment with width of 2.0 m.</p> <p>Waste water collection system to be invested with University Campus planning. The land area for renovating ecological lake, planting trees: 223,412m²</p> <p>b) <i>Long Hoa regulation reservoir</i>:</p> <p>Locates at Long Hoa ward, Binh Thuy district. The land for building ecological lake, trees plating by expanding existing canals, ditches such as Muong Khai ditch, Cai Son ditch, Hang Bang ditch, Pho Tho ditch and Nuoc Lanh ditch, etc.</p> <p>Dredging lake with an area of 17.53 ha. Dredged depth from 2 m; total sludge volume of 93,000 m³ of dredged materials. Soft embankment; water surface area: 67,774 m²; Green and landscape area: 142,049 m²; Area of playground and walkway: 13,589 m²; construction of providing road protected embankment with width of 2.0 m. The land area for renovating canals, ditches for building ecological lake, planting trees: 102,130m².</p>

No.	Item	Detailed description
		<p>Waste water collection system to be invested with Xuan Lan resident area in the future</p> <p>c) A small pump station (2m³/s) will be built in Tham Tuong catchment. It is because of the high density population area with the most vulnerable by extreme weather.</p>
1.2. Environmental sanitation improvement works		
	1. Improving drainage system for routes in the center of Ninh Kieu district;	<p>a) Improving Hoang Quoc Viet road infrastructure</p> <p>The road has starting point at the provincial road 923 passing through the intersection with Nguyen Van Cu road and ends at Nguyen Van Linh road with a total length of 3.3km. Currently, the road width is small (4m) by asphalted macadam road and has no technical infrastructure,</p> <p>b) Renovating drainage system with length of 12 km in the center of Ninh Kieu district: Minimum culvert diameter is 300mm for wastewater culvert and 400mm for stormwater culvert. A mobile pumping station with capacity 1.6m³/s are located in Xang Thoi Lake.</p>
	2. Equipement	Equipment attached to buildings and equipment to support the management and operation of regulatory monitoring drainage system, dredging of drains, canals, pumping stations, reservoir, and damper.
2	Component 2	<p>Urban corridor development to connect backbones of the town, promote connectivity among new and existing residential areas in the city center, enhance connectivity among inter-regional urbans and public transport options of Can Tho city.</p> <p>The total investment is USD 78.91 million.</p>
2.1	Quang Trung bridge (modul 2)	<p>Construction of Quang Trung bridge with total length of bridge and connecting road is by 689m, bridge with length of 481m, width B = 11m.</p> <p>Renovation of existing bridge: To ensure aeration and increase aesthetics for the works, excavating soil at section of high backfilling, install additional access spans similar to Structure alternative 2 and expanding 3 spans of 3x33m to the side of Cai Rang and 2 spans of 2x33mm to the side of Ninh Kieu.</p>
2.2	Road and bridge of Tran Hoang Na	<p>Length of total line is about 3.684 km in which</p> <p>Section from Nguyen Van Cu to residential area 91B: road base of 20m (carriage way of 2x3.5m= 7m, combine vehicle way = 2x2.5m= 5m, sidewalk in two side: 2x4m= 8m)</p> <p>Section from residential area to NH 1A: Roade base of 28m (carriage way of 2x2x3.5m= 14m, combined vehicle way of 2x1x2.25= 4.5m, median strip of 1x0.5m= 0.5m, safety lane of 2x1x0.5m= 1m, sidewalk of 2x4m= 8m).</p> <p>There are 2 bridges: Dau Sau 1 and Dau Sau 2 on the route:</p> <p>Dau Sau 1: 24.53+24.54+24.537, L= 74.613m, scale of 15.6m (carriage</p>

No.	Item	Detailed description
		<p>way of 2x6m= 12m, sidewalk of 2x1.5m, handrail of 2x0.3m = 0.6)</p> <p>Dau Sau 2: 1x24.54m, length of L= 25.44m, scale of 15.6m (carriage way of 2x6m= 12m, sidewalk of 2x1.5m, handrail of 2x0.3m = 0.6)</p> <p>Tran Hoang Na Bridge with total length of bridge, L = 576.56m (to edge behind abutment wall). Main span is structured with arch for vehicles running below: Span diagram: 39.1m + 4x40m + 39.1m + 99m + 39.1m + 4x40m + 39.1m</p> <p>Bridge surface: 23m (carriage way of 2x2x3.5m= 14m, combined vehicle way of 2x1x2.25m= 4.5m, median strip of 1x0.5= 0.5m, safety lane of 2x1x0.5m = 1m, pedestrian way handrail 2x1.5m = 3m)</p>
2.3	Building the road connecting the August revolution road to provincial road 918	The starting point begins at the August Revolution road intersecting with Alley 91 and ends at the provincial road 918 near Can Tho prison with total length of about 5km
2.4.	Building residential areas for resettlement	Building the resettlement site in Ninh Kieu district with an area of about 54.5ha is suitable with the planning with technical and social infrastructure as stipulated to ensure living conditions for local people.
2.5	Equipment	Equipment attached to the works and serving for the management and operation includes: (a) establishment of GIS center; (b) equipment for the street and bus stop.
3	Component 3	<p>Strengthening urban management for climate change resilience with the objectives of (1) Management for risks of natural disasters and climate change resilience; (2) Management of transportation and urban development; (3) Financial plan of the city and (4) Application of information technology in urban administration management</p> <p>The total investment is USD 6.8 million.</p>

2. BASELINE CONDITIONS

2.1. Geographical and Natural Conditions

Can Tho, located at the center of the Mekong delta region is a gateway city to the lower reaches of the Mekong River. It is an industrial, commercial-service, education and training, technological center, health and cultural center; serves as an important transport center; and holds a key strategic position in the fields of national defense and security. Can Tho City has a slightly inclined topography with river systems connecting to interlocking canals and a common ground elevation of 0.8 - 1.0m above sea level. The annual average water level fluctuates from 39-51cm, the highest water level from 193-200cm and the lowest water level from (-140) - (-121cm). The rainy season lasts from May to October. Total annual average rainfall is about 1,247.7mm. Although the project area is not affected by flooding from upstream, high rainfall combined with high tide could cause local flooding

with the level ranging from 20-50cm. In the rainy season, prolonged thunderstorms lead to flooding in urban areas.

2.2. Environmental Baseline

There are few incidences of air pollution exceeding emission standards (only one of thirty-five samples taken is over the permissible standard located in Under Bridge 3 on Nguyen Van Linh road). The surveys show that the dust and noise levels are permissible under Vietnamese standards. Analysis results of sludge samples from dredged canals indicates heavy metal concentration within the level permitted under Vietnamese standards.

With regard to surface water, the analytical results show that analytical indicators of most of samples are within the permitted limit. However, samples taken at some creeks (Dau Sau, Hang Bang, Ngong, Ba Bo, Tu Ho, Ong Ta, Muong Khai) showed signs of pollution by solid waste and sewage emanating from residential areas. For the underground water, analytical results show that most of analytical indicators pass permitted limits. Particularly, Coliform and E.Coli indicators exceed permitted limits many times. It means that underground water here is unusable for domestic purpose unless underground water is treated. Using untreated underground water will cause digestion diseases.

In addition, the analysis results of phytoplankton composition in the project area in March 2015 have recorded that there was 60 species belonging to 24 families, 16 orders, and 4 branches.

2.3. Socio-economic Conditions

In 2009, the total population of Can Tho city was 1,189,555 people, of which urban population was 783,104 people (65.8%); rural population was 406,451 (34.2%). The population density is 8,416 person per km² in Ninh Kieu, 1,026 person per km² in O Mon, 1,567 person per km² in Binh Thuy and 1,251 person per km² in Cai Rang. The Kinh ethnic makes the majority of 96.74%, while the rest is Chinese (1.27%), Khmer (1.95%) and other ethnics (0.04%). Average income per capita reached \$1,749 (2009). The poverty rate is about 4.67%. The labours in agriculture, forestry and aquaculture were 49%, industry and construction about 18.27%, and trade and services about 32.73%. The number of un-employees was 4.84% (36,735 people).

Can Tho is a city of cultural diversity. Religious elements and religious institutions are also very rich with temples, pagodas and churches scattered everywhere. There are 15 religious institutions that may be affected during the project construction.

3. ALTERNATIVE ANALYSIS

Due to the investment items of the project, there are various technical options. Proposed design alternatives are analyzed based on their advantages and disadvantages of technical, economic, social and environmental aspects to choose the best option.

“Without project”: In the absence of the Project, flooding and tidal surges will continue unabated. There will be deterioration of environmental sanitation conditions: air pollution, solid waste, accretion of sludge, and other negative environmental impacts, that would have detrimental effects on the welfare of the citizens of Can Tho.

3.1. For the “With project”

Analysis of the 5 proposed flood control options was undertaken. : Multi Criteria Analysis (MCA) considered technical, economical, environmental, social, and resettlement aspects and cost-effectiveness analysis at a preliminary level to select a feasible option.

3.2. Alternatives for Flood Control System

Under component 1, the alternatives for flood control system have also been analyzed:

Alternatives for selecting engineering and technology options for Can Tho embankment; and Alternatives for selecting engineering and technology options for construction road and park behind embankment. Option 1 was selected for economic and technical reasons, and to enhance urban aesthetics as it will be constructed in line with the prior embankment system and can increase elevation, reducing flood risk in the future. The road will connect with other areas of the City.

Alternatives for selecting engineering and technology options for Dau Sau and Cai Khe tide sluice gate: The most environmentally friendly and aesthetically pleasing option was selected.

Alternatives for selecting engineering and technology options for five ship locks: Option 1 has been selected as it was judged to have the greatest impact on water pollution and odour control.

3.3. Alternatives for Environmental Sanitation

Four alternatives have been taken into consideration namely: (1) Alternative 1: Continue to build separated drainage system to drain 100% of storm water; (2) Alternative 2: Construction of separate drainage system. Rehabilitation of the existing drainage system to ensure the capacity of 30% storm water and newly construction of storm water drainage system, ensure to drain 70% remaining storm water; (3) Alternative 3: basically, Alternative 3 is similar to Alternative 2, drainage direction and receiving sources for the catchments; (4) Alternative 4: Storm water is mainly diverted to Xang Thoi Lake, with a small volume diverted to the Cai Khe Canal (Route of Mau Than, Tran Hung Dao, Xo Viet Nghe Tinh, Nguyen Trai) drain to Cai Khe Canal.

Alternative No 4 has been selected due to lowest possibility of flood risk and the creation of an improved environment and landscaping around the drainage system

3.4. Alternatives of Investment Scale for Urban Corridor Development

Alternative for Quang Trung Bridge: To ensure the connection between the old bridge and the new bridge, creating a focal point for the southern gate of the city of Can Tho. Alternative 2 has been selected due to its having the shortest construction periods, therefore negative impacts are reduced.

Alternative for – the connecting road to the August Revolution road to provincial road 918: Two options have been analyzed. Option 2 has been selected due to lower costs and reduced impacts of site clearance.

4. SUMMARY OF ASSESSMENT OF IMPACTS

When the project is completed, the overall impact will be positive. Nevertheless, the project will cause some negative impacts (temporarily or permanently) on the local environment and the local population. Therefore, effective implementation of mitigation measures will be necessary.

4.1. Positive Impact

Positive impacts which are expected to be generated by the project during the operational phase include:

- (i) Improved public health and living conditions in the project area, especially with regard to reduced pollution of Can Tho River households in areas adjacent to existing open channels, drains and lakes;
- (ii) Minimized flooding for households and commercial areas along two Can Tho riversides;
- (iii) Safety issues along two river banks is improved;
- (iv) Increased income in the construction phase (thanks to enhanced income by protecting assets and commercial goods, and the continuity of business operations during the flood season);
- (v) Increased opportunities for commerce, tourism, local recreation and exercise;
- (vii) Improved access to markets and primary social services (health, education) and urban employment opportunities
- (viii) Reduced flooding because the drainage system is improved (personal and public health protection);
- (ix) Increased income from production and marketing of agricultural products
- (x) Increased efficiency of production and consumption of goods due to better market accessibilities
- (xi) The flooding, inundation and foul odors will be reduced in the city through flood control works, drainage systems under the project;
- (xii) Additional economic, social, environment and aesthetic benefits from the construction of linear parks along Can Tho river embankment i.e. open space for recreation of local people, conditions for river tourism development.
- (xiii) The project works are expected to be built to adapt to climate change and reduce inland saltwater intrusion in Can Tho city.

4.2. Negative Impact

Pre-construction phase impacts include the activities of land acquisition and rehabilitation; reclamation, clearance, preparation process of construction of embankment. Work sites and worker camps would generate dust from the process of clearing, grading; Emissions generated from construction vehicles; Solid waste generated from the reclamation; Noise, vibration from machinery; Impact on vegetation area, impact on regional ecosystems.

Construction phase: the activities in construction phase includes: Embanking, Pipeline construction. Worker activities would generate Dust, emissions from material transportation and machinery. Work camp management, if improperly maintained, improper disposal of solid waste, waste water, diseases and social problems caused by the concentration of workers in a centralized urban location. A key environmental impact is the need to properly dispose of sludge resulting from the dredging process.

Operation phase: the environmental and social impacts during the operational phase are largely positive. However, the negative impact would occur if the Operation and Maintenance would not be well implemented: (i) Flooding caused by failure to maintain the drainage and canal system; (ii) Odor: drainage system for roads in Ninh Kieu could cause odor in local area. However, the level of impact will not be significant and easily managed by the proper operation and maintenance of the Can Tho City; (iii) risk on embankment cracking and subsidence (iv) Disruption to the activity of inland waterway; and (v) Inadequate management and operation of tide sluice gate cause disruption to the activity of inland waterway.

4.3. Induced impacts

The Mekong Delta, and by extension Can Tho City, is particularly vulnerable to hydro-metrological disasters, particularly flooding. Flooding has significantly impacted the socioeconomic development of the city and the entire Mekong Delta as a whole. Each year, about half of the Delta is flooded by overflow of 1 m to 3 m in depth. As one of the 13 Mekong Delta provinces, and being located along the Bassac River (Hau River), Can Tho City shares the hazards of the larger Mekong Delta. The City is susceptible to flooding caused by Mekong alluvial overflow, high tides, and extreme rainfall events. Seasonal flooding typically impacts 30 percent of the city area, but has recently increased to 50 percent. Close to 95 percent of the total land area is less than 1 m above mean sea level, except for the built-up urban area located along the bank of the Hau River, which is about 2 m above mean sea level.

According to the City's analysis, urban flooding caused direct economic damages of more than US\$300 million in the last 5 years. A recent study by the International Institute for Environment and Development estimates total (direct and indirect) annual economic losses due to flooding at US\$642 per household, which represents 11 percent of each household's annual income. City-wide, this could represent some US\$130–190 million in damages and losses per year due to flooding. Yet the city does not have a strategy or specific instruments to manage these costs efficiently and to reduce the negative development impact from flooding.

High flood risk, and the negative impacts of climate change, will have implications on economic growth and poverty reduction goals in Can Tho and the greater Mekong Delta. Can Tho has a population of approximately 1.25 million, and an urban annual growth rate of 5 percent between 2005 and 2012. As the 4th most populated city in Vietnam and the largest city in the Mekong Delta, it is an engine of economic growth for the region. The City is an emerging hub for high-tech agro-industrial production and aquaculture, food processing, and export. As a major actor in the region, Can Tho has a strategic role in promoting food security in the Delta, and concentration of industries, educational institutions, and health facilities. Although the City is growing dynamically, it faces multiple threats to sustainable development that are primarily caused by seasonal flooding, sea-level rise, land subsidence and rapid urbanization.

The aim of this project is to address the two primary threats to its socioeconomic development goals, flooding and uncontrolled urbanization, by more proactively guiding urban growth to areas with lower flood risk, including the higher elevation areas near the heart of the city. The project will address the economic, social, environmental and financial dimensions of resilience by strengthening the capacity of the City to manage flood risks on multiple fronts. Structured as a physical planning program, the project includes a large technical assistance package to integrate both the hard and soft

facets of the investments. A combination of “low-regret” engineering solutions, including surrounding embankment, tidal gates/valves, and improvement in the drainage system is the most appropriate and necessary solution to address the flooding challenges in the urban core. Environmental considerations are incorporated by minimizing negative environmental impacts and by integrating green, permeable, and ecosystem-based approaches. These investments will reduce surface run-offs and enhance drainage capacity. A combination of “low-regret” engineering solutions will be employed to minimize water displacement of flood management interventions. The design of the embankments, tidal gates/valves and improved drainage system will integrate, where possible, adaptable features that can be further strengthened in the future in light of potentially severe climate change impacts.

The project developments will lead to increased urbanization and densification in the city core as the flood risk decreases. This will result due to two key reasons. First, additional investment will be made in the urban core due to the reduction in negative impacts associated with flooding, such as direct physical damage to buildings and associated infrastructure, and business interruption. This additional investment expected to result in greater economic activity and growth, which will therefore draw an increased number of the surrounding population into the urban core. Second, the negative impacts of climate change, such as increased flooding and salinization will impede or reverse agricultural growth, at an increasing rate. Rural households, particularly farmers, from across the Mekong Delta are expected to move to the urban core of Can Tho as they are increasingly unable to maintain their existing livelihoods.

This greater urbanization and densification, of the project area will therefore have significant positive impacts. However, it will also put a greater strain on basic services. Over time, the City will need to increase investment in wastewater treatment, water supply, electricity supply, traffic management, schools, and health facilities in order to manage the potential negative impacts of increased urbanization and densification. In the coming years, the City will need to follow a disciplined capital investment plan based on realistic forecasts of increased urbanization, and enhance maintenance of existing and planned infrastructure services, in order to limit pressure on services that play a key role in limiting flow of emissions into groundwater and surface water, as well as into the urban airshed, such as wastewater treatment and solid waste management. Deviation from such an investment program would lead to increased pollution and decreased human welfare. City planning should also focus on promotion of Bus Rapid Transit (BRT) schemes, and increased and more efficient public transport, to reduce traffic congestion and minimize air emissions, particularly the carbon monoxide, hydrocarbons, and particulate matter emanating from two stroke engines. Electricity demand will grow as the city grows in size and affluence, and the use of energy efficient lighting for public streetlights and for commercial, industrial, and residential use should be encouraged. It is critical that zoning laws be strictly monitored and enforced to ensure that there is no repeat encroachment along the river banks.

4.4. Natural habitats impacts

In Can Tho the intrusion of agriculture and aquafarming has led to the depletion of biodiversity and the degradation of natural riverine habitats. The commercial breeding of catfish, basa fish (*Pangasius bocourti*) and hybrid catfish has contaminated the river system and is significantly brought negative impacts to natural resources. A survey conducted in Can Tho in August 2015 revealed that cyanophyta is the dominant phytoplankton in the project area, present at a relative high level of

about 40-98.7%. This is highly toxic algae, suited to a high nutrient (in other words, heavily polluted) aquatic environment.

The project interventions under Component 1 and 2, which include canal dredging and extension of the sewage system will, in the first instance, remove existing high levels of plankton, and in the second instance, will reduce the pollutant load into the Can Tho and Hau Rivers to a certain extent. In terms of temporary construction activities, canal dredging and embankment protection will lead to increased turbidity during works. It will be necessary to ensure that wastewater from construction activities and worker camps not be released into natural waterways and canals.

Although there will be changes in the hydrology of the Can Tho and Cai Son rivers, due to flood risk management measures, there will be no net abstraction of water from the rivers, therefore effecting no change in the ecological flow, and maintaining riverine ecological integrity at the current state.

Given the heavy urbanization of the region, Can Tho's diversity of species has already been reduced in recent years. There are no known threatened flora or fauna in the project area. The forest resources of Can Tho city are extremely limited. According to the results of a land inventory in 2010, the city only has 227 hectares of plantations with the majority of these being an exotic species - eucalyptus trees. Even this plantation area will be converted for other agricultural uses.

An innovative measure to be adopted by the Project is an ecological bank protection and tree plantation scheme. In addition to preserving existing indigenous trees and vegetation along canals, the Project will use indigenous species (including mangrove apple and Nipa plants) as a "green" soft embankment protection. In addition to adding to Can Tho's canopy cover, these plants have excellent erosion protection properties.

4.5. Impacts on Physical Cultural Resources

The urban corridor development component will lead to the relocation of 84 tombs, including 75 built tombs and 9 earth covered tombs of 42 households who are living in An Binh, Hung Loi (Ninh Kieu), An Thoi and Long Hoai (Binh Thuy) and Hung Thanh (Cai Rang) Wards. The mitigation measures for grave relocation including relocation cost, will be covered in the resettlement plan. Before construction, relocation of the graves shall be undertaken in accordance with the updated Resettlement Plan which is currently being prepared, cleared by the Bank and adopted by the local authorities.

4.6. Socio-economic Impacts

Land Acquisition and Resettlement

Land acquisition and resettlement are the main social impacts for the project. According to the Inventory of Loss (IOL) conducted, the implementation of the 2 components of the project will affect 4,539 households, of which 1,814 will be relocated, 634 severely affected households (losing more than 20% of productive land, 10% for vulnerable HH) and 709 households with small business affected. 35 companies (mainly construction material companies) will also be affected as well as 2 markets (see Table 3).

The total acquired land for the project is 1,354,055 m², of which Residential land represents 361,936 m² (26.8%); Agricultural land: 735,736 m² (54.4%), non- agricultural land: 27,917 m² (2%), public land (35,909 m² (2.6%) and other land (transportation, rivers, canals, cemeteries) 192,557 m² (14.2%).

444 vulnerable HH including 349 female head of HH with dependents, 35 poor HH and 11 HH belonging to an ethnic minority groups will also be affected. They are however fully integrated with the Kinh majority. 222 HH are encroaching on the River and canals banks without right or claim on land. They will all be relocated in a serviced resettlement site.

A resettlement plan (RP) will be prepared in compliance with World Bank policy for involuntary resettlement and regulations of Vietnam to mitigate impact on the affected households. An Income Restoration Program (IRP) for severely affected HH, relocated HH and HH losing business will also be prepared as part of the RP. Due to the relocation of 1,814 HH several km from their former location, preparation of the IRP, in close collaboration with HH losing their livelihood, will be a key issue for the Project.

Table 3: Information about the land acquisition of 02 project components

Kinds of affected assets		Unit	Total		Component 1		Component 2	
			Quantity	AH/ Companies	Quantity	AH/ Agencies	Quantity	AH/ Agencies
Land								
Non-agriculture	Residential	m ²	361,936	3,598	215,280	2,357	146,656	1,241
	Non- agriculture	m ²	27,917	35 Comp-anies	27,797	35 Comp-anies	120	2 Companies
	Public land	m ²	35,909	8WPCs	30,015	6WPCs	5,894	5WPCs
	Other land (cemetery, transportation, canals)	m ²	192,557	10 Agencies 11WPCs	146,184	10 Agencies 10WPCs	46,373	7WPCs
Agriculture	Annual crops	m ²	31,539	64	14,673	38	16,866	26
	Perennial trees	m ²	704,197	1,024	170,085	524	534,112	500
Total affected land			1,354,055		604,034		750,021	
Totally affected houses		m²	115,226	1,625	77,723	1,145	37,503	480
Partly affected houses		m²	26,069	856	15,620	580	10,449	276
Total of AHs								
	Total AHs	HH	4,539		2,858		1,681	
	DHs	HH	1,814		1,271		543	
	No of HHs have productive lands	HH	826		347		479	
	No of HHs have their business stores affected	HH	709		472		237	
Vulnerable HHs			444		200		244	
	Women headed with dependents	HH	349		150		199	
	Minority HHs	HH	11		6		5	
	Disabled headed HHs	HH	6		4		2	
	poor HHs	HH	35		22		13	
	Elderly headed HHs	HH	10		5		5	
	HHs under supported by social policies	HH	33		13		20	

Other social impacts

Other potential social impacts on local communities include road and public safety during construction, spreading of HIV/AIDS during the construction period and disruption of communities and livelihoods during site clearance and construction. A Social Action Plan (SAP) to mitigate impacts and to maximize benefits on the affected communities; this SAP also includes a gender action plan.

4.7 Potential Impacts to Sensitive Facilities

The project does not have any direct impacts to historical and cultural monuments, religious, school and health facilities during land acquisition process. However, in the construction phase, construction material transportation and construction activities can affect access to, pagodas, churches and schools; which could also be affected by dust and noise during construction phase and facing some difficulties of get in/out the structures. Most of sensitive areas are a part from more than 10 m to construction sites. These are: Preventive Medicine Center, guest house No.2 (Km0); 2 markets of Tan An (Km0+220) and An Lac (Km0+710) located near river banks, Cathedral (Km0+480); Ninh Kieu Methadone treatment facility (Km0+850) ; The Military Court of Region 9 (Km0+860); Nguyen Hien primary school (Km2+780), Inland Waterways Management and Maintenance Joint Stock Company No. 12 (Km3+620); Ong church (Km5+000); An Binh market (Km5+700). Giac Thien pagoda at Km0+230;

4.8. Cumulative Impact Assessment

The ESIA conducted a review of related recently completed and ongoing investments in the project cities to identify possible linkages and potential cumulative impacts in relation to the proposed Project. Based on the assessment and due diligence review, negative cumulative impacts from linked and associated urban infrastructure projects are deemed to be limited. Several projects will have a positive cumulative impact on the CTUDR by reducing the pollution load on waterways, through treating sanitation, which will allow the drainage and sanitation components of the CTUDR to operate more efficiently.

Over the past years, Can Tho city, with the support of the Vietnamese Government, donors and international funding institutions, has been implementing various development programs and projects for the Mekong River Delta region in general and Can Tho city in particular. Key infrastructure projects are as follows:

Can Tho drainage and wastewater treatment project (financed by KfW)

Cai Sau sludge landfill project financed by (Cai Rang district)

Mekong Delta Transport Infrastructure Development Project (financed by the WB)

Mekong Delta Water Resources Management for Rural Development project (financed by the WB)

Vietnam Urban Upgrading project (VUUP) from 2002-2014, (WB funded project).

Mekong Delta Urban Upgrading project (MDR-UUP) from 2012 - 2017 (VUUP2) (financed by the WB)

Mekong Delta Urban Upgrading project (MDR-UUP) from 2012 - 2017 (VUUP2)

In assessing cumulative impacts, in addition to assessing the positive and negative impacts of urban infrastructure projects, the impacts of industrial facilities on the city's environment must also be

evaluated. Can Tho City has 5 industrial parks which contain 211 existing and proposed investment projects in force, of which 188 projects are operating, 15 projects are being built, and 5 projects have not been implemented. These industrial park management units are responsible for organizing plan preparation, construction investment, managing and operating the drainage systems in industrial parks under their management.

According to current regulations, all wastewater from industrial parks must be collected and treated to meet discharge requirements before discharging into the receiving water. In order to solve environmental problems in industrial parks, the city has implemented the construction of a centralized wastewater treatment plant in Tra Noc Industrial Park, Hung Phu Industrial Park and Thot Not, of which, the centralized wastewater treatment plant in Thot Not Industrial Park Phase 1 was inaugurated in August 2013 and officially came into operation from February 2014. The phase 1 wastewater treatment plant in Thot Not Industrial Park has the capacity of 2,500m³/day, with total fund of 52.7 billion dong, mainly serving seafood companies operating in the industrial park.

The centralized wastewater treatment plant in Tra Noc Industrial Park was started on April 18, 2013, with capacity of 12,000m³/day and a total investment of 213 billion dong. The plant in Phase 1 has the capacity of 6,000m³/day. By the first quarter of 2014, construction of central treatment tank, settling tank and disinfection tank was completed. Administration house construction progress gained 85%, sludge treatment house 60%. In the second quarter, the construction unit is urgently finishing construction of pipelines to collect wastewater in Tra Noc 2 Industrial Park in order to take wastewater from the processing plants to the concentrated wastewater treatment plant.

Cumulative impacts were assessed based the most relevant Valuable Ecological Components (VECs) that may be affected by the CTUDR project. These VECS have been selected and assessed against other related and ancillary projects that may have a cumulative impact on the Hau and Can Tho rivers:

- a. Water quality
- b. Aquatic Bio-diversity
- c. The quality of life of local communities
- d. Downstream water use

Due to lack of detailed pollution data, the impacts of the industrial and urban infrastructure projects are assessed by order of magnitude.

5. PROPOSED MITIGATION MEASURES

The mitigation measures proposed on the project include:

- Preconstruction phase: (1) Land Acquisition and Resettlement: The RPF has been prepared in compliance with the World Bank's Operational Policy on Involuntary Resettlement (OP 4.12) and Vietnam's laws and regulations. Resettlement Action Plan (RAP) will be prepared in compliance with the approval RPF and submitted to the World Bank for approval before construction activities will be started; (ii) (3) Unexploded ordnance removal: will be carried out in the Can Tho embankment; Cai Son canal; Long Tuyen and Long Hoa regulatory lake.; (iii) Air pollution: The vehicles must have canvas cover crate and must not drop the rock, materials in order to minimize dust emissions the

environment; the maximum velocity of the vehicles traffic on the dirt road near the project area is 5 km/h, watering regularly in the construction area, especially in the construction site on the route,

- Construction phase: (i) Noise and Vibration: Setting up appropriate operational schedule of noise generate equipment; Use modern and new construction machineries and equipment which generate lower noise level and strickly carry out equipment maintenance as regulated by the Government; Usage of machines generate noise level over >55 dBA at night (from 22:00 to 6:00) is strictly prohibited at the location nearby residential area; Heavy truck transportation, loading/unloading shall not allow to operate at night (from 22:00 to 6:00); (ii) Air pollution: Spraying water to maintain certain moisture levels, and to prevent or minimize dust dispersion. The watering activities are proposed at least one a day during rainy season and twice a day during dry season. Storing the excavated soil storage areas must be placed in the designed areas far from any residential area, keeping a distant to the surrounding sensitive receptors and not allow to stay on site over 24 hours; (iii) Domestic waste: Domestic waste generated on the site shall be managed as the following steps: i) provide dustbins at work site; ii) waste category for reuse; iii) domestic waste and garbage from worker camps need to be collected by hygienic manner through service provision of local companies. (4) Construction-generated solid waste: Wherever possible, materials used or generated by construction shall be recycled such as excavated soil for regulatory lake, embankment, pipeline installation could be reused for levelling purpose on the sites, Construction wastes will be disposed at area where are approved Can Tho' PC on the disposal construction waster; Dredged sludge will be transported to Cai Sau sludge landfill. According to PPMU, The location to construct Cai Sau landfill has enough land for disposal of dredging sludge and material of CTUDR project.

- Operation phase: To reduce risks of flooding, odor, salinization and disruption to the activity of inland waterway: Ensure implementation of anadequate operation and management plan budget allocated ; Ensure that traffic safety provisions, including signs, lights, and pavement markings, that were installed during construction are permanently and effectively maintained, and renewed as necessary, Ensure the city's operations and maintenance plan, and related budget, includes the work and resources required to maintain the road in its as-completed condition; Ensure, with the assistance of the traffic control authority, that overloaded vehicles do not use the road.

6. ENVIORNMENTAL AND SOCIAL MANAGEMENT PLAN

Prepared as a part of the ESIA, an Environmental and Social Management Plan (ESMP) is a safeguards instrument that is typically used in many projects. It consists of information on, and guidance for, the process of mitigating and managing adverse environmental impacts throughout project implementation. Typically in Vietnam, an EMP comprises a list of typical mitigation measures to be carried out by contractors and others, an environmental monitoring program, capacity building, organizational arrangements and responsibilities, and the estimated cost of EMP implementation and monitoring.

There is a comprehensive regulatory framework in Vietnam related to EIA preparation, environmental standards, protection and management of forests and cultural property, and other aspects related to construction and operation of facilities and infrastructures in Vietnam. This ESMP in consistent with these regulations.

To facilitate effective implementation of the ESMP, the PMU will: (a) Establish an Environment and Social Unit (ESU) responsible for ensuring timely implementation of the EMP, including monitoring,

reporting, and capacity building related to safeguards; (b) Assign the Construction Supervision Consultant (CSC) to also 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's terms of reference; and (c) Hire qualified national consultants as the Independent Environmental Monitoring Consultant (IEMC) to assist the ESU in performing its task.

6.1. Environment Monitoring Program

Objective and Approach

Main objective of the Environment Monitoring program is to ensure that (a) the potential negative impacts of the project are minimized; (b) the EMP is effectively implemented; and (c) the EMP is adequate to mitigate the potential negative impacts. Given that monitoring the implementation of the RP will be conducted separately, the environmental monitoring program will comprise (a) monitoring the safeguard performance of the contractor during site clearance and construction, (b) environmental quality monitoring, (c) monitoring effectiveness of the ESMP.

6.2. Capacity Building Program

6.2.1. Technical Assistance support for the implementation of safeguards

The scope of the technical assistance would cover support from experts and training that would cover both the knowledge on safeguards requirements and procedures for the project as well as training that covers both specific knowledge on safeguard procedures and requirement for the project staff, consultants, and national contractor would be important. This would include, for example, assistance in the preparation of documents and implementation of training program on environmental management and environmental monitoring for contractors, CSC and relevant staffs of PMU (environmental staffs and coordinators of packages) to do their tasks. It would also include assisting the PMU's environmental staffs with the review of contract documents on the bidding packages for construction items of the project to ensure compliance with environmental protection policies and impact mitigation and monitoring requirements as well as provide general environmental guidance as requested by the PMU to enhance overall project implementation and performance.

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. The WB safeguard specialists will participate in the capacity building in particular in the training activities as appropriate.

7. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

7.1 Objectives of Public Consultation

The consultation with the participation of local authorities and local people in the project site during the preparation and implementation of EMP and ESIA is to provide essential information for further understanding about the project, impacts of the project implementation and potential mitigation measures for the project.

7.2. Implementation Methods

This is a Category A project, thus public consultation were carried out twice during the ESIA process.

To implement the EIA report of the CTUDR, the ODA-PMU organized consultation meetings with the People's Committees and Vietnam Fatherland Front of 20 wards in 4 districts of Ninh Kieu, Binh Thuy, Cai Rang and O Mon.

Before consulting at wards, the ODA-PMU held general meetings at each district to introduce about the project and collect opinions for the project, including the meeting at office of Ninh Kieu DPC on 01 June 2015, the meeting at office of Binh Thuy DPC on 02 June 2015, the meeting at office of O Mon DPC on 03 June 2015 and the meeting at office of Cai Rang DPC on 08 June 2015. The participants at these meetings consist of representatives of DPC, WPC and some divisions.

After holding the general meetings at districts, the ODA-PMU carried out consultation at each ward to introduce about the project, identify the zone/population group in the project area, collect information about the status of environmental sanitation at the locality, discuss potential environmental impacts and mitigation measures as well as coordinate with the local authorities in holding public consultation in the project area. Simultaneously, the ODA-PMU also sent the dispatches for applying for consultation for the relevant agencies.

Generally, through the public consultations at the project area, the authorities and local people supported for the project and desired the project to be implemented early. All local people agreed with the project implementation, however, they requested that the construction be carried out rapidly, and that environmental management and regular environmental monitoring be undertaken, as well as that labor, community, and traffic safety measures be followed.

The local people requested the local authorities and the project to make proper compensation and arrange resettlement for them at their expectation.

The People's Committees and Vietnam Fatherland Front as well as representatives of people in the project will jointly discuss and solve issues raised during the project implementation.

8. CONCLUSIONS, RECOMMENDATIONS

On the basis of analysis and assessment on existing environment, environmental and socio-economic impacts in the project area, the report presents the following conclusions.

The construction of flood control infrastructure will enhance drainage capacity, improve living conditions and sanitation conditions, and enhance the quality of life for city residents. Also, the urban transport infrastructure development will enhance the inter-regional transport links in order to facilitate socio-economic development and increase the accessibility of residents in low-income areas to social infrastructure services of the city.

The project will help improve urban integrated management capacity (technical infrastructure and operational units, strengthen the planning, scheduling, coordination mechanisms, management of natural disaster risks, urban management and financial management of the city) to ensure high efficiency in urban integrated management and ensuring the sustainable development of Can Tho city.

The measures of prevention, control and handling of environmental pollution are taken. During the operation of the Project, there will be some adverse environmental and socio-economic impacts but these will be mitigated and are considered to be manageable in comparison to the environmental and social benefits that the Project brings.