# DATA COLLECTION SURVEY ON TRANSPORTATION NETWORK FOR REGIONAL ECONOMIC DEVELOPMENT IN MEKONG DELTA

## Final Report

**April 2023**

**Japan International Cooperation Agency (JICA)**

**ALMEC Corporation**
**Nippon Koei Co., Ltd.**
**Chodai Co., Ltd**

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**EXCHANGE RATE**

USD 1 = JPY 134.65

VND 1 = JPY 0.005706

Average of JICA Rate from April 2022 to February 2023

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# Abbreviation List

| | |
|---|---|
| ADB | Asian Development Bank |
| ADF | Asian Development Fund |
| AFD | Agence Française de Développement |
| AID | U.S. Agency for International Development |
| AIDS | Acquired Immunodeficiency Syndrome |
| ASEAN | Association of South-East Asian Nations |
| AUD | Australia Dollar |
| BCR | Benefit - Cost Ratio |
| BOD | Biochemical Oxygen Demand |
| CBD | Central Business District |
| CDM | Clean Development Mechanism |
| CETD | Center for Environment and Transport Development |
| CIP | Cast in Place |
| COVID-19 | Coronavirus Disease 2019 |
| DONRE | Department of Natural Resources and Environment |
| DOT | Department of Transport |
| DPI | Department of Planning and Investment |
| DPO | Development Policy Operation （Program) |
| DWT | Deadweight Tonnage |
| EDCF | Korea Economic Development Cooperation Fund |
| EIA | Environmental Impact Assessment |
| EIRR | Economic Internal Rate of Return |
| EMP | Environment Management Plan |
| EU | European Union |
| EZ | Economic Zone |
| FDI | Foreign Direct Investment |
| FS | Feasibility Study |
| GAP | Government Action Plan |
| GDP | Gross Domestic Product |
| GIZ | Die Deutsche Gesellschaft für Internationale Zusammenarbeit |
| GMS | Greater Mekong Subregion |
| GRDP | Gross Regional Domestic Product |
| GSO | General Statistical Office |
| HCMC | Ho Chi Minh City |
| HIV | Human Immunodeficiency Virus |
| HWL | Hight Water Leve |
| IBRD | International Bank for Reconstruction and Development |
| ICD | Inland Container Depot |
| ICT | Information and Communication Technology |
| IPC | Investment Promotion Committee |
| IT | Information Technology |
| IWT | Inland Water Transport |

| | |
|---|---|
| IZ | Industrial Zone |
| JICA | Japan International Cooperation Agency |
| JST | JICA Study Team |
| KEXIM | Export-Import Bank of Korea |
| KFW | German State-Owned Development Bank (Kreditanstalt für Wiederaufbau) |
| KOICA | Korea International Cooperation Agency |
| KRW | South Korean Won |
| MARD | Ministry of Agriculture and Rural Development |
| MDIRP | Mekong Delta Integrated Regional Plan |
| MDP | Mekong Delta Plan |
| MDR | Mekong Delta Region |
| METROS | Data Collection Survey on Railways in Major Cities in Vietnam |
| MLIT | Ministry of Land, Infrastructure, Transport and Tourism |
| MOC | Ministry of Construction |
| MOC | Memorandum of Cooperation |
| MOF | Ministry of Finance |
| MONRE | Ministry of Natural Resources and Environment |
| MOT | Ministry of Transport |
| MOU | Memorandum of Understanding |
| MPI | Ministry of Planning and Investment |
| MRC | Mekong River Commission |
| MRD | Mekong River Delta |
| NH | National Highway |
| NPV | Net Present Value |
| NSO | National Statistical Office |
| NSP | National Subsector Plan |
| OCR | Ordinary Capital Resources |
| OD | Origin-Destination |
| ODA | Official Development Assistance |
| OECD | Organization for Economic Co-operation and Development |
| PC | People's Committee |
| PCU | Passenger Car Unit |
| PEIA | Preliminary Environmental Impact Assessment |
| PM | Particulate Matter |
| PMU | Project Management Unit |
| PPAP | Phenom Penh Autonomous Port |
| PPP | Public Private Partnership |
| PR | Public Relations |
| PVD | Prefabricated Vertical Drain |
| RCP | Representative Concentration Pathways (Scenario) |
| SEDP | Socio Economic Development Plan |
| SIWRP | Sub-Institute for Water Resources Planning |
| SLR | Sea-Level Rise |
| TCVN | Tiêu chuẩn Việt Nam |
| TDM | Transportation Demand Management |
| TEDI | Transport Engineering Design Inc. |

| | |
|---|---|
| TEU | Twenty-foot Equivalent Unit |
| TSM | Traffic System Management |
| TTC | Travel Time Cost |
| UN | United Nations |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environment Programme |
| USAID | United States Agency for International Development |
| USD | United State Doller |
| VAT | Value Added Tax |
| VCCI | Vietnam Chamber of Commerce and Industry |
| VINAMARINE | Vietnam Maritime Administration |
| VITRANSS-3 | Data Collection Survey for Sustainable Transport Development Strategy in Vietnam |
| VIWA | Vietnam Inland Water Administration |
| VOC | Vehicle Operating Unit Cost |
| WARM | Water and Natural Resources Management (by AFD) |
| WB | World Bank |

# SUMMARY

## 1. The Study

The Study, covering the entire Mekong Delta Region (MDR) consisting of 1 centrally-managed city and 12 provinces, has the following two-fold data collection objectives:

- road and bridge projects as essential parts of regional transport network deemed important for economic development in the Mekong Delta; and
- road and bridge projects under preparation, including their conditions and applicability to Japan's ODA.

The MDR Masterplan was approved by the Prime Minister on 28 February 2022 (Decision No. 287/QD-TTg). MPI was assigned to take responsibility, in coordination with relevant ministries/agencies, for realizing the master plan. MPI coordinated with MDR provinces to identify priority infrastructure project list and asked development partners, including JICA for financing cooperation.

Under the MPI initiatives, JICA has shown the interest to work with Can Tho City and Hau Giang Province. The Study, therefore, selected the following two target projects:

(a) the Can Tho City section on the new inter-provincial corridor from Sa Dec (Dong Thap Province) – O Mon (Can Tho City) – Giong Rieng (Kien Giang Province); and

(b) upgrading of NH 61C from Can Tho–Vi Thanh (Hau Giang Province).


Source: Addition by the Study Team on the Mekong Delta Region Master Plan

**Figure S1 Target Projects**

# 2. Development Directions and Conditions

## Development Policy

The First Mekong Delta conference in September 2017 put regional development in the mainstream of the national development agenda with some keywords such as 'sustainable development', 'climate change and sea-level rise' and so on. The Third conference in March 2021 was of great significance as it confirmed the Government's coherent commitment. MPI expressed extensive fund mobilization for the period 2021–2025, reaching VND266 trillion. As for ODA, MPI coordinated with the World Bank (WB) to develop the masterplan with a budget of USD1.05 billion. Recent policy documents, including the Government's regulations, resolutions, and decisions since 2017, are listed below.

**Table S1 Recent Policy Documents to Support Mekong Delta Development**

| Regulations, Official Resolutions and Decisions |
|---|
| 2017 Nov: Resolution (Government) 120/NQ CP on Sustainable Development of the Mekong Delta in Response to Climate Change |
| 2019 Apr: Decision (Prime Minister) 417 /QD TTg on Issuance of the General Action Plan for Implementation of Resolution No. 120/NQ CP of november 17, 2017 of the Government on Sustainable Development of the Mekong Delta to Adapt to Climate Change |
| 2019 Sept: Directive No. 23/CT TTg (Prime Minister) on Accelerating the Implementation of Resolution No. 120/NQ CP of the Government on Sustainable Development of the Mekong Delta to Adapt to Climate Change |
| 2020 June: Decision (prime Minister) 825/QD TTg on the Establishment and Promulgation of the Regulation on Operation of the Coordinating Council of the Mekong Delta in the Period of 2020–2025 |
| 2021 April: Resolution 41/NQ CP on the Government's regular meeting in March 2021 |
| 2021 Dec.: Decision (Prime Minister) 2109/QD TTg Attraction, Management and Use of ODA and Concessional Loans in 2021–2025 |
| 2022 Feb.: Decision (Prime Minister) 287/QD TTg Approving the Masterplan for the Development of Mekong Delta Region |
| 2022 April: Resolution (Politburo)13 NQ/TW on the Direction of Socio economic Development and Assurance of National Defense and Security in the Mekong Delta Until 2030 |
| 2022 June: Resolution (Government) 78/NQ CP Promulgating the Government's Action Plan to Implement the Resolution 13 NQ/TW of the Politburo on the Direction of Socio economic Development and Assurance of National Defense and Security in the Mekong Delta Until 2030 with a Vision to 2045 |

Source: Collected by the Study Team

## Socio-economic Conditions

The **MDR** encompasses a large portion of southwestern Vietnam of 40,816 square kilometers, where a local populace of 17.3 million resides, and the economy generates VND 571.6 trillion in terms of GRDP as of 2020. Those regional shares in Vietnam are 12.3%, 17.9%, and 12.1%, respectively.

The primary industry accounts for about 30% of the GRDP, while it is largely supported by local resources, e.g., extensive farmlands (70% of the land) and the dominant rural population (70% of the population). Thus, the region's primary industries, such as rice production and aquaculture, are essential to maintain the country's food self-sufficiency and export for foreign currency earning. The industrialization trend has historically come from HCM City in line with modern infrastructure, particularly high-grade roads and long-span bridges.

**Can Tho City** is the largest city in the region and the fourth largest in Vietnam. The city's development masterplan[1] recognizes itself as an international trade hub and gateway to the region. The present population of 1.6 million is expected to be 1.9 to 2 million by 2030, of which

[1] The Prime Minister's Decision No. 1515/QD-TTg in 2013 on the Construction Plan of Can Tho City till 2030 with Vision to 2050.

the urban population is 1.5 to 1.6 million. The plan will expand and create industry development zones to 26,250 ha in total, including O Mon new urban area (4,700 ha).

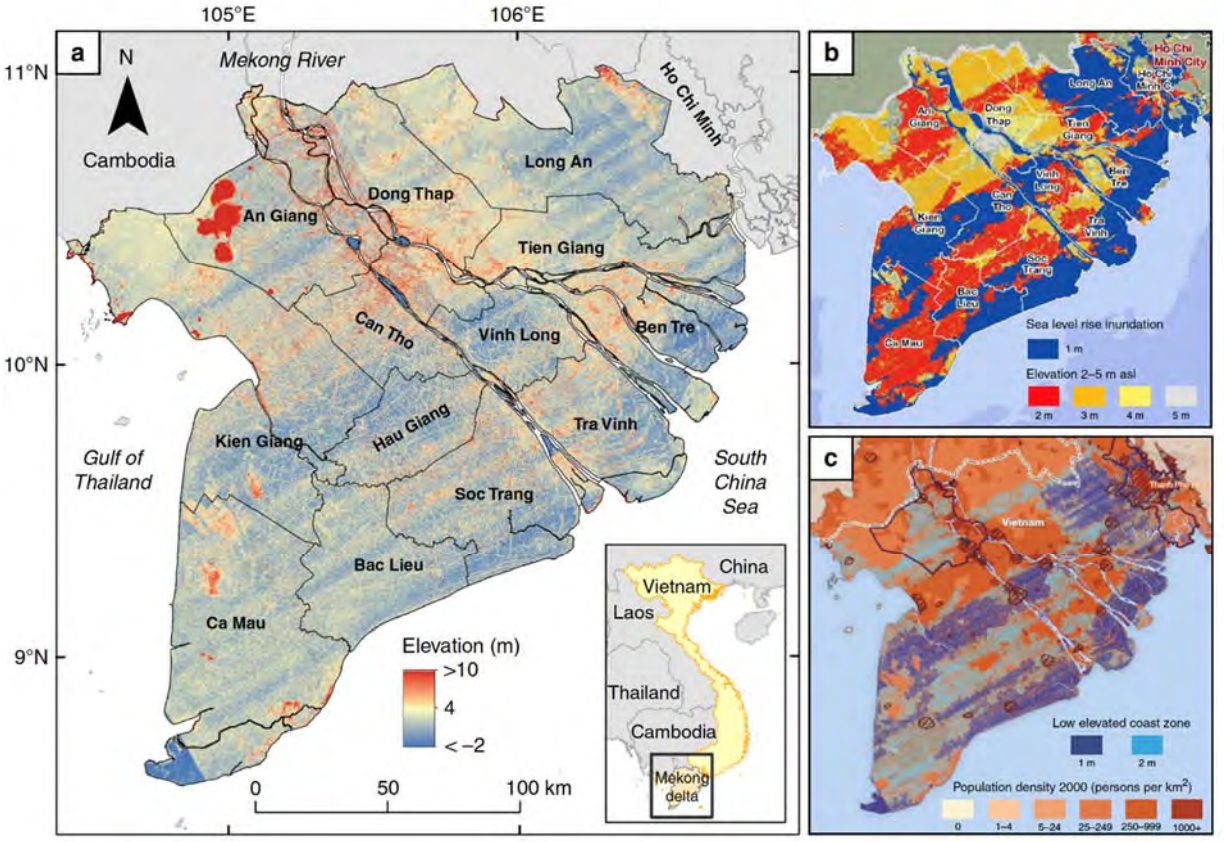
**Hau Giang Province** is famous for rice production, i.e., 1.3 million tons in 2019. It plans to export 350,000 to 400,000 tons of rice via the Xa No Canal and the Hau River. Since the split of the former Can Tho Province into two new administrative units (Can Tho City and Hau Giang Province) in 2004, the provincial government has laid stress on new provincial capital development in Vi Thanh and its connection, such as NH61A with the city center of Can Tho.

## Natural Conditions

The MDR is a relatively young, flat, and low delta, with an average elevation of 0.5 to 1.2 m above sea level. This topography makes one of the region's greatest features of its great interconnection through the water element, which some scholars have likened to the area as a swamp, to represent the submerged nature of this region.

In the western part, the Ca Mau peninsula is the lowest. The northern area along the border with Cambodia is relatively higher, but it becomes a floodplain during the rainy season because the coastal area forms a high belt. The coastal area has high sand dunes, alternating with low tide flooded areas, most commonly in the Ben Tre, Tra Vinh, and Soc Trang Provinces. Dong Thap Muoi is a low-lying area, so it is often flooded during the flood season (refer to Figure S2-a).

Figure S2-b illustrates inundation areas in the case of sea-level rise or storm surge from 1 to 5 meters, while low-elevated coastal zones with population density are shown in Figure S2-c.




Source: "Mekong delta is much lower than previously assumed in sea-level rise impact assessments" by PSJ Minderhound and others (2019)

**Figure S2 Topographic Features**

The MDR is one of the most susceptible regions in Vietnam to climate change. Climate change has clear consequences, including rising temperatures and sea-level rise, changing rainfall patterns and river flows. As a result, drought, saline intrusion, floods, and landslides are significant impacts of climate change. Its economy, society, and ecosystem are all at risk.

MONRE prepared four scenarios of sea-level rise.[2] A common understanding in Vietnam is that the RCP 4.5 scenario is applied to transport infrastructure designs. Thus, in the MDR, sea-level rise is anticipated to range from 53 to 58 cm in various areas in 2100.

# 3. Existing and Future Transport Network and Infrastructure

**Roads and Bridges.** The regional road network is composed of expressways (170 km), national highways (2,539 km) and provincial roads (4,559 km) as of 2022. There are eight long-span bridges over 800 m, all developed after 2000.

The regional road infrastructure has just begun to focus on investment since 2017. Until 2030, many expressway construction projects will be completed, including the Eastern North–South Expressway (Trung Luong–My Thuan–Can Tho–Ca Mau or R1, R2, R3, R4 in Figure S3), the Western North-South Expressway (My An–Cao Lanh or R8), the Chua Duc–Can Tho–Soc Trang Expressway (R10, R11, R12), the Ha Tien–Rach Gia Expressway (R13). National highways will be upgraded and improved, such as the NH1, NH30, NH53, Nh54, Nh57, and NH60, including Dai Ngai and Rach Mieu 2 bridges, Nh61/61B/61C, NH62, Nh63, NH80, and NH91/91B/91C.

**IWT.** It has been considered a region-specific mode with a dense network (special grade: 817 km, grade I: 50 km, grade II: 1,139 km, grade III: 1,807 km, and others) connecting to the port system within the region as well as HCM City and Cambodia. For modernizing the existing IWT system, more investments must be necessary to improve waterways (W1, W2, W4, W5, W6, W7, W8 in Figure S4), improve and construct riverports, construct more IWT-IDCs, replace low-clearance bridges, and install navigational safety equipment (W12).

**Railway.** The first railway line, 170 km long (RA1), is expected to operate between HCM City and Can Tho City. The project is under prefeasibility study stage.

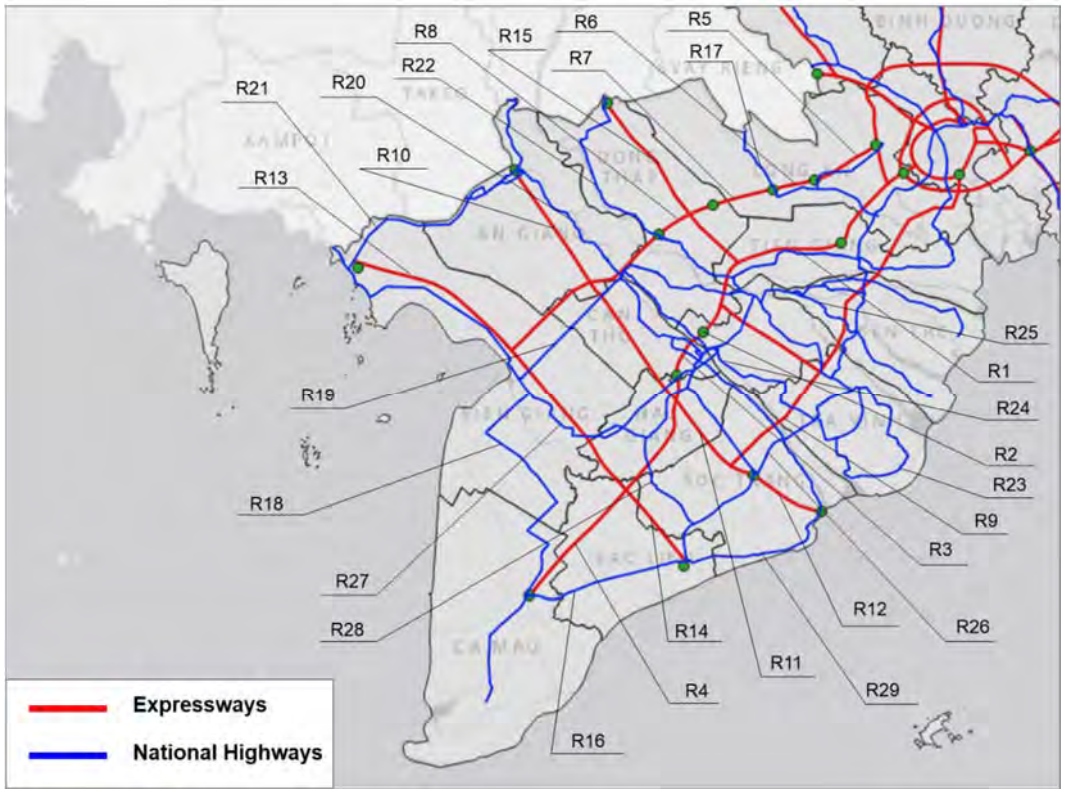
**Seaport.** Although some ports handle international cargo, the region has no deep-water port. Tran De Port is therefore conceptualized with its navigational channel improvement in the Hau River and its estuary (Pi, P2, P3).

**Airports.** Currently, there are two international airports of Can Tho and Phu Quoc in the region. They opened in 2011 and 2012, respectively, and capacity expansion must be necessary by 2030 (A1, A2). Other local airports of Rach Gia and Ca Mau will need improvement (A3, A4).

**Hau River Crossing.** Presently, two long-span bridges and four ferry routes serve the Hau River crossing traffic. The Study Team conducted a traffic count survey and data collection to grasp daily river crossing traffic by route. As a result, the bridges of Can Tho and Vam Cong served 59,715 pcu and 28,157 pcu, respectively, in 2022. The ferry routes served much smaller traffic, from 1,380 pcu at Tan Chau to 7,362 pcu at Chau Giang in 2022.

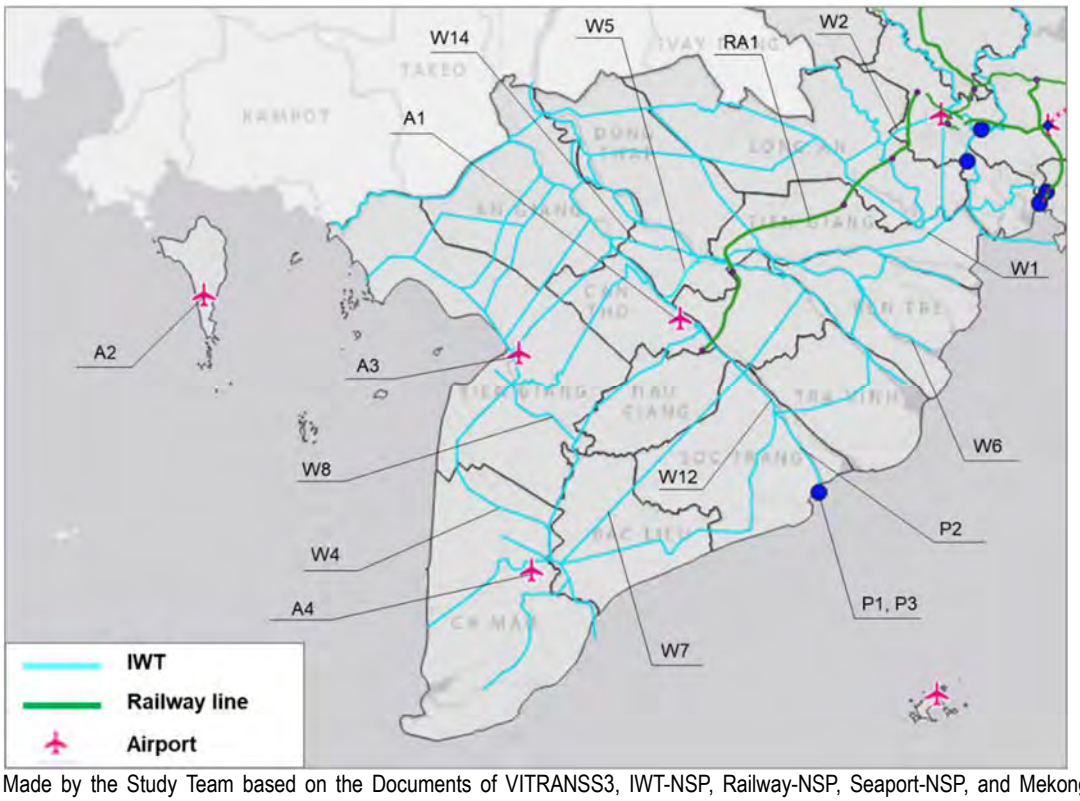
It is noteworthy that bridge construction creates considerable development traffic in addition to the converted traffic from ferry service, e.g., 20,797 pcu of ferry service in 2008 and 41,288 pcu of Can Tho Bride in 2012.

[2] "Climate Change and Seawater Level Rise Scenarios of Vietnam, 2016" prepared by MONRE




Source: Made by the Study Team based on the Documents of VITRANSS3, Road-NSP and Mekong Delta Integrated Regional Plan 2021–2030

**Figure S3 Location of Road Projects**




Source: Made by the Study Team based on the Documents of VITRANSS3, IWT-NSP, Railway-NSP, Seaport-NSP, and Mekong Delta Integrated Regional Plan 2021–2030

**Figure S4 Location of Projects in Other Transport Subsectors**

# 4. Development Concept of Greater Can Tho

Facing the Hau River and located at the center of the Mekong Delta, Can Tho City has the advantage of collecting agricultural and aquatic products by truck and IWT and processing them in the city for domestic consumption and export. This explains why Can Tho City has been developed as a regional hub with the biggest population.

For future development, the Masterplan for the Development of the Mekong Delta Region (the Government Decision No. 287/QD-TTg in 2022) designates four regional development corridors:

(1) Urban-industrial economic corridor from Can Tho to Long An

(2) Tien River–Hau River corridor

(3) Coastal economic corridor from Long An, Ca Mau to Kien Giang

(4) Border corridor from Long An to Kien Giang

Can Tho City is strategically located on the corridors of (1) and (2). The city can have a good economic and social influence and connection with the coastal corridor (3) and the border corridor (4).

To make it happen, a desirable future transport system should be deliberated regardless of the city's administrative boundary. In other words, a perspective of Greater Can Tho must come in.

Since there is no Greater Can Tho planning document available, the Study attempts to delineate the following important elements:

- Metropolitan area and population: Can Tho City, Hau Giang Province, and adjoining areas of the provinces of An Giang, Dong Thap, Vinh Long, and Kien Giang or on a flat land of around 5,000 km$^2$ with 5 million populace.
- Hau river crossing: Four road bridges and one rail bridge
- Gateway infrastructure: upgraded Can Tho International Airport and new Tran De Port


Source: The Study Team

**Figure S5 Concept of Greater Can Tho**

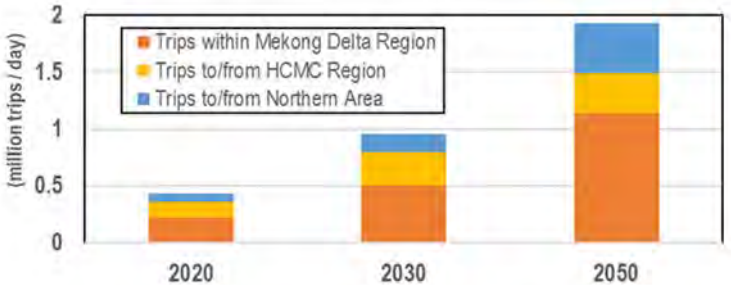
# 5. Traffic Demand Forecast

The Study has developed its traffic demand forecast model based on VITRANSS3. Major modification points are the future transport network (refer to Figures S3 and S4), a more densely zoning system (from 13 to 70 zones in the region) and an updated socio-economic framework. As a result, the Study projects a substantial traffic demand increase in the MDR between 2022 and 2050, largely due to economic growth (refer to Figure S6).

Next, the regional traffic demands for the years 2022, 2030, and 2050 are assigned to the respective transport networks.

As for the traffic assignment results of the target projects in 2030, the Study projects 44,900 PCU/day for IPC on the Can Tho section and 23,500 PCU/day for NH61C, respectively. A 4-lane carriageway is deemed appropriate for both projects (refer to Table S2).

As reported, many transport projects are planned in the MRD until 2030. Despite such efforts, however, the Study predicts some congested corridors between HCM City and Can Tho City, the Eastern and Western North–South Expressways in particular. Most expressway sections are designed to provide a 4-lane carriageway but seem insufficient to meet the future demand even in 2030. In this sense, the target projects will be able to alleviate those traffic congestions as part of the regional network (refer to Figure S7).




Note: Excluding intra-zonal (district) trips
Source: The Study Team

**Figure 6 Estimated Traffic Demand in Mekong Delta**

**Table S2 Traffic Forecast of the Target Projects**

| Project | Parameter | | 2030 | 2050 |
|---|---|---|---|---|
| IPC Can Tho Section | Road Design | Length (km) | 21.9 | |
| | | No. Lanes | 4 | |
| | | Speed (km/hr) | 80 | |
| | | Capacity (PCU/day) | 50,000 | |
| | Traffic Volume (PCU/day) | Private | 23,800 | 26,500 |
| | | Public | 2,900 | 4,700 |
| | | Freight | 18,200 | 12,600 |
| | | Total | 44,900 | 43,800 |
| | | V/C | 0.90 | 0.88 |
| NH61C Can Tho – Hau Giang | Road Design | Length (km) | 49.2 | |
| | | No. Lanes | 4 | |
| | | Speed (km/hr) | 80 | |
| | | Capacity (PCU/day) | 50,000 | |
| | Traffic Volume (PCU/day) | Private | 20,900 | 33,300 |
| | | Public | 1,800 | 2,800 |
| | | Freight | 800 | 8,700 |
| | | Total | 23,500 | 44,800 |
| | | V/C | 0.47 | 0.90 |

Source: The Study Team

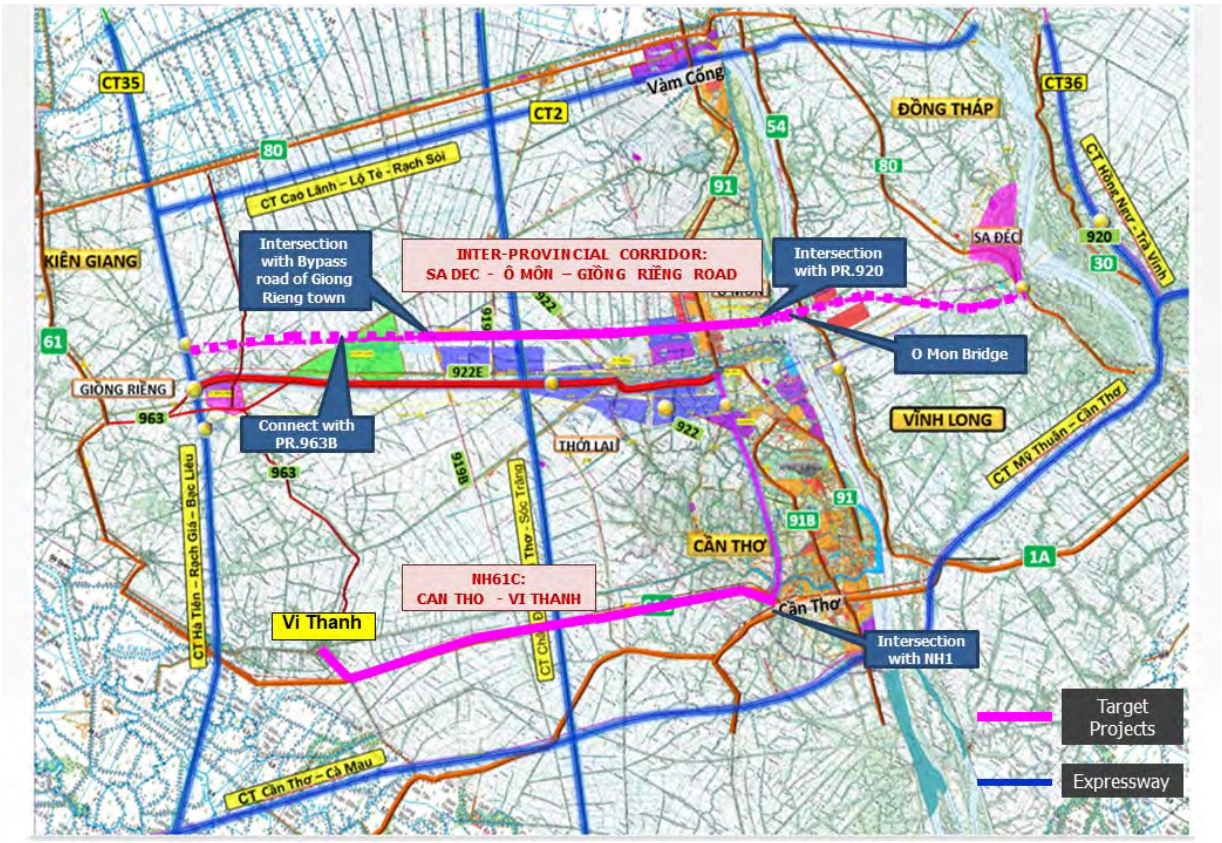
**Figure S7 Traffic Assignment in 2030**


Source: The Study Team

# 6. Development Studies on the Target Projects

JICA has expressed the interest in formulating the two target projects in collaboration with Can Tho City and Hau Giang Province, more specifically on (1) the new inter-provincial corridor project (Sa Dec–O Mon–Giong Rieng, covering the Can Tho City section of 27.2 km only) and (2) NH61C upgrading and widening project (47.4 km).

It is remarkable that the target projects are surrounded by five expressways, provisionally operated or under construction or planned. The target projects are designed to be national highways. Combined with the expressway network, the target projects will serve as an artery of Greater Can Tho in the future.




Source: Modified by the Study Team based on the Presentation Slide of Can Tho City, in April 2022

**Figure S8 2 Target Projects Surrounded by 5 Expressways**

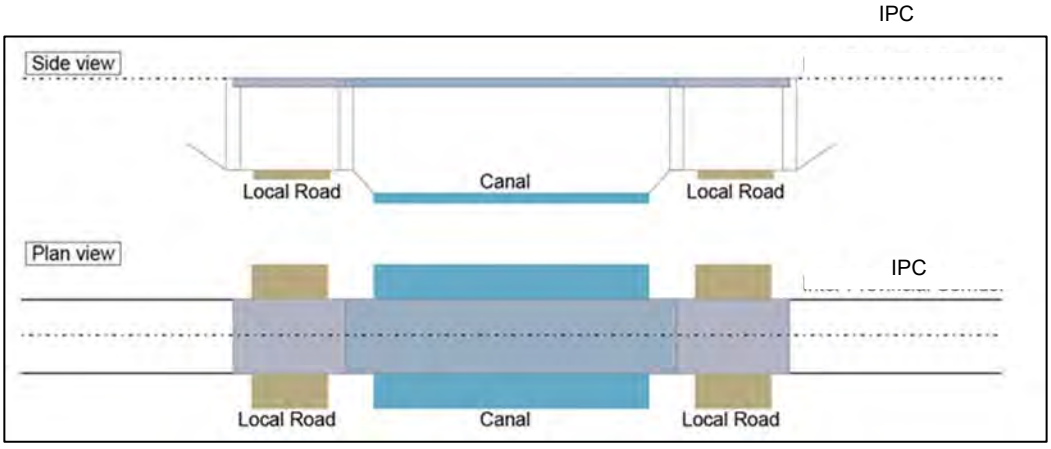
After the confirmation of the target projects by the Study's Interim Report in July 2022, the JST was expected to receive draft pre-FS reports from Can Tho City and Hau Giang Province by September 2022. Due to the delay in the Project Proposal process, those draft reports were not submitted on time. To respond to such a situation, JST changed its study direction at the end of September from reviewing their draft reports to giving pre-input to them. Thereafter, the three parties (JST, Can Tho DOT with its consultant, and Hau Giang DOT with its consultant) have simultaneously engaged in development studies with some coordination meetings.

Next, both the DOT of Can Tho City and Hau Giang Province promised to prepare and submit their draft pre-FS reports to JICA by the end of December 2022. As results, JICA received the draft version of the pre-FS report on the NH61C Hau Giang section from Hau Giang DOT in December 2022. As of writing this DFR, Can Tho DOT has not submitted two pre-FS reports.

# 7. New Inter-provincial Corridor Project

The IPC project (Can Tho City section, 27.2 km) is outlined as follows:

- **Route**: BP is set on PR920, which is the connection point of the O Mon bridge project. EP is on the border of Kien Giang Province.
- **Class**: National Highway Grade III, 4-lane carriageway, design speed: 80 km/hr
- **Bridges**: Forty-one bridges from small to medium in total for crossing many canals and local roads[3]. All the bridge lengths amount to 2,041 m.
- **Road surface height against climate change**: Design water level is set at HWL (4%) as a national highway structure (all-weather road). With the MONRE scenario RCP 4.5, the road surface height is raised in the embarkment section by 15 cm or 25 years' probability and in the bridge section by 46 cm or 100 years' probability.
- **Access control**: The Project road belongs to the class of "partially controlled access road (new highway)." Interchanges and intersections are planned for crossing/connecting with only arterial roads such as expressways, national highways, and provincial roads. Direct access from roadside properties is not allowed without frontage roads.
- **Bridge clearance**: In the case of small to medium bridges over canals, the navigational clearance is properly designed in compliance with the local standard where the HWL is set at 5%. Similarly, the clearance over crossroads is properly designed (refer to Figure S9).
- **O&M organization**: The Road and Waterway Management Section under the Can Tho DOT (28 officials in total) has enough experience.
- **O&M Cost**: JST estimated the O&M costs, including routine maintenance work, periodic repair work, and big repairment work over the project life, for reference and economic analysis.




Source: The Study Team

**Figure S9 Typical Image of Overpassing a Canal and Local Roads**

# 8. NH61C Project

NH61C has a relatively young story. The joint force of Can Tho City and Hau Giang Province

[3] This is the result of JICA study team preliminary study. According to Can Tho City DOT, the number of bridges has been updated to "30 works crossing rivers including 25 bridges, 5 viaducts" in the Project Proposal (Document No.13 dated Feb 20, 2023).

constructed one local road with two lanes between Can Tho and Vi Thanh in 2012. The MOT decided to upgrade it to NH61C, and then the first local construction work is now known as the NH61C Phase I project. Facing with considerable traffic volume of around 15,000 PCU/day and many subsided road surfaces, both local governments decided to rehabilitate and widen the entire road stretch to a 4-lane highway, and therefore, the Phase II project is proposed.

Under such situations, the NH61C project is more complicated compared with the IPC project. The project route is divided under two project implementing and operation bodies, i.e., Can Tho City and Hau Giang Province, and the existing infrastructure (road sections and bridges) must be maintained and utilized in addition to road and bridge widening works.

The project (consisting of Can Tho City: 10.2 km and Hau Giang: 37.2 km) is outlined as follows:

- **Route**: BP is set on NH1A in Can Tho City, while EP is on NH61 at Vi Thanh, Hau Giang Province.
- **Class**: National Highway Grade III, 4-lane carriageway, design speed: 80 km/hr
- **Bridges**: Forty-one bridges in total on the route, 40 of which are small to medium bridges for crossing many canals and local roads. They have PCI girders and PC slab girders in the structure. The remaining is Ba Lang Bridge with a PC box girder located in Can Tho City.
- **Road surface height against climate change**: Design water level is set at HWL (4%) as a national highway structure (all-weather road). With the MONRE scenario RCP 4.5, widening road surface height is raised in the embarkment section by 15 cm or 25 years' probability. On the existing road, repair work of the past subsidence is added by 30 cm. Then the planned height is 45 cm.
- **Access control**: Presently, roadside houses and establishments can directly access NH61C. In the project, some grade-separated intersections are planned to ensure smooth traffic flow. For the same purpose, an elevated central median in the road is designed at most of the road sections except for turning points by cutting off the central median.
- **Bridge clearance**: In the case of small to medium bridges over canals, the navigational clearance is properly designed in compliance with the local standard where the HWL is set at 5%. Similarly, the clearance over crossroads is properly designed.
- **O&M organization**: Judging from the collected information, two organizations responsible for NH61C operation and management: the Regional Road Management Unit IV.5 ad and Waterway Management Section under Can Tho DOT and the Transport Infrastructure Management Division under Hau Giang DOT, have enough experience.
- **O&M Cost**: JST estimated the O&M costs, including routine maintenance work, periodic repair work, and big repairment work over the project life, for reference and economic analysis.

JST have some engineering-related discussions with the counterparts (Can Tho DOT and Hau Giang DOT) about construction methods and procedures, particularly to implement the project without disturbing existing traffic flow or minimizing necessary disturbance. In conclusion, the Study proposes the following:

(1) The existing bridges will not be heightened. Instead, minimum work, such as pavement, will be done. It can avoid large construction costs and long periods. But the IWT service under the bridges may be affected during the rainy season because of the gradual sea-

level rise.

(2) New bridges or the widening parts of existing bridges will have separate substructures where a space of 500 mm distance is designed for construction clearance.

(3) For the substructure, existing and new abutments are designed to be in contact. This is a practical suggestion that existing and new abutments will be in contact through a 20 mm joint rather than unifying these parts (Figure S10).

(4) For the foundation, the cast-in-place pile construction method with the full-casing method is recommended to minimize negative impact to existing structures (Figure S11). Only Ba Lang Bridge is an exception because the existing pile length over 60 m is too long to apply the same method. A separate construction approach must be considered.

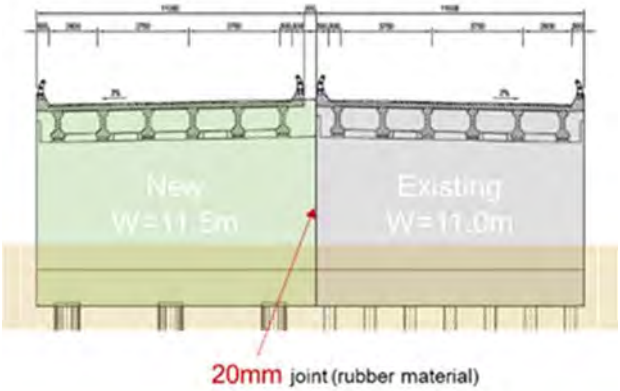



**Figure S10 Abutment Type**

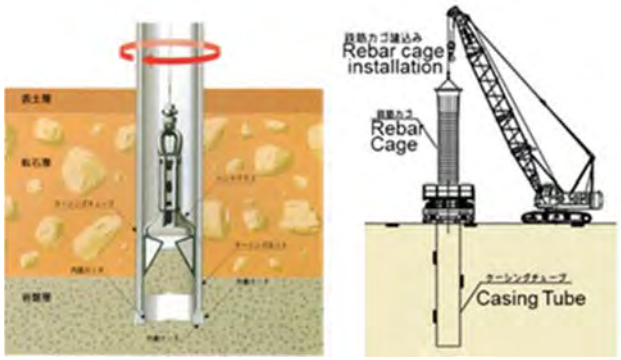
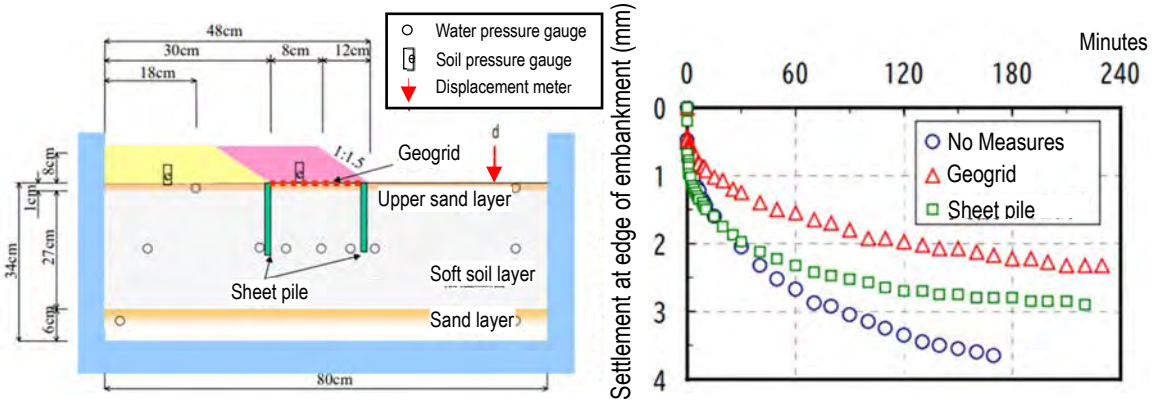



**Figure S11 Cast-in-Place Pile Construction**

(5) To minimize negative impact to existing structures due to widening the road embankment, particularly in soft soil conditions, it is suggested to take appropriate mitigation measures, including sound soil compaction, before embankment and placement of geogrid (geotextile sheet) on the embankment surface before embankment. One centrifuge model test indicates the effectiveness of the geogrid method (Figure S12). One more practical suggestion is careful monitoring of earthwork speed because quick and dirty works must greatly affect deformation in this regard.




Source: Obayashi Corporation

**Figure S12 Image and Result of Centrifuge Model Test**

# 9. Implementation Considerations on the Target Projects

## Economic Analysis

The economic internal rate of return (EIRR) is calculated and analyzed to determine the validity of the project in terms of economic benefits relative to the investment costs. A comparison of the benefits and costs of the cases with and without project is carried out for the analysis of the target project. The economic analysis will be completed by calculating EIRR, net present value (NPV), and benefit-cost ratio (B/C).

**Table S3 Approximate Project Cost**

(Unit: billion VND)

| Item | IPC *1 | NH61C (Can Tho) *1 | NH61C (Hau Gaing) *2 |
|---|---|---|---|
| 1. Preparation cost (land, resettlement, etc.) | 845.21 | 123.7 | 573.85 |
| 2. Construction cost | 2,851.51 | 1,210.2 | 2,849.32 |
| 3. Project management (consulting service, etc.) | 427.73 | 145.7 | 308.13 |
| 4. Contingency (physical contingency) | 412.45 | 203.4 | 559.70 |
| Total investment cost | **4,536.9** | **1,683.0** | **4,291.0** |

Source: *1 Submission Letter Ref.: 3192 /TTr-SGTVT. Proposal on Project for Mekong Delta Transport Network Development to adapt to Climate Change in Can Tho City – Project 1 (Upgrading and expanding National Highway 61C, section passing Can Tho city and Road connecting O Mon district, Thoi Lai district, Can Tho city with Giong Rieng district, Kien Giang province (section through Can Tho city) under the DPO program. Can Tho City DOT. November 9, 2022.

*2 Table 6.2.25 "The Result of Review of Cost Estimate" in Chapter 6 of this report

**Table S4 O&M Cost**

(Unit: million VND)

| Item | IPC *1 | NH61C (Can Tho) *2 | NH61C (Hau Gaing) *1 |
|---|---|---|---|
| O&M Cost for the project life | 3,193,600 | 1,316,659 | 2,805,456 |

Source: The Study Team

The economic benefit is calculated from the reduction in vehicle operating cost (VOC) and travel time cost (TTC). The impact of the project on the transportation network was calculated for 2030 and 2050 as a result of the traffic demand forecast. The economic benefit other than the forecast years was estimated using the interpolation method. The project is set to begin construction in 2025 and be completed and placed in service in 2027, with a project life of 30 years and a residual value of zero.

If the EIRR is greater than the social discount rate, the investment in the project is usually considered reasonable, and the project is approved from an economic evaluation perspective. The B/C is the ratio of total benefits to total project costs. Like the EIRR, the B/C is an indicator of the economic efficiency of the project, and if it is greater than the value of one, the project is assumed to be feasible.

As Table S5 shows, the EIRR is higher than the 10% social discount rate in Vietnam. B/C is over the value of one, and NPV is also positive, indicating the appropriateness of the project. As a result of the economic analysis, all evaluation indicators show the appropriateness of the project.

**Table S5 Summary Result of Cost Benefit Analysis**

| Indicator | Value |
|---|---|
| EIRR | 13.8% |
| B/C (at 10% discount rate) | 1.2 |
| NPV (million VND at 10% discount rate) | 25,789,317 |

Source: The Study Team

## Funding Arrangement

Since the early 2010s, Vietnam has adopted a more cautious attitude toward ODA, putting forward the need to control the public debt. Between 2016 and 2020, ODA loan agreements to Vietnam amounted to nearly USD13 billion, or 51% of the amount signed between 2011 and 2015 according to the PM's decision in 2021[4]. The same decision estimated the total ODA financing needed by 2025 at VND452.9 trillion up to VND527.1 trillion or USD19.4 billion to USD22.7 billion. The same document indicates that on-lending should represent almost 42% of ODA loan.

Eligible borrowers of the on-lending mechanism in Vietnam are primarily provincial people's committees and centrally-run cities, as well as non-business units like state-owned enterprises and joint ventures. Through on-lending, the MOF keeps some control over the financing of local projects but also transfers part of the ODA credit risk to the end-borrower. The Study's target projects are supposed to be implemented under the on-lending mechanism when Can Tho City and Hau Giang Province become end-borrowers.

On-lending-related regulations have been changed several times and are likely to change further to adapt to policy and financial contexts.

**Table S6 Chronology of the Recent Regulation on On-lending**

| Date | Regulations and Official Resolution and Decisions |
|---|---|
| 2015 June 15 | Law (National Assembly). 83/2015/QH13 on State Budget |
| 2016 June 30 | Circular (MOF). 111/2016/TT-BTC Regulations on Financial Management for Programs and Projects Using Official Development Support Capital (ODA) and Concessional Loans of Foreign Countries |
| 2017 Nov.17 | Resolution (Government). 120/NQ-CP on Sustainable Development of the Mekong River Delta |
| 2017 Nov. 23 | Law (National Assembly). 20/2017/QH14 On Public Debt Management |
| 2017 April 28 | Decree (Government). 52/2017/ND-CP on On-lending of Government's Foreign Loans to People's Committees of Provinces and Centrally-run Cities |
| 2019 April 13 | Decision (Prime Minister) on Issuance of the General Action Plan for Implementation of Resolution No. 120/NQ-CP of November 17, 2017 of the Government on Sustainable Development of the Mekong River Delta |
| 2018 June 30 | Decree (Government). 97/2018/ND-CP On-lending for ODA and Concessionary Loans |
| 2019 June 13 | Law (National Assembly). 39/2019/QH14 On Public Investments |
| 2020 May 25 | Decree (Government). 56/2020/ND-CP On Management and Use of Official Development Assistance (ODA) and Concessional Loans from Foreign Donors |
| 2020 June 12 | Decision (Prime Minister) 825 /QD-TTg on the Establishment and Promulgation of the Operational Regulations of the Coordinating Council of the Mekong River Delta, Period of 2020 - 2025 |
| 2020 July 8 | Resolution (National Assembly; Standing Committee) 973/2020/UBTVQH14 on Regulations on Principles, Criteria, and Level of Allocation of Public Investment Capital Sources of State Budget Period of 2021-2025 |
| 2020 Sept. 14 | Decision (Prime Minister) 26/2020/QD-TTg on Details Implementation of Some Articles of Resolution no. 973/2020/UBTVQH14 |
| 2021 April 1 | Resolution (Government). 41/NQ-CP Annual Government Meeting March 2021 |
| 2021 Aug. 16 | Decree (Government). 79/2021/NĐ-CP on Amendments and Supplements of some Articles of 97/2018/ND-CP On-lending for ODA and Concessional Loans |
| 2021 Oct.8 | Decision (MOF). 1972 /QD-BTC on the Announcement of the Rate of Loans of ODA for provinces and Centrally-run Cities |

[4] The Prime Minister's Decision No.2109/QD-TTg on the Approval of Scheme to Attract, Manage and Use ODA and Preferential Loans from Foreign Sponsors for the period 2021 - 2025

| | |
|---|---|
| 2021 Dec. 16 | Decree (Government). 114/2021/ND-CP on the management and use of official development assistance capital (ODA) and Concessional Loans from Foreign Donors |
| 2022 July 6 | Decision (MOF). 990/QĐ-BTC About the Announcement of On-lending Rates for ODA and Concessionary Loans for provinces and Centrally-run Cities |

Source: The Study Team

Under the regulation, the MOF cannot offer an on-lend at a lower interest rate than as specified in the loan agreement. Decree 97/2018/ND-CP sets management fees for local governments at 0.25% per year. The lending risk is set at 0%.

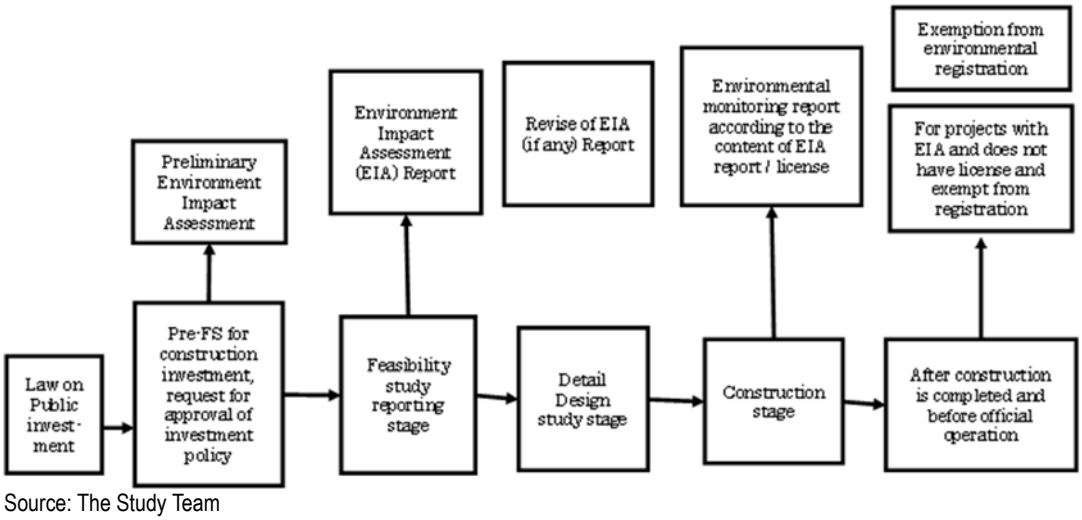
For a given project, the proportion of ODA loan subject to on-lending is regulated for each province by the MOF. Provinces more financially supported by the central budget are required a lower on-lending rate. On the contrary, provinces contributing to the central budget are required at a higher rate. According to the latest regulation, rates are currently at 10%, 30%, 50%, 70%, and 100%. For instance, Can Tho City, which only contributes to the central budget, i.e., 9% of its revenue, in the MDR belongs to the group of 70%. Hau Giang Province belongs to the group of 30%.

Importantly, Decree 79/2021/ND-CP states that the on-lending rate for projects relating to sustainable development adapted to climate change in the MDR can be lower but not lower than 10%.

In regard to the target projects, Can Tho City and Hau Giang Province have submitted project proposals to the MPI, wherein an on-lending rate of 10% is requested. The final position of the central government regarding on-lending for the target projects is unknown. The newly established Coordinating Council of the Mekong Delta Region (Decision 825 /QD-TTg dated June 2020) will assume an advisory role to the Prime Minister.

## Environmental and Social Considerations

In Vietnam, the Law on Public Investment 2019 classifies a transport project over VND2,300 billion investment as a Category A project. The Law on Environment Protection 2020 also classifies investment projects into Group I and Group II. Since the target projects are regarded as Group I projects, the project must take the prescribed EIA procedure as depicted in Figure S13.




Source: The Study Team

**Figure S13 Flow of EIA Steps for the Target Projects in Vietnam**

JICA's Guidelines for Environmental and Social Considerations in 2022 categorizes investment projects into four based on the extent of environmental and social impacts, taking into account the project's characteristics, scale, site condition, etc. Although JICA's decision of categorization is not officially available, JST assumes that the target projects are rated as Category A, which is likely to have significant adverse impacts on the environment and society. Therefore, careful environmental and social considerations are required at every step of the project implementation based on sufficient project descriptions like FS level.

JST collected and analyzed the project-site data and information on air quality, water quality, waste management, noise and vibration, soil contamination, ground subsidence, odor, natural protected area, ecosystem and biodiversity, hydrology, topography and geology, resettlement need, living and livelihood, heritage and landscape, ethnic minorities, and indigenous people, etc. When rating the target projects, the checklist of the JICA Guidelines is used. The ratings are summarized in Table S5.

In addition to the checklist, some information is noteworthy:

- **Hydrology in Hau Giang Province**: The local people used to enjoy rich surface and groundwater resources. Nowadays, however, saltwater intrusion has become apparent. At the risk of a drinking water shortage, the provincial government was forced to drill 11 wells. The local society is apprehensive that groundwater reserves would further decrease due to saltwater intrusion brought about by sea-level rise.
- **Resettlement for the NH61C project**: The necessary land acquisition was completed for the Can Tho section during Phase I (2007–2012). In Hau Giang, the road widening will affect partly or entirely around 130 houses. Therefore, land acquisition and resettlement works must be necessary for the Hau Giang section.

**Table S7 Summary of Preliminary Examination Results**

| Category of Preliminary Project Impact | | | Rating | |
|---|---|---|---|---|
| | | | IPC Project | NH61C Project |
| 1. Permit and Explanation | 1.1 EIA and Environmental Permits | - | N/A | N/A |
| | 1.2 Explanation to the Local Stakeholders | - | N/A | N/A |
| | 1.3 Examination of Alternatives | - | N/A | N/A |
| 2. Pollution Control | 2.1 Air Quality (including Green House Gas) | PCS/CS | A - | A - |
| | 2.1 Water Quality | PCS/CS | A - | A - |
| | 2.3 Wastes | PCS/CS | A - | A - |
| | 2.4 Noise and Vibration | PCS/CS | A - | A - |
| 3. Natural Environment | 3.1 Protected Areas | - | C | C |
| | 3.2 Ecosystem | PCS/CS | B - | B - |
| | | OS | C | C |
| | 3.3 Hydrology | PCS/CS | B - | B - |
| | | OS | C | C |
| | 3.4 Topography and Geology | PCS/CS/OS | B - | B - |
| 4. Social Environment | 4.1 Resettlement | PCS | A - | A - |
| | | CS/OS | C | C |
| | 4.2 Living and Livelihood | PCS/CS | B - | B - |
| | | OS | C | C |
| | 4.3 Heritage | - | C | C |
| | 4.4 Landscape | - | B - | B - |
| | 4.5 Ethnic Minorities and Indigenous Peoples | PCS/CS/OS | B - | B - |
| | 4.6 Working Conditions | PCS/CS | B - | B - |
| | | OS | B - | B - |
| 5. Others | 5.1 Impact during Construction | PCS/CS/OS | B - | A - |
| | 5.2 Monitoring | - | - | - |

Note: PCS: Pre-construction stage, CS: Construction stage, OS: Operation stage

Rating: A: Significant impact, B: Mid impact, C: Small/ Negligible impact, U: Unknown, NA: Not applicable,
+: Positive effect, -: Negative impact
Source: The Study Team

# 10. Recommendations

## For Transport Network Planning

The Study's target projects located in Can Tho City and Hau Giang Province are strategically important to form a transport network of the region's most significant growth area surrounded by five expressways which are provisionally operated or under construction or under planned. The regional development masterplan is available in 2022 while Can Tho City and Hau Giang Province have their own transport development plans issued in 2015 and 2011, respectively. These plans do not include the target projects and most of the on-going expressway projects. Can Tho Bridge, the first bridge over the Hau River since 2010, substantially expanded socio-economic activities across the river. However, there is no integrated planning document covering both and the adjoining areas which will be affected by the target projects, the surrounding expressways and other important infrastructure projects.

The Study, therefore, conceptualized Greater Can Tho in Chapter 4 of this report. It is quite a new concept and no previous discussions at least on the development planning documents of the central and local governments as well as the donor community of Vietnam. But there is a significance to work out such a metropolitan development plan for strategic project formation and justification.

### For Designing of the Target Projects

The new IPC project starting from Sa Dec (Dong Thap Province) via O Mon (Can Tho City) to Giong Rieng (Kien Giang Province) requires close coordination among the three local governments in terms of route alignment, design of road and bridge, construction schedule, and so on. Similarly, good collaboration is required between Can Tho City and Hau Giang Province to implement the NH61C project.

Sound resilience against climate change impact is a common development issue. To operate as all-weather roads, MONRE's scenario RCP 4.5 is applied in the road design, particularly the planned road surface height. NH61C suffers from widespread road surface subsidence spots, although it began operations in 2012. Those problematic spots should be repaired in the project, i.e., 30 cm on average, in addition to the calculated additional height to respond to climate change impact, i.e., 15 cm from 25 years' probability. JST did not receive any road surface inundation damage record and has not collected and analyzed inundation records along the project roads. Therefore, past inundation records on and around the road alignment were suggested to be analyzed. If necessary, the planned road surface height and flood relief culvert must be reconsidered.

The observed geotechnical condition in MDR is the composition of thick layers of soft soil. Along the sites of the IPC new road project and the widening of the NH61C project, a thick and soft soil layer may be the basic geotechnical condition. When handling the soft soil condition at embankment works, the target projects will apply "vertical drains" for road embankment to accelerate settlement due to consolidation during the construction (before forming the embankment), the same as other road projects. In addition, at the NH61C project site, a negative impact on the existing structure shall be minimized with an appropriate method and

procedure of soft soil treatment. To determine it, a geotechnical survey on the proper location and contents will be necessary for the next project preparation stage.

Even applying the appropriate soft soil treatment for the embankment section, a residual settlement due to consolidation shall occur during road operation. Therefore, periodic maintenance work of repairing road surface height will be required when performing all-weather roads.

**For Evaluation / Implementation of the Target Projects** For enhancing reliability in economic analysis, it is suggested to estimate project costs again in the F/S stage. More accurate construction costs will be estimated based on a topographic survey. In the project's RAP, the necessary amounts of land acquisition and resettlement will be counted. Economic benefit analysis should not be a problem since there is a profound experience in benefit calculation using VOC and TTC as indicators in Vietnam, but Can Tho City and Hau Giang Province should collaborate in analyzing NH61C as one project.

**Funding Arrangement**. Vietnam has well developed its on-lending mechanism to tap ODA loans to provincial governments and other public entities with many experiences. Decree 79/2021 indicates projects /programs relating to climate change in the MDR can enjoy special on-lending ratio in line with Government Resolution 41/2021, not less than 10%. MPI proposed PM to apply 10% to the target projects.

**Environmental and Social Considerations**. In accordance with the related regulation of the GOV, the target projects are under the Project Proposal stage and will go to the pre-F/S and F/S stages. Based on the project descriptions determined by F/S, EIA, and RAP, the studies will be conducted fully in accordance with the related legislation and regulations of Vietnam, including EIA approval from Vietnam authorities.

On the other hand, the target projects are expected to be recognized as Category-A under JICA Guidelines for Environmental and Social Considerations in case of applying for the yen loan scheme, including sector loans. In this case, the EIA and RAP will be conferred and reviewed by the JICA Advisory Committee in order to verify the fulfillment of policies and requirements of the JICA guidelines. It is suggested that the EIA and RAP studies and outcomes be prepared in due consideration of the requirements of the JICA guidelines.

In general, the prepared pre-F/S reports by the Vietnamese localities will be duly reviewed by JICA as one important step in the formulation of the ODA project. As long as the Study Team observed, however, any designs in the pre-F/S are not made based on topographic survey results, and even the elevation of road infrastructure cannot be designated properly. This inaccuracy of project descriptions affects all the project features, including environmental and social considerations. To smoothly prepare the target projects in the procedure of bilateral ODA loan scheme, it is suggested that Can Tho City and Hau Giang Province enhance accuracy in their development plans and designs with providing necessary information for project appraisal in the following stages.

# 1. THE STUDY

## 1.1. Study Scope

### 1.1.1. Study Background

The Mekong Delta, consisting of 1 special city and 12 provinces, is the region in southwestern Vietnam where the Mekong River approaches into the sea through a network of distributaries. The region encompasses a large portion of southwestern Vietnam of 40,816 square kilometers where local populace of 17.3 million resides, and the economy generates VND571.6 trillion in terms of GRDP as of 2020. Those regional shares in Vietnam are 12.3%, 17.9% and 12.1%, respectively.

In the region, the primary industry accounts for about 30% of the GRDP while it is largely supported by the local resources, e.g., extensive farmlands (70% of the land) and dominant rural population (70% of the population). Thus, the region's primary industry such as rice production and aquaculture is essential to maintain the country's food self-sufficiency and export for foreign currency earning.

Since the region is located next to Ho Chi Minh City (HCMC), nowadays, the regional economy has become modernized, industrialized, and diversified. There are mushrooming industrial estate projects and plans. The service industry is also growing at both urban and rural areas. The prevailing COVID-19 pandemic and the unforeseeable US-China conflict is paving the way to reorganize global supply chains. Under such circumstances, the Mekong Delta Region (MDR) can attract international investors' interests more than ever before.

Historically, inland water transport (IWT) and its endowed crisscross network have supported freight and people movements largely. The regional IWT system, however, imposes some inherent constraints on transport services such as travel speed and punctuality. Recently, capacity constraint become more apparent in some sections. In addition to a conventional weather threat or seasonal floods, climate change impact is a growing threat to enable sustainable IWT system development.

JICA completed VITRANSS3 and submitted its final report to the MOT in November 2021 where the blueprint of national transport systems towards 2030 and 2050 is depicted in line with individual regional transport plans. As results, five national sector plans including road, railway, IWT, seaport and airport were formulated, and four (except for airport) issued with the Prime Minister's approval. The Government of Vietnam issued the Decision No. 287/QD-TTg in February 2022 regarding the Approval of the Mekong Delta Region Development Plan for the Period 2021–2030 with Vision towards 2050 or the MDR Masterplan.

### 1.1.2. Study Objectives

The Study has the following two-fold data collection objectives:

- road and bridge projects as essential parts of regional transport network deemed important for economic development in the Mekong Delta; and
- road and bridge projects under preparation, including their conditions and applicability to Japan's ODA.

### 1.1.3. Study Area

The study area is the entire Mekong Delta Region (1 centrally-managed city and 12 provinces).

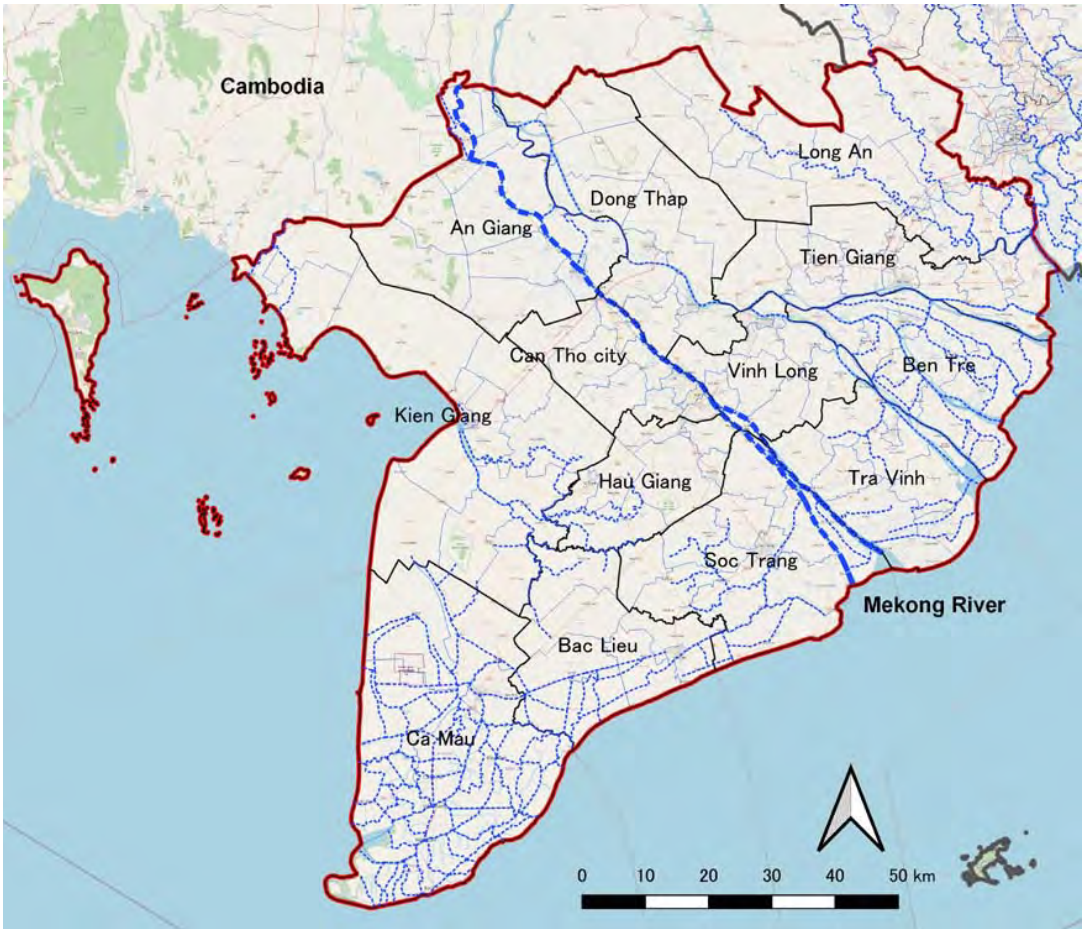



**Figure 1.1.1 Study Area**

### 1.1.4. Target Project

From its mobilization in Vietnam in February 2022, the Study gave intensive attention to the Dai Ngai bridge project bridging between the provinces of Tra Vinh and Soc Trang on NH60 across the Hau River as a target project. In April 2022, however, the Government of Vietnam showed its intention to implement the project through the "Fiscal and Monetary Policies for Supporting Socio-economic Recovery and Development Program,"[1] not by Japan's ODA.[2] The Study was requested to restart identification of target projects.

On the other hand, the MDR Masterplan was approved by the Prime Minister on 28 February 2022 (Decision No. 287/QD-TTg). The Ministry of Planning and Investment (MPI) was assigned to take the primary responsibility for realizing the master plan. It has worked out the infrastructure project list with 1 centrally-managed city and 12 provinces in the MDR. Their development partners (6 bank groups) have expressed the interests in these projects. The official signing ceremony of the MOC (Memorandum of Cooperation) between MPI and 6 bank groups was held on 21 June 2022.[3]

Under the MPI initiatives, JICA is expected to work with Can Tho City and Hau Giang Province.

[1] Resolution No. 43/2022/QH15: Fiscal and Monetary Policies for Supporting Socio-Economic Recovery and Development Program
[2] TuoiTre Online: Cầu Đại Ngãi sẽ hoàn thành vào năm 2026 nếu dùng vốn ngân sách, April 2022
[3] The overall MPI initiative is reported in Section 3.5 of this report.

The Study, therefore, selected two target projects (refer to Figure 1.1.2).

(a) new inter-provincial corridor from Sa Dec (Dong Thap Province) – O Mon (Can Tho City) – Giong Rieng (Kien Giang Province), and

(b) upgrading of NH 61C from Can Tho–Vi Thanh (Hau Giang Province).

Regarding (a), the entire corridor stretch has been studied for effective transport planning works, although the JICA loan is expected to tap into the portion of Can Tho City only.


Source: Addition by the Study Team on the Mekong Delta Region Master Plan

**Figure 1.1.2 Target Projects**

## 1.2. Study Activities

On 21 January 2022, the kick-off meeting was organized by MOT and JICA. The attendees belonged to DPI/MOT, PMU85/MOT, JICA HQ, JICA Vietnam Office, and the JICA Study Team (JST). JST submitted and presented the study's Inception Report, including study scope, approach, work plan, study tasks and the requests to the counterpart. Some discussions were made such as study schedule including project implementation after the study, project evaluation and a study's coordination body.

From February to March, JST contracted out the screen line traffic survey along the Hau River to the Center for Environment and Transport Development (CETD) located in HCMC in order to update the VITRANSS3 traffic database and make it subdivide into a small zoning system particularly in the MDR. The survey results were analyzed in Section 3.2 of this report with the respective appendix to the report.

From March to April, JST visited all the special city and provinces so as to collect information on each province's socio-economic development plans, road network development plans, and other relevant information. In the three provinces of Can Tho, Soc Tran, and Tra Vinh, the survey team met with the respective people's committees to provide an overview of the survey and interview them about infrastructure development trends and transportation issues in the region. In the other 10 provinces, the survey team met with respective DPIs.

**Table 1.2.1 Records of Provincial Visits**

| Province | Date of Visit | Province | Date of Visit |
|---|---|---|---|
| Long An | April 29 | Kien Giang | April 26 |
| Tien Giang | April 29 | Can Tho | March 14 |
| Ben Tre | April 28 | Hau Giang | April 26 |
| Tra Vinh | March 16 | Soc Trang | March 15 |
| Vinh Long | April 28 | Bac Lieu | April 25 |
| Dong Thap | April 27 | Ca Mau | April 25 |
| An Giang | April 27 | | |

Source: The Study Team

In July 2022, JST submitted the Interim Report where field survey results and other data collection works were analyzed and reported. The report confirmed the two target projects of the Study as depicted in Figure 1.1.2.

Since then, JST has conducted a series of consultation meetings with the relevant provincial governments and local consultant firms which are supposed to work for pre-feasibility studies of the target projects. (Refer to Table 1.2.2)

As the results of initial consultation meetings, JST expected to receive draft pre-FS study reports from Can Tho City and Hau Giang Province by September 2022. Due to the delayed approval of the target project proposals by MPI and other reasons, those draft reports were not submitted on time. To respond such situations, JST changed its study direction at the end of September, from reviewing their draft reports to give pre-input to them.

On the latest situation (as of this writing), Hau Giang Province submitted the draft pre-FS report for the improvement and upgrading of NH61C to JICA in December 2022. Can Tho City,

on the other hand, has not submitted the two draft pre-FS reports for NH61C and the IPC both in the Can Tho section. For JST to understand project preparation conditions without their reports, an online meeting with Can Tho City was held on 17 January 2023.

**Table 1.2.2 Records of Consultation Meetings for Target Projects**

| Date | Participants | Agenda |
|---|---|---|
| 2 August 2022 | Can Tho City | • IPC alignment, roadside land use and other matters in construction, additional data collection |
| 3 August | Dong Thap Province | • IPC alignment, roadside land use and other matters in construction, additional data collection |
| 4 August | Kien Giang Province | • IPC alignment, roadside land use and other matters in construction, additional data collection |
| 26 August | Can Tho City, Dong Thap Province, Kien Giang Province (at Can Tho PC) | • Wrap-up of the respective meetings on August 2, 3, and 4<br>• Traffic demand forecast of IPC and its vicinity |
| 31 October | TEDI-South | • Progress of pre-FS for NH61C in Hau Giang Province |
| 3 November | TEDI | • Progress of pre-FS for IPC and NH61C both in the Can Tho sections |
| 8 November | Hau Giang Province | • Pre-input study items, local needs for road widening, preparation against climate change, etc. |
| 9 November | Can Tho City | • Pre-input study items, local needs for road widening, preparation against climate change, etc. |
| 28 November | Hau Giang Province | • Report of pre-input study results, coordination with important planning/designing matters |
| 29 November | Can Tho City | • Report of pre-input study results, coordination with important planning/designing matters |
| 17 January 2023 | Can Tho City (online) | • Report of project preparation by Can Tho City based on the questionnaire by the Study Team |

Source: The Study Team

# 2. Development Directions and Conditions in Mekong Delta

## 2.1. Regional Development Policy Directions

### 2.1.1. History of Developments in the Mekong Delta Region

The most recent regional master plan for the MDR was published in 2022, which is the Master Plan for Mekong Delta Region for the period of 2021–2030, with a vision to 2050.

#### 1) Master Plan for Mekong Delta Region for the Period 2021–2030, with a Vision to 2050

The Master Plan was approved by the Prime Minister on 28 February 2022, which is the first regional plan approved under the Law on Planning (No. 21/2017/QH14, 2017) and Resolution No. 120/NQ CP on Sustainable Development of Mekong River (Mekong Delta) to adapt to climate change signed by the government on 17 November 2017. The Ministry of Planning and Investment (MPI) was assigned to assume the prime responsibility for and coordinate with related ministries, branches, and agencies in formulating the Master Plan for Mekong Delta Region for the period of 2021–2030, with a vision to 2050.

The planning area covers the entire administrative lands of Can Tho City and 12 provinces, including Long An, Tien Giang, Ben Tre, Dong Thap, Vinh Long, Tra Vinh, Hau Giang, An Giang, Soc Trang, Kien Giang, Bac Lieu, and Ca Mau. It also coves the coastal waters of the following provinces: Tien Giang, Ben Tre, Tra Vinh, Soc Trang, Bac Lieu, Ca Mau, and Kien Giang.

#### 2) History of Developments in the Mekong Delta region

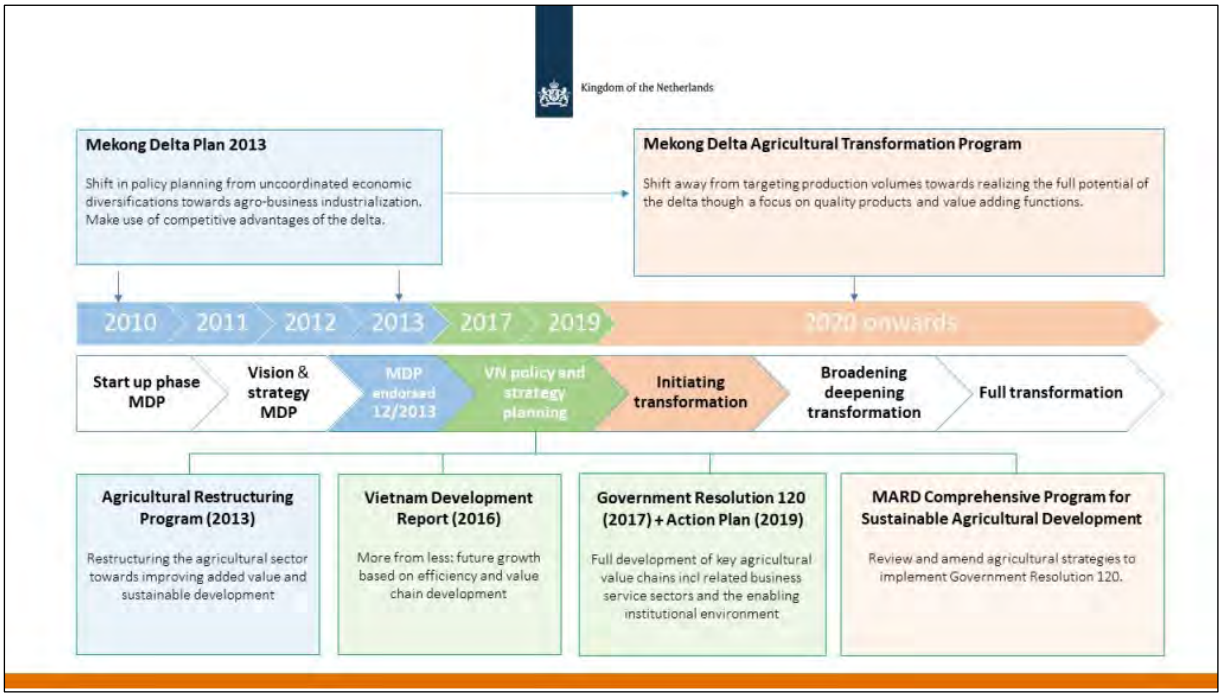
Many developments in the region have involved national agencies, regional development committees, and bilateral and international donors. **Figure 2.1.1** shows a history of development plans compiled by the Dutch government since 2010. As stated above, this is followed by the Master Plan for the Mekong Delta region developed by MPI with support from World Bank in 2022.

In 2013, the Mekong Delta Plan[4] concluded that a policy shift from unregulated economic diversification to a focus on agribusiness is essential for long-term sustainable socio-economic development in the delta. This development scenario is to emphasize economic growth through the development of agriculture value chains instead of simply increasing agriculture production. The unique demographic characteristics of the region, such as lowlands, inland waterway networks, and fertile soils, may make a possible adaptation to climate change. The plan envisioned that the region would be developed as a modern, commercially oriented regional hub for export and domestic markets, specializing in high-value agricultural and agro-food production so that economic development and GDP growth based on the region's agricultural advantages would be possible. It was underlined that effective spatial planning and appropriate investments in production systems, harvesting and processing, transportation and logistics, marketing and branding, and related business services would be necessary to pursue the plan.

The relevance of this development scenario became very clear directly after the endorsement of the MDP principles by the government of Vietnam and key international partners.

[4] Mekong Delta Plan – Long-term vision and strategy for a safe, prosperous, and sustainable delta. Ministry of Natural Resources and Environment. Ministry of Agriculture and Rural Development with partners in the Netherlands (Ministry of Infrastructure and Environment, etc.). December 2013.

As stated on the website, “lacking alignment and inconsistencies between parallel agricultural policies combined with emerging climate change trends polarizing the seasonal conditions of the delta have caused 'early crises’ such as the 2011 flood and the 2014 and 2016 droughts. These events resulted in a broad consensus amongst Vietnamese and foreign stakeholders that the delta's agricultural system has now arrived at a critical tipping point.”[5]




Source: “Trends and developments in the Mekong Delta”
(URL: https://www.mekongdeltaplan.com/mekong-delta-business-platform/trends-and-developments-in-the-mekong-delta as of May 2022)

**Figure 2.1.1 Trends and Developments in the Mekong Delta region**

### 3) Recent Events

In September 2017, at the First Mekong Delta Sustainable Development Conference, Prime Minister Nguyen Xuan Phuc highlighted the major challenges facing the region: climate change and sea-level rise, exploitation of water resources upstream of the region, and the many negative impacts brought by intensive economic activities in the region.

The Prime Minister presented a series of perspectives and solutions, specifically mentioning, “Respect the laws of nature and choose adaptation models accordingly.” He further indicated, “We shall avoid harsh interference with nature, and develop sustainably with the motto of living with floods, with salinity, with drought, with water scarcity, and with the actual conditions.” Subsequently, the government released Resolution 120/NQ-CP, 11-2017, “Sustainable Development of the Mekong River Delta Responsible to Climate Change,” a major breakthrough in conceiving and shaping development strategies for a prosperous and sustainable future for the Mekong Delta region. The thought of integrating socio-economic development across the region from a long-term perspective and strengthening inter-local, inter-regional, and inter-sectoral development connectivity through a unified coordination mechanism was shared by all governmental agencies involved.

The Third Conference on Sustainable Development of the Mekong Delta to Adapt to Climate

[5] “Trends and developments in the Mekong Delta”
(URL: https://www.mekongdeltaplan.com/mekong-delta-business-platform/trends-and-developments-in-the-mekong-delta, as of May 2022)

Change on 13 March 2021 was of great significance as it confirmed the government's and Prime Minister's coherent commitment and profound concerns for the sustainable development of the Mekong Delta. The meeting especially recognized the work and outstanding results after three years of implementation of Resolution 120 and made important recommendations to promote sustainable development in the region.

The Minister of Planning and Investment Nguyen Chi Dung said that the total state budget capital expected to support projects managed by provinces for 2021–2025 reached VND 266 trillion. He also said that state budget capital to be invested through several ministries and agencies to implement projects in provinces was approximately VND121.6 trillion.

As for ODA, the MPI has coordinated with the World Bank to develop the master plan and proposed a budget of USD1.05 billion to implement the development in the region. With such a scale of capital, a coastal road from Tien Giang to Kien Giang, freshwater reservoirs related to irrigation infrastructure in Long Xuyen, and some inter-provincial transportation projects of an extensive nature are expected to be constructed. Minister Nguyen Chi Dung proposed several related programs/projects of great significance to the Mekong Delta in terms of ODA, planning, and resource allocation.[6]

In March 2021, the minister of Transportation Nguyen Van The mentioned the government believes that the transportation system in the Mekong Delta is still weak and not commensurate with the region's potential and strengths. For the past three years, the MOT has been working closely with the provinces to implement two tasks assigned by the government in Resolution 120. In this context, the MOT has completed five transportation plans by 2021.

The MOT has also coordinated with the city and 12 provinces to harmonize their local transportation plans to obtain the best possible transportation system to connect to the central transportation system.

The MOT has agreed with the MPI on the public investment plan of about VND57 trillion for the transportation sector in the region from 2021 to 2025 (only VND29 trillion in the previous period). The city and provinces in the region expect better development conditions to be created for the Mekong Delta region to transform and develop sustainably.[7]

The Coordinating Council of the Mekong Delta Region: Decision No. 825/QD-TTg dated 12 June 2020 on the “Establishment and promulgation of the regulation on the operation of the coordinating council of the Mekong River Delta (MRD) for the period 2020–2025” aims to renew the regional coordination mechanism and to promote sustainable development of the Mekong Delta to adapt to climate change. The council is an interdisciplinary coordinating body established to oversee the implementation of regional coordination for the sustainable development of the Mekong Delta region to adapt to climate change, including the development of the major economic regions of the region, to advise and propose to the prime minister, to assist the prime minister, and to perform functions in the coordination of the stakeholders (Decision 1054/ QD-TTg, 2021).

### 2.1.2. Socio-economic Status of the Mekong Delta region

The region is in southern Vietnam, covering approximately 40,000 km$^2$, and is home to more

6 https://doanhnghiepvn.vn/dau-tu/
7 https://vn.sputniknews.com/20210313/

than 18 million people, or about 20% of the population of the country. The average population density is 423 people per $km^2$, which is greater than the national average (290 people per $km^2$), but significantly lower than the country's economic hub HCM City at 4,363 people per $km^2$ or Hanoi at 2,398 people per $km^2$. Most of the population lives in rural areas (the Mekong Delta's urban population was 21.7% in 2008 and 25.1% in 2019), and the rate of urbanization is lower than the national average (29.0% in 2008 and 34.4% in the year 2019). The Mekong Delta is the country's third most populated and urbanized region and ranks fourth in terms of geographic size, population growth, and urban population growth (2016).

Mekong Delta accounts for 20% of the country's population, but in 2019, 12% only contributed to the GDP. The GDP per capita in 2019 reached VND51.3 million, 18% lower than the national average of VND62.7 million. Between 2013 and 2018, the real GDP of the Mekong Delta increased by an average of 6% per year, compared with the national average of 6.6%. The relatively slower economic growth of the Mekong Delta is mainly due to the high proportion of agriculture, forestry, and fishery in the regional GDP. Labor productivity rates in these sectors are significantly lower than in industry, especially smallholder farmers, who still make up most of the agricultural picture of the Mekong Delta. Due to the purely agricultural nature of the regional economy, the proportion of agriculture, forestry, and fishery sectors in the GDP structure is high at 31.5% compared to the national average of 14.0%, while the proportion of industry and construction is low (the proportion of this sector in regional GDP is 25.3% compared to the national average of 35.4%).[8]

In 2019, the region accounted for 10.8% of Vietnam's industry and construction and was the third largest industrial area in Vietnam, after Ho Chi Minh City and Hanoi. Despite its enormous potential, the region is lagging behind neighboring regions in terms of industrial development and is currently facing a developmental paradox. The region has much potential for development, especially in agriculture, yet it has not prospered due to the lack of adoption of the latest technology and innovation in the agricultural sector. As a result, agriculture has not been able to contribute much to the development of the Mekong Delta region.[9]

A similar point is mentioned in the Master Plan report. Industry, construction, and services are growing faster than agriculture, forestry, and fishery (industry and construction by 7.2%, service by 8.5%, and agriculture by 8.5%). The whole region is going through a period of industrialization and restructuring—albeit later and slower than other regions in the country.[10]

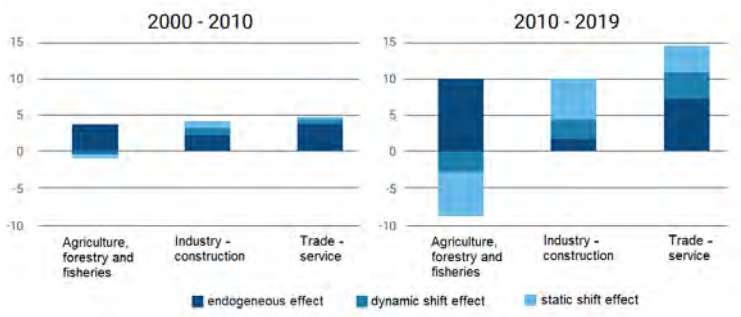
**Figure 2.1.2 Economic Growth Rate of Mekong Delta, Vietnam, and the World**

The economic crisis in 2008–2009 changed the average growth rate of countries worldwide. It affected the economy of Vietnam in general, particularly the Mekong Delta. While the global economy has maintained a low growth rate of less than 3%, Vietnam's economic growth has remained around 6–7%. Meanwhile, the Mekong Delta's economic growth rate has become greater than the national

[8] Master Plan for Mekong Delta Region for the Period 2021–2030, with a Vision to 2050. MPI. February 2022.
[9] Barrett, C. B. (1999). The microeconomics of the developmental paradox: on the political economy of food price policy. Agricultural Economics, 20(2), 159-172
[10] Master Plan for Mekong Delta Region for the Period 2021–2030, with a Vision to 2050. MPI. February 2022.

rate, and the gap has narrowed dramatically in recent years, particularly since 2015.[11]

The shift from agriculture, forestry, and fisheries (primary sector) to other sectors (industry-construction (secondary sector), and trade services (tertiary sector) could be explained by the endogenous effect, static shift effect, and dynamic effect. The endogenous effect is considered as the improvement in productivity within each economic sector, the static shift effect is the movement from an area of low labor productivity to an area of higher labor productivity (for example, the movement of labor from agriculture to industry and trade - services), and the dynamic effect is the movement from an area of low productivity growth to an area of higher productivity growth.[12]




Source: VCCI (Vietnam Chamber of Commerce and Industry) 2020

**Figure 2.1.3 Endogenous, Dynamic, and Static Shift Effects in Sectors in Vietnam**

**Figure 2.1.3** shows the effects in the main sectors. The endogenous effect occurred in the agriculture sector, followed by the trade-services sector. In contrast, in the industry-construction sector, the static effect is the most significant, and the role of endogenous and dynamic effects are equal.[13]

The primary sector in the Mekong Delta experienced the fastest restructuring; however, this was only in the first decade (2000–2010) as it increased from 8% to 18.5%. In the following decade (2010–2019), the increase went only from 18.5% to 22.9%. Between 2010 and 2019, the economic structure of the Mekong Delta shifted significantly from agriculture to industry and construction and trade services. In the Mekong Delta, its primary industry accounted for 39.6% of GRDP in 2010, but only 28.3% in 2019. Nationally, the GRDP was 20.5% and 13.96%, respectively. The transformation of the industrial structure can also be seen in the secondary and tertiary industries, which was in line with the overall economic structure of the country. In particular, the trade and services sector's contribution to the region's GRDP was higher than the other two sectors combined, at 56.6%, but it accounted for only 40% of the region's GRDP from 2000 to 2010. This shows how trade and services have grown more significantly than agriculture and industry and construction in the region.[14]

### 1) Primary Sector

The Mekong Delta is the most important agricultural region in Vietnam, producing 55% of the country's rice. In addition, nearly 70% of the region's population lives in rural areas, making the industry very important in providing income and employment and ensuring the country's

[11] VCCI (2020). Báo cáo kinh tế thường niên ĐBSCL 2020. Cần Thơ: NXB Đại học Cần Thơ.
[12] Dong, N. T. et al. (2020). The Interaction between Labor Productivity and Competitiveness in Vietnam. The Journal of Asian Finance, Economics and Business, 7(11), 619–627. (URL: https://doi.org/10.13106/JAFEB.2020.VOL7.NO11.619, as of May 2022)
[13] VCCI (2020). Báo cáo kinh tế thường niên ĐBSCL 2020. Cần Thơ: NXB Đại học Cần Thơ.
[14] VCCI (2020). Báo cáo kinh tế thường niên ĐBSCL 2020. Cần Thơ: NXB Đại học Cần Thơ

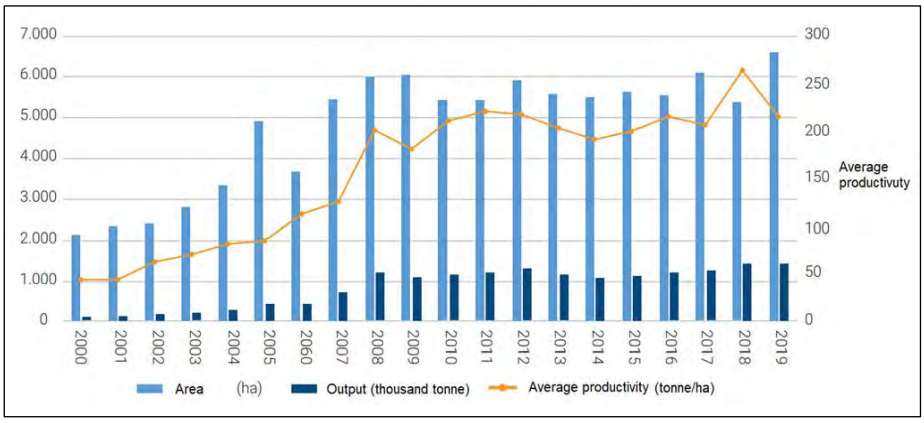
food security and exports.[15]

Rice productivity and production have continuously increased over the past 25 years. Between 1990 and 2015, the average production of paddy rice increased by 3.25% per year, from 3.18 to 5.77 tons per hectare. At the same time, the area under cultivation has increased by 26.8% over the past 25 years, so rice production has grown from 19.225 million tons in 1990 to 45.22 million tons in 2015, with an average growth rate of 5.41%.[16] However, compared to production, rice prices declined year by year after it rose slightly in 2012, with the Mekong Delta's export rice price falling 20.4% or USD90/ton in 2015 compared to 2011. The rice export market is highly competitive, and imports from other countries are in demand.

Over the past 29 years (1989–2017), Asia has accounted for an average of 67% of Vietnam's rice exports, followed by Africa (19%), the Middle East (3%), the United States (7%), Europe (2%), and Australia (1%).[17]

The natural characteristics of the Mekong Delta make it a suitable feeding ground for basa pike and pangasius catfish. Australia was the first market for the export of basa fish (1987). Due to increased production and more stringent farming conditions for basa fish, pangasius has become increasingly popular since 1990. Pangasius production and exports in Vietnam have exploded, and Vietnam has become a world leader in pangasius catfish exports. Over the past 20 years, Vietnamese pangasius catfish have been sold to more than 130 countries and regions, including the United States, the European Union, Brazil, Australia, Canada, China, and Hong Kong.[18]

Figure 2.1.4 shows the area, production, and productivity of pangasius in the Mekong Delta. Pangasius productivity has improved over the years but remains unstable. Over the past decade, the overall turnover has declined (from 28.3% in 2010 to 23.4% in 2019).[19]



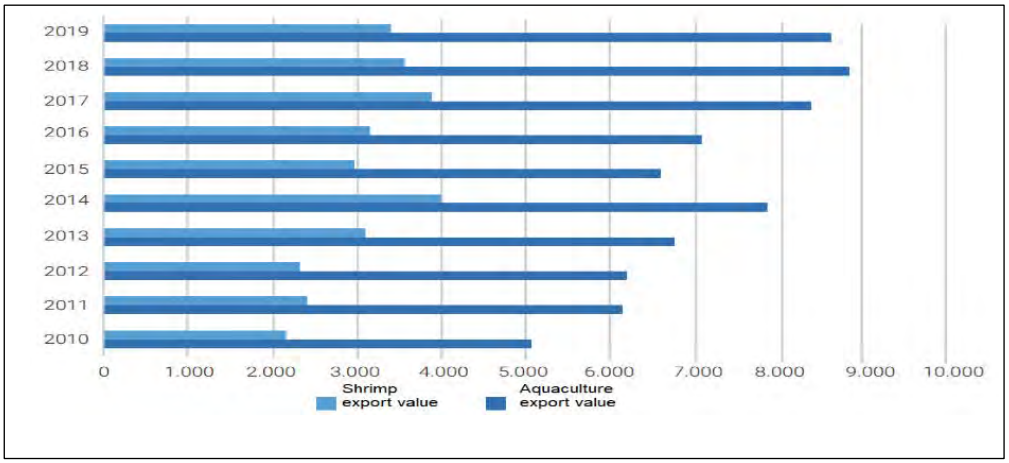

Source: VCCI 2020

**Figure 2.1.4 Area, Output, and Productivity of Pangasius in Mekong Delta**

Besides catfish, the Mekong Delta has been the country's largest shrimp producer in the last two decades. As shown in **Figure 2.1.5**, the national shrimp export value increased from USD2.1 billion (2010) to USD3.4 billion (2019), an increase of 5.3%/year. Shrimp species like white shrimp and black tiger shrimp are concentrated in the Mekong Delta region. In the past years, the main markets for Vietnam's shrimp exports were the EU, the USA., Japan, and

[15] Danh, Vo. (2019). Phát triển kinh tế Đồng bằng sông Cửu Long: Thành tựu và Thách thức.
[16] Vi, N. T. T., & Liu, T. (2019). Improve the competitiveness and value of rice exports of the Mekong Delta provinces. Agricultural Sciences, 10(06), 707.
[17] VCCI (2020). Báo cáo kinh tế thường niên ĐBSCL 2020. Cần Thơ: NXB Đại học Cần Thơ.
[18] VCCI (2020). Báo cáo kinh tế thường niên ĐBSCL 2020. Cần Thơ: NXB Đại học Cần Thơ
[19] VCCI (2020). Báo cáo kinh tế thường niên ĐBSCL 2020. Cần Thơ: NXB Đại học Cần Thơ

China (accounting for about 75%).




Source: VCCI 2020

**Figure 2.1.5 Export Value of Shrimp and Aquaculture in Vietnam**

Besides rice and aquaculture, the region's main agricultural products are fruits. The Mekong Delta has the largest area under fruit cultivation in the country (34.5%).[20]

Popular fruits include longan (Tien Giang, Vinh Long), orange (Vinh Long, Hau Giang), mango (Tien Giang, Dong Thap, An Giang), pomelo (Ben Tre, Vinh Long), dragon fruit (Long An, Tien Giang), pineapple (Long An, Tien Giang, Kien Giang), and rambutan (Ben Bamboo).[21]

The low rice prices and unstable profits make farmers' lives difficult. Converting agricultural products to vegetables and fruits is an inevitable development that will lead to higher profits; however, at the national level, policies focused on economic growth in agriculture, particularly growing vegetables and fruits, have not yet been successfully implemented. The Mekong Delta region is famous for its fruit and vegetable brands, but inter-regional cooperation is still limited. Each province continues to pursue its strategy, and agricultural land planning is incomplete.

### 2) Secondary Sector

In the Mekong Delta, the development of processing and manufacturing industries using fish, shrimp, and agricultural products as inputs was expected to lead to a breakthrough in the local economy in the 2000s. As seen in **Table 2.1.1**, the role of processing and manufacturing declined from 2010 to 2015, but this trend reversed between 2015 and 2019. As a result, the region's manufacturing sector fell more sharply than the national average from 2010 to 2015. This is because production is highly volatile and virtually entirely dependent on the global market.

The ratio of processing and manufacturing to GDP is larger than the national average, mainly due to the relatively low growth of output and GRDP in the region. Over the past decade, however, the ratio to GDP of the manufacturing and processing sector has been lower than that of the nation as a whole, falling from 24.9% to 16.9%.

[20] VCCI (2020). Báo cáo kinh tế thường niên ĐBSCL 2020. Cần Thơ: NXB Đại học Cần Thơ
[21] VCCI (2020). Báo cáo kinh tế thường niên ĐBSCL 2020. Cần Thơ: NXB Đại học Cần Thơ

**Table 2.1.1 Processing Industry and Manufacturing in Mekong Delta and the Country**

| City/Province | % Industry/GRDP | | | Average growth | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2019 | 2010–2015 | 2015–2019 | 2010–2019 |
| An Giang | 7,4 | 6,6 | 8,1 | 5,1 | 8,7 | 6,7 |
| Bac Lieu | 16,9 | 6,8 | 8,0 | 10,6 | 12,5 | 11,4 |
| Ben Tre | 11,1 | 10,4 | 13,5 | 10,6 | 9,4 | 10,1 |
| Ca Mau | 14,4 | 13,6 | 9,2 | 8,7 | 9,4 | 9,0 |
| Can Tho | 36,4 | 25,6 | 26,4 | 5,7 | 10,4 | 7,8 |
| Dong Thap | 17,7 | 17,1 | 18,5 | 8,3 | 6,3 | 7,4 |
| Hau Giang | 21,2 | 13,2 | 17,2 | 16,2 | 8,6 | 12,8 |
| Kien Giang | 18,1 | 10,3 | 11,7 | 7,9 | 9,7 | 8,7 |
| Long An | 30,1 | 34,9 | 45,2 | 16,4 | 13,8 | 15,2 |
| Soc Trang | 6,4 | 6,3 | 8,2 | 6,8 | 8,3 | 7,5 |
| Tien Giang | 23,5 | 15,9 | 22,4 | 13,0 | 10,9 | 12,0 |
| Tra Vinh | 8,3 | 8,3 | 8,2 | 19,5 | 13,9 | 17,0 |
| Vinh Long | 12,0 | 15,3 | 12,9 | 13,0 | 7,8 | 10,6 |
| Mekong Delta | 18,3 | 15,6 | 18,6 | 10,1 | 10,2 | 10,2 |
| The whole country | 13,0 | 13,7 | 16,5 | 14,2 | 9,5 | 12,1 |
| % of Industry/the whole country | 24,9 | 16,7 | 16,9 | - | - | - |

Source: VCCI 2020

Exports in the Mekong Delta have risen at an average of 11.8% annually from 2010 to 2018, lower than the national rate (16.4% per year). The rise may be due to the conversion of some of the coastal farmland in Tien Giang, Ben Tre, Bac Lieu, Soc Trang, and other areas to fisheries, which led to increased turnover saturation and lower output.

**Table 2.1.2** shows the export rates and major export products by city and province. The region's main exports are rice, aquaculture, and fruits. The transition of the global textile dyeing chain from China to Vietnam has resulted in new items such as clothing, textiles, leather, and footwear due to low-cost input, but the emerging industry of textile and others are still small compared to the concentration of textile and apparel industries in Vietnam's southeastern region.[22]

**Table 2.1.2 Export Rate and Main Products for Export in Mekong Delta (2010–2018)**

| Province/City | Export rate 2018 in the region | Export trend | Products with increasing turnover | Products with decreasing turnover |
|---|---|---|---|---|
| An Giang | 4,8% | downward (2013)* | garment and textile | rice, aquaculture |
| Ca Mau | 6,4% | downward (2014) | aquaculture, nitrogenous fertilizer | rice |
| Kien Giang | 3,6% | downward (2013) | aquaculture | rice |
| Tra Vinh | 2,5% | downward (2015) | aquaculture, coconut | rice |
| Vinh Long | 2,6% | downward (2012) | garment and textile, leather, and footwear | rice |
| Bac Lieu | 3.4% | upward | aquaculture | rice |
| Ben Tre | 5,5% | upward | aquaculture | rice, products from coconut |
| Can Tho | 11,7% | upward | aquaculture, handicraft | rice |
| Dong Thap | 6,7% | upward | garment | rice |
| Hau Giang | 4,3% | upward | aquaculture | rice |
| Long An | 28,9% | upward | rice, garment and textile, leather and footwear | rice |
| Soc Trang | 4,4% | upward | aquaculture | textile |
| Tien Giang | 15,2% | upward | aquaculture, garment | rice |

Note: * () year that city/province gets the highest turnover
Source: VCCI 2020.

22 VCCI (2020). Báo cáo kinh tế thường niên ĐBSCL 2020. Cần Thơ: NXB Đại học Cần Thơ.

### 3) Tertiary Sector

The service sector accounts for 41.2% of the region's GRDP, about the same as the country as a whole. These include automobile and motorcycle maintenance, real estate, accommodation and food services (including tourism), and education and training wholesale and retail trade. The service sector was the most developed in the region. The region's service sector has grown at an annual rate of about 8.5% since 2013. The Mekong Delta has been identified in the past Mekong Delta Regional Development Plans as having potential in the service sector, including tourism, retail, healthcare, and education.[23]

For tourism, the Mekong Delta is an integral part of Vietnam with natural and cultural resources for tourism, such as islands, beaches, rivers, orchards, pagodas, traditional music of different religions, etc. In 2019, compared to the whole country, domestic tourists visiting this region accounted for more than 30%, but the overall revenue increase was less than 2%. Foreign visitors to the region accounted for about 20% of the total number of foreign tourists in Vietnam, and most of them were day-trippers. The majority of overnight visitors were from the EU, USA, and Australia, who preferred local accommodations such as lodges, homestays, resorts, yachts, and four- to five-star hotels. Government policies and strategies, infrastructure for connectivity, and human resources to provide good service seem to be the bottlenecks for tourism in the region.

### 4) Labor Market

The economic structure also affects the local labor market. **Table 2.1.3** shows the distribution of labor force by sector in the Mekong Delta and Vietnam in 2010 and 2019. In 2010, 62.2% of workers in the Mekong Delta were employed in the agricultural sector, compared to 48.7% nationally. As such, the share of the labor force in the remaining sectors was much lower than at the national level. By 2019, however, economic restructuring has shifted the labor force from agriculture to industry (construction and trade) services, significantly narrowing the difference in labor structure between the country and the Mekong Delta.

**Table 2.1.3 Labor force Distribution by Sector (%)**

| Sector | Primary | | Secondary | | Tertiary | |
|---|---|---|---|---|---|---|
| Year | 2010 | 2019 | 2010 | 2019 | 2010 | 2019 |
| Mekong Delta | 62.2 | 43.3 | 12.2 | 22.1 | 25.6 | 32.8 |
| The whole country | 48.7 | 34.5 | 21.7 | 30.1 | 29.6 | 35.4 |

Source: VCCI 2020.

At the end of 2018, there were approximately 10.5 million workers in the Mekong Delta, representing 59.1% of the regional population and 19.4% of the national labor force, a slight decline from 2009. The average labor force growth rate from 2009 to 2018 was 0.9% per year, lower than the national average (1.4% per year) for the same period. Migration declined from 2014 to 2017, but this trend began to increase sharply in 2018. Challenging living conditions due to climate change and flood-related disasters, as well as lack of employment opportunities, are considered the main reasons for the high migration in the region.[24]

The private sector[25] contributes significantly, over 90%, to job creation in the Mekong Delta.

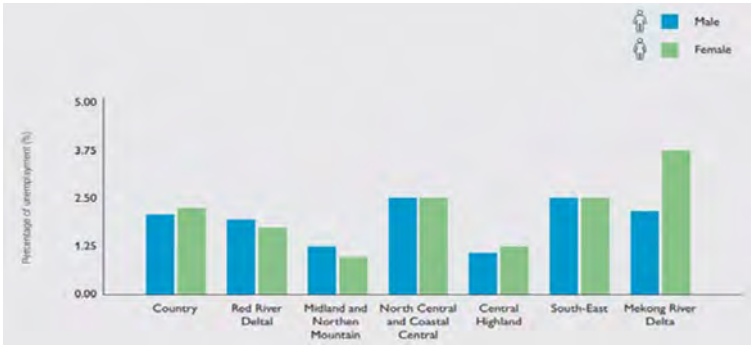
[23] MPI (2020). Báo cáo quy hoạch vùng đồng bằng sông Cửu Long thời kỳ 2021-2030, tầm nhìn đến năm 2050

[24] VCCI (2020). Báo cáo kinh tế thường niên ĐBSCL 2020. Cần Thơ: NXB Đại học Cần Thơ.

[25]. As defined by the General Statistics Office (GSO) of Vietnam, the non-public sector includes private enterprises (100% private capital), partnership companies (state-owned limited liability companies, limited liability companies with less than 50% state capital invested, joint

However, the majority of the labor force has been engaged in agriculture in rural areas. Labor force in private companies accounts for only 11.1% in 2017, compared to 27% for the entire nation. Foreign direct investment (FDI) industries employ only about 3.7% of the region's labor force, most of which is in the formal sector.[26]

Nationally, the female unemployment rate is slightly higher than the male unemployment rate. However, the female unemployment rate in the MDR is much higher than the male unemployment rate in other regions (see **Figure 2.1.6**).




Source: VCCI 2020

**Figure 2.1.6 Unemployment Rate by Gender (%)**

### 5) Industrial Estates

Industrial Park development in the Mekong Delta is largely based on national industrial development plans and local government policies to add value to agricultural and fisheries products. Between 2010 and 2019, the number of newly planned industrial parks increased by 29, but only three were actually invested in. On the positive side, the number of industrial parks in the Mekong Delta has been steadily increasing since 2010, and the occupancy rate of industrial parks with infrastructure investments is at least 70%. However, the development of industrial estates has encountered various challenges as follows.

The development of industrial parks in the Mekong Delta is limited mainly due to the high cost of logistics and transportation networks. The greatest advantage of industrial development in the Mekong Delta is the availability of agricultural inputs, but there are disadvantages in terms of transportation infrastructure leading to domestic and foreign consumption markets. For example, the development of industrial parks in Long An, unlike other areas in the Mekong Delta, demonstrates the importance of the integration of transportation and market access.

In many cases, industrial parks were built in the wrong locations in anticipation of profits from cross-border trade with Cambodia, resulting in failure to attract investment even when the basic infrastructure is in place, as in the case of the Xuan Tho Industrial Park in An Giang. In addition, the Mekong Delta's proximity to Ho Chi Minh City, an economic and industrial center in southern Vietnam that attracts abundant resources from around the world, means that the region is heavily influenced by and dependent on industrial spillovers from Ho Chi Minh City.

The ICT Technology Infrastructure Index in the Mekong Delta is on an upward trend. Can Tho, Long An, and Dong Thap are undergoing good changes, with investments in technology infrastructure and human resources. Can Tho, for example, has a solid infrastructure, but the

stock companies with less than 50% state capital, etc.), and family and individual businesses. The "private enterprise" referred to in the next paragraph is one of the non-public sectors.

[26] VCCI (2020). Báo cáo kinh tế thường niên ĐBSCL 2020. Cần Thơ: NXB Đại học Cần Thơ

level of IT utilization is still low compared to other large cities such as Hanoi, Ho Chi Minh City, and Da Nang.[27]

The Mekong Innovation Initiative, launched by USAID and the MPI in 2022, aims to help drive Vietnam's digital economy and the fourth industrial revolution by developing a more robust and digitally ready workforce in the Mekong Delta and mobilizing resources to support the Mekong Innovation Initiative. It will train 500 individuals in digital transformation and e-commerce competencies to meet the growing digital technology needs across the Vietnamese economy. This will create new employment opportunities in Mekong Delta as well. This project builds on Vietnam's labor reform efforts and will support the implementation of the country's Fourth Industrial Revolution strategy.[28]

### 2.1.3. Investment Environment in the Mekong Delta Region

While the southern region of Vietnam, centered on HCMC, has a high-income level and is an attractive investment and consumer market, it should be noted that the expansion of investment and consumer markets to neighboring areas is limited to some extent. In the MDR, many Japanese companies have invested in industrial estates in Long An province, which is adjacent to HCMC, but investment in other provinces and the city is limited. The number of industrial estates in the MDR is relatively small compared to the number of industrial estates in the provinces adjacent to HCMC, and the region is considered not competitive in terms of the clustering of industrial estates. Compared to Ba Ria Vung Tau (12), Binh Duong (28), and Dong Nai (33) provinces, the number of industrial estates nearby HCMC, such as Dong Thap (3), Tien Giang (3), and Ben Tre (2) provinces is far fewer, except in Long An province (22), which is adjacent to HCMC.[29]

Agriculture is positioned as a major investment area in regional development policies and local development plans of the MDR. Although the MDR advocates reforming the agricultural sector and exporting value-added agricultural products overseas, development and investment strategies related to attracting research institutes for food processing, food processing factories, and human resource development are not featured significantly as major investments or development projects in the development plans of the local governments. The investment environment is generally the same in all local governments in the MDR. Industrial estates are subject to the preferential terms and conditions set by the government and their approval, and the preferential terms and conditions for industrial estates built by the local governments do not differ substantially between them.

### 2.1.4. Economic Situation in the Mekong Delta Region (2022)

Vietnam Confederation of Trade and Industry (VCCI), formerly the Vietnam Chamber of Commerce and Industry, released its Mekong Delta Economic Annual Report in August 2022. Since this annual report summarizes the most recent economic and social development status of the Mekong Delta region, an overview is outlined in this report. The 2022 Mekong Delta Annual Report is compiled under the theme of "Development Model Transformation and Comprehensive Development Planning." After the Planning Law in 2017, local governments

[27] VCCI (2020). Báo cáo kinh tế thường niên ĐBSCL 2020. Cần Thơ: NXB Đại học Cần Thơ.

[28] URL: https://en.vietnamplus.vn/measures-sought-to-promote-innovation-human-resources-development-in-mekong-delta/224616.vnp (as of May 2022)

[29] Data collection of industrial estates and parks near Ho Chi Minh City, Vietnam. JETRO. March 2019.

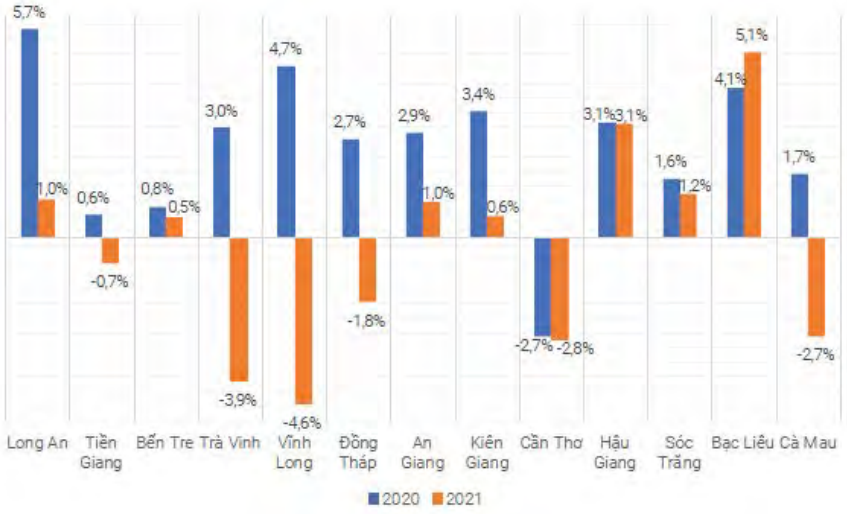
had not started to formulate comprehensive development plans until recently. According to interviews with local governments, each province and city in the MDR is in the process of formulating its comprehensive development plan by the end of 2022.

The report notes that there are seven main challenges in the MDR, and these are population, the number and quality of workforce, investment funds, lagging infrastructure development, innovation and technology, interregional linkages, and economic development.

Since the report analyzes and summarizes the Mekong Delta Regional Master Plan briefly introduced in the next section, some similarities can be seen in the challenges and recommendations for the Mekong Delta region.

Impact of COVID-19

According to the report, the MDR was heavily affected by COVID-19 due to its economic structure. The region has a higher share of the service sector in GRDP than the entire country. The drop in the growth rate of the industrial sector in the MDR (-2.26%) was also much higher than that of the country as a whole (4.05%), which hampered economic growth.




Source: Mekong Delta Economic Report 2022. VCCI

**Figure 2.1.7 Economic Growth in the MDR in 2020 and 2021 by Province**

It is worth noting that, as **Figure 2.1.7** shows, the economic growth rate of Can Tho City, which is the driving force of the Mekong Delta region's economy, has been negative for two consecutive years, while that of Bac Riau province has been growing. The growth in the economic growth rate in Bac Riau Province is mainly attributed to the favorable market conditions in the fishing industry and the impact of wind power generation revenues on the economy.

In the MDR, agriculture contributed 1% of the economic growth rate, while industry and services contributed less, revealing that they are not yet solid enough to become sustainable economic pillars in the region. Another characteristic phenomenon of COVID-19 was that many migrant workers returned to the MDR due to COVID-19 measures within Vietnam and in the Southeast Asia region. Although exact statistical figures could not be confirmed, various media reported that many workers from industrial estates in HCMC and neighboring provinces returned to their hometowns, and in particular, many workers in the service industry in HCMC lost their jobs and were forced to return home. Meanwhile, official statistics showed little change in the unemployment rate, with a 0.08% decrease in the Mekong Delta region in 2020

compared to 2019. Incidentally, the national average unemployment rate in 2019 was 2.17% and 2.90% for the MDR.[30]

Labor Force and Labor Quality

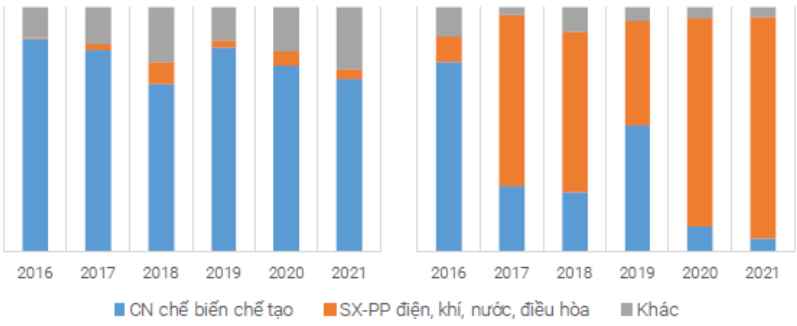
The quality of the labor force has been identified as the greatest weakness in the economic development of the MDR. Statistics on labor training in the region over the past four years show that it is the lowest in the country. The image of an abundant and inexpensive labor force in the region being favorable for attracting investment is disappearing. The labor force reduction rate in the region between 2017 and 2021 is -42%, the largest labor force reduction in the country. In addition, it is the only region in the country that has seen its labor force decline every year from 2017 to 2021. One reason for this is the limited number and size of enterprises in the region. The MDR accounts for about 20% of Vietnam's population, but the number of enterprises has declined from 7.6% to 6.7% of the national total, only slightly higher than in the Central Highlands, where natural conditions are worse than in the Mekong Delta. There is a concern in the region that decreased population in the future and the migration of the labor force to urban areas and low-quality labor will impede economic growth.

Investment

The MDR has the lowest average enterprise growth rate in the country, averaging 4.1% over the five years 2017–2021. If this growth rate continues at this rate, the region is expected to be overtaken by the Central Highlands region in 20 years, becoming the region with the lowest number of enterprises in the country.

Although the MDR has been successful in attracting FDI to some extent, it is not necessarily more successful in attracting FDI than other regions in the country. Compared to the country as a whole, the region accounts for only 5% of the number of projects and 8% of the FDI registered capital, and the challenges in attracting FDI have been identified as the lack of infrastructure and human resources.

It should be noted that FDI in the Mekong Delta region is extremely low in the agricultural sector, which the region and provinces and cities have identified as a major industry for the future. The 2021 FDI shows that the sector with the highest number of projects was manufacturing (77.6%), while the sector with the largest amount of investment was energy (60.25%). The agricultural sector, which is the key industry of the region, accounted for only 1.7% of the total number of projects and less than 0.3% of the total registered FDI, indicating future investment.




Source: Mekong Delta Economic Report 2022. VCCI

**Figure 2.1.8 Trends in FDI by Sector in the MDR**

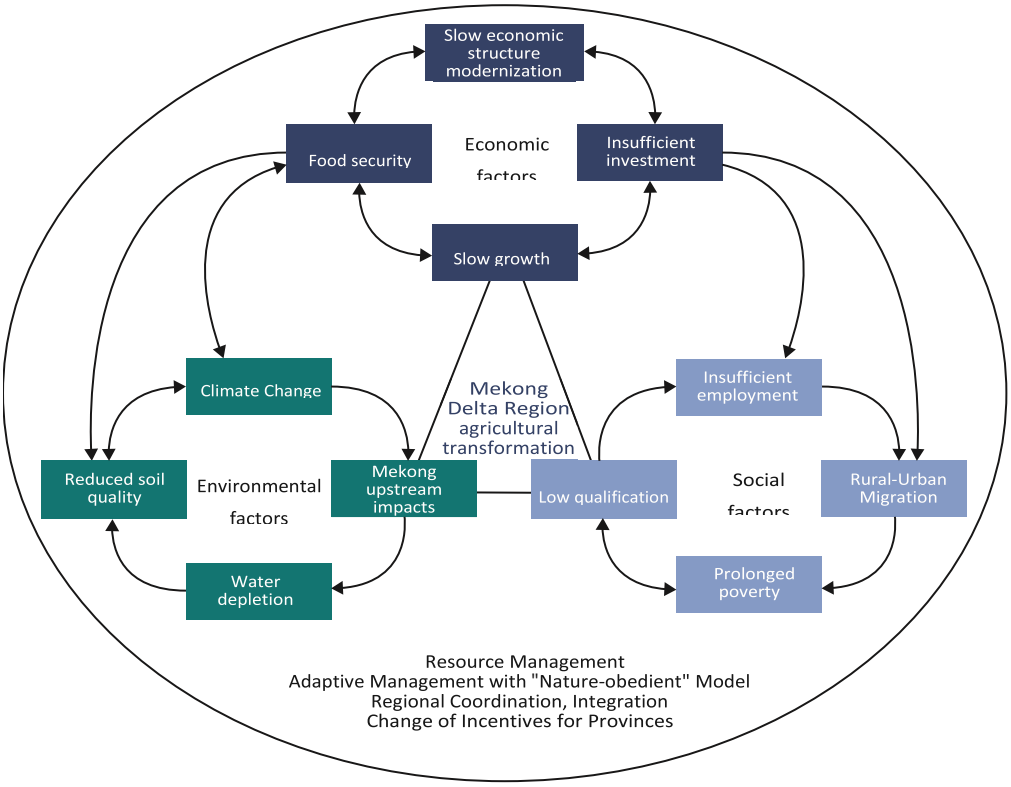
[30] Pg. 164. 65. Unemployment rate of the labor force at working age by region and by residence. Statistical Yearbook of Vietnam 2021.

In the MDR, COVID-19 has had a significant impact on the manufacturing market, revealing the vulnerability of the manufacturing industry. The small size of manufacturing businesses in the region and the low-skilled, labor-intensive production system have been pointed out as reasons for this. Other issues include underdeveloped transportation infrastructure and logistics, and it has been pointed out that the manufacturing industry is not a growth engine for the region.

Vietnam's Agricultural Policy and the MDR

From the perspective of food security in Vietnam, agricultural production in the region has been focused on quantity rather than quality, and the region has a history of being Vietnam's breadbasket. This has led to social distortions, such as a lack of employment opportunities due to low economic growth and an exodus of the working population to HCMC and the southeast region.

The key message of the annual Mekong Delta Economic Report (2022) is that only by breaking the negative economic, social, and environmental spiral can shift sustainable price of agricultural products increase. Over the past few decades, agriculture in the region has achieved an important transformation, but it has not been enough to bring sufficient economic prosperity to the Mekong Delta region. (See Figure 2.1.9.)




Source: Mekong Delta Economic Report 2022. VCCI

**Figure 2.1.9 Negative Spiral of Agriculture in Mekong Delta Region and the Need for Agriculture Sector Reform**

Agricultural Reform in the Mekong Delta Region: Transportation and Logistics

The report identifies transportation and logistics as one of the four pillars of agricultural reform in the region. The report notes that the region has the lowest percentage (10.5%) of national

roads among the seven economic regions, and that the national road quality index is lower than the national average and ranks second from the bottom, indicating the need to improve road infrastructure.

Regarding logistics, a cold storage facility have been constructed in Long An province, which mainly serves as a satellite storage facility for HCMC. Can Tho city and Hau Giang province on the Hau River play the role of collecting goods from the region. However, the logistics industry in the region is faced with the challenges on not enough road network and deterioration of roads. Besides, there is a need for comprehensive and efficient improvement of goods collection and distribution systems in the region. It is expected that transportation infrastructure improvements will be implemented in the comprehensive development plans that are currently being formulated in each province and city, and that will be compiled in the regional master plan in the future, thereby reducing transportation and logistics costs in the region. It is also expected that transportation nodes (inland, coastal, road, and inland waterways) will be significantly improved and collection and distribution points connected to large-scale distribution centers and dry hubs will be strategically located in the region.

### 2.1.5. Regional Development Policy Directions

**The Mekong River Region Development Plan (Decision No. 287/QD-TTg).** The latest Mekong Delta Region Development Plan (February 2022) outlines development directions as follows.

a) Develop a sustainable and green-growing region through implementing the Resolution No. 120/NQ-CP dated 17 November 2017 of the government on sustainable and climate change resilient development of the Mekong Delta Region; attach importance to protection, embellishment, and development of socio-cultural facilities and natural ecosystem; put “the people” in the center and consider water resources as the core; conduct integrated management of water resources across the basin to assuredly maintain the living resources for the environment and the people; and conduct a change of livelihood models in sub-regions for proactive resilience to climate change.

b) Turn challenges into opportunities; transform the growth model by increasing efficiency and values, focusing on effective promotion of human resources, science and technology, innovation, urbanism and industrial development, and digital transformation.

c) Transform the development model from “scattered and small” to “centralized” and develop agricultural clusters with proper linkage to urbanized and industrialized areas so as to initiate breakthrough developments.

d) Strengthen linkages among provinces within the Mekong Delta and with Ho Chi Minh City and the Southeast Region; strengthen trading with ASEAN countries, especially countries in the Greater Mekong Sub-region (GMS).

e) Focus on infrastructure development, which is important for the development model transformation, particularly on transport, energy, clean water supply, irrigation, and social facilities.

f) Combine socio-economic development closely with national defense and security, political stability, and social order and safety; focus on securing food supply, water sources, borders, sea areas, and islands.

The development goals are highlighted that the Mekong Delta will be “a sustainable, dynamic and highly efficient agricultural economic center of the country, the region and the world through developing focal centers for agricultural development, agricultural and economic corridors, and dynamic cities with diversified services and industries supported by integrated infrastructure system which is resilient to climate change by 2030.” It is emphasized that the Mekong Delta region will continue to be developed with agriculture as the core industry. On the other hand, regarding the labor force, the master plan promotes employment in industries other than agriculture.

For employment, “Develop a high-quality and skilled workforce suitable to market needs, with emphasis on key regional industries. By 2030, the trained workers ratio will reach 65%, wherein those with degrees and certificates of 25%; workers in the non-agricultural sectors (services and industry - construction) will make up 75-80%; the unemployment rate in working-age workers in urban areas will be less than 4%.” It also underlined that “gradually shift from labor-intensive to capital-intensive model, from low to medium and high technology, and towards intelligent/smart technologies. By 2030, the share of labor-intensive, raw processing, and low-tech industries will be reduced to less than 50%; the share of capital-intensive, medium and high-tech industries such as chemicals, textiles, machinery and equipment, electrical appliances, and means of transport will make up over 40% of manufacturing industry’s outputs.”

In terms of infrastructure development, a multi-modal transport system to provide inter-regional and international connectivity, with emphasis on promoting the regional strengths in inland waterway transport by 2030 are emphasized, and the development and/or upgrade of about 830 km of expressways, about 4,000 km of national highways, 4 airports, 13 seaports, 11 inland waterway passenger port clusters, and 13 inland waterway cargo ports are envisioned to be developed.

In addition, 22 April 2022, the People's Committee held a national conference to disseminate the Politburo Resolution No. 13-NQ/TW, which presents the socio-economic, national defense, and security plan for the Mekong Delta region until 2030 and the vision until 2045. The conference was specifically aimed at promoting understanding of the Mekong Delta region and making it known that actions and political decisions should be promoted in a consistent manner. It was expressed that the need for party committees, party organizations, government agencies, party members, civil servants, etc. to act as one body in order to effectively implement the resolution.

## 2.2. Provincial Development Plans

It was confirmed that the city and the provinces are currently developing an integrated master plan in accordance with the Law of Planning (2017). The following describes the socio-economic development direction of the three target provinces.

### 2.2.1. Dong Thap Province

Dong Thap is one of three provinces in Dong Thap Muoi's Mekong Delta. On the north, it shares a border with Cambodia; on the south, it shares a border with Vinh Long Province and Can Tho City; on the west, it shares a border with An Giang Province; and on the east, it shares a border with Long An and Tien Giang.

Dong Thap's success has always been based on the agricultural industry. Fruit production covers about 30,000 ha in the province, with a growing number of farms with VietGAP criteria. Besides that, mango and other citrus fruits are also important products. The province's capital, Sa Dec, is the epicenter of floriculture.[31]

The province is also a key rice production hub of the country. Dong Thap is Vietnam's third-largest province in rice production, generating 5.6% of the country's rice. Policymakers have worked in recent years to move the province's agricultural sector toward sustainable production methods, aiming to lower production costs, increase agricultural technology adoption, and improve production efficiency, crop yield, and product quality. Farmers are also being urged to embrace global production standards, such as VietGAP and GlobalGAP, for fruit production. Dong Thap has also been successful in designing high-tech, green, and smart agriculture models, setting the groundwork for adapting to the effects of climate change. Major product lines' value chains have also been regularly improved. Significantly, the club model has emerged and is spreading rapidly, ushering in a new era of productive collaboration.[32]

The decision on the latest master plan of Dong Thap province (No. 470/QD-TTG, 30 March 2011) indicates the development directions of the province.

- To strive for an annual average economic growth rate of 12.4% during 2016-–2020. The province's per-capita GDP will be over USD 2,900 by 2020.
- To restructure the economy in the direction of increasing proportions of industries, construction, and services, while reducing that of agriculture. The proportions of agriculture, industry-construction, and services by 2020 will be 28.5%, 36.5%, and 35%, respectively.
- The export turnover will reachUSD 1,350 million by 2020, growing at an annual average rate of 11.7%, of which cross-border export turnover will account for around 10%. The local budget revenues will account for 9%–11% of GDP with an annual average growth rate of 12%. The investment capital annually raised from all economic sectors will account for around 29–31% of GDP.
- To strive reaching for a road density of 1–1.3 km/km$^2$.
- To concentrate on rapid and effective development of industrial parks and clusters under approved plans. By 2020, the province will have some 7 industrial parks and 32 industrial clusters, occupying a total area of over 4,626 ha.

[31] URL: https://www.vietnam-briefing.com/news/investing-in-vietnams-dong-thap-province-3-key-drivers.html

[32] URL: https://vir.com.vn/dong-thap-grasps-momentum-in-socioeconomic-development-81453.html

### 2.2.2. Can Tho City

Can Tho is the largest city in the Mekong Delta and the fourth largest city in Vietnam, with a population of 1.61 million. It connects the delta's provinces with Ho Chi Minh City and Cambodia. The city expects the population will be 1.95 million in 2030, and population growth rate will be 9.42 – 9.76% per year. The city's development goal is to become a center of education, medicine, and sports in the Mekong Delta region, and an important hub for intra-regional and international transportation, and to become a driving force in the development of the Mekong Delta region.The most recent SEDP master plan for Can Tho city that the Study Team was able to review was No. 1533/QD-TTg on Approving the General Planning for Socio-Economic Development of Can Tho City to the year 2020, with vision to 2030 dated 30 August 2013.

The decision indicates the development directions of the province as follows.

- To restructure the city economy in the direction of hi-tech industry - service - agriculture in the period up to 2020 and towards hi-tech service - industry - agriculture in the period after 2020.
- To invest in areas where the city has a competitive advantage, such as value-added agricultural and aquaculture products, high-tech products, and tourism.
- To link the city's socio-economic development with the socio-economic development orientation of the Mekong River Delta (Mekong Delta); Constructing and developing Can Tho city is a driving force for the region's development.
- The average annual GRDP growth rate for 2021–2030 is assumed to be 10.5% and GRDP per capita is assumed to be USD 14,200 by 2030.
- In 2030, the economic structure is expected to be 3.3% agriculture, forestry, and fisheries, 48.8% industry and construction, and 47.9% services.
- By 2030, the city will be a center of tourism, trade and logistics and ecological urban agriculture. It will be a center for training and medical services in the Mekong Delta region.

The City Master Plan for the period 2021-2030, with a vision to 2050, will be developed comprehensively to maximize the city's assets and potential for the Mekong Delta region's development. Within the next ten years, the city will build a network of expressways connecting Ho Chi Minh City, Can Tho, and Cà Mau, as well as connecting Can Tho to other provinces in the region and the Cambodian border through Chau Doc City. In addition, to make full use of its capacity, Can Tho International Airport will add additional local and international aircraft routes. This city, which serves as a national and international traffic hub, plays a vital role in the regional transportation system, supporting regional connections and housing critical infrastructures, such as telecommunications, power, and water networks that benefit the entire region.[33]

According to the Prime Minister’s Decision No. 1515/QD-TTg (28 August 2013) on the Approval of the Project on adjustment of the Construction Plan of Can Tho City till 2030 and with a Vision to 2050, the city made substantial changes on its mater plan.

Compared to the previous Master Plan, Can Tho city recognizes itself to be an important

international trade hub and gateway to the Mekong Delta region and the country. It also recognizes its important strategic position in the national security of the Mekong Delta region.

The decision indicates the development directions of the province as follows.

- By 2030, the population of Can Tho is expected to be approximately 1.9 to 2 million, of which the urban population is estimated to be 1.5 to 1.6 million, with the urbanization rate of approximately 75% to 80%.
- Industrial-urban development zone in inner city will be 26,250ha, among others, a) O Mon new urban area (4,700ha), 2) Ninh Kieu-Binh Thuy traditional zone (8,100ha), 3) Tra Noc industrial zone (2,850ha), 4) Cai Rang industrial zone (4,800ha), and Phong Dien ecological zone (1,500ha).
- Zone for agricultural and rural development (100,500ha).
- Agricultural production land (73,000ha), including high-tech agriculture area (15,000ha) along the east of new highway near Hau River Park.

O Mon new urban area is the new urban center of Can Tho City, a transportation center of roads, waterways, and railroads, a center of international trade, a research center for science and technology, and an education and training center at the national and international levels. A center of industry and high technology, a specialized park for high-tech agriculture along the Hau River. By 2030, the population is projected to be 160,000 and the land size for urban development about 4,100 ha.

### 2.2.3. Hau Giang Province

The most recent SEDP master plan for Hau Giang province that the Study Team was able to review was No. 1496/QD-TTg on Approving the Adjusted and Supplemented Socio-Economic Development Master Plan of Hau Giang Province through 2020 dated 27 August 2013.

The decision indicates the development directions of the province as follows.

- Economic development in the Hau Giang province must respect the natural characteristics, climatic conditions, and unique biological features, as well as the population characteristics.
- The province will focus on the development of industrial parks, urban centers, and the high-tech agricultural sector areas that are expected to be a breakthrough development. At the same time, attention will be paid to the areas in difficult situations in order to ensure stability and promote the strengths of each village and district.
- The average annual GRDP growth rate for 2016-2020 is assumed to be 16.3% and GRDP per capita is assumed to be VND 72 million by 2020.
- In 2020, the economic structure is expected to be 14% agriculture, forestry, and fisheries, 39% industry and construction, and 47% services.
- The Population is assumed to be 871,000 people by 2020 and the ratio of urban population is assumed to be 44.2% by 2020.

Hau Giang ranks sixth in economic growth and ninth in industrial production value among the 13 Mekong Delta provinces. Hau Giang is one of the provinces in the Mekong Delta with high rice production and will be a rice center in the future via the Xa No canal, exporting between

350,000 and 400,000 tons of rice per year. In the global market, the brand "Hau Giang Rice" is being developed. Moreover, the province also has potential in the industry, trade and services, education and training, public health, science and technology, and urbanization, all of which will aid the province's economic and social development in tandem with the Mekong Delta's industrialization and modernization.[34]

Hau Giang has the special advantage of serving as a hub for traffic, waterway transport, trade-services, and logistics in the south of Hau River. This creates favorable conditions for transportation, as well as effectively addresses individual and business travel demands. In the near future, the launching of An Giang–Can Tho–Soc Trang and Can Tho–Ca Mau expressways allows Hau Giang to connect to other parts of the region. The province also uses specific capital sources granted by the central government budget to invest in new projects in transportation infrastructure, industrial zones, and agricultural infrastructure development during the next few years.[35]

Four industrial zones for small and medium-sized firms have been established in Hau Giang, covering 177.56 ha and attracting 41 projects from various economic sectors, 24 of which have been put into operation with a total investment capital of over VND3.693 trillion. This has made a significant contribution to the province's industrial expansion and provides a considerable number of job opportunities. Hau Giang intends to open five more industrial zones by 2025, enlarge two others, and achieve an average industrial zone occupancy rate of more than 70%. The province will continue to improve industrial zone infrastructure, increase occupancy rates, and increase the percentage of industrial zones with standard wastewater treatment systems to 90% or greater between 2026 and 2030.[36]

[34] URL: https://vccinews.com/news/2356/.html

[35] URL: https://vir.com.vn/hau-giangs-breakthrough-successes-bucking-the-trend-85583.html

[36] URL: http://ven.vn/hau-giang-province-expands-industrial-zones-to-meet-demand-45698.html

## 2.3. Socio-Economic Conditions

Socio-economic conditions of the city and provinces are based on the latest information available from each respective city and province.

### 2.3.1. Long An Province[37]

#### 1) Economic Growth

The GRDP in 2020 increased by 5.62% compared to 2019. It is the lowest growth rate in the past few years as the COVID-19 unfolded in a complex manner and negatively affected all economic and social sectors. In terms of economic growth, the agriculture, forestry, and fisheries sector increased by 2.64%, contributing 0.45% to GRDP growth, the industry and construction sector increased by 7.61%, contributing 3.74%, and the services sector increased by 3.69%, contributing 1.00%.

GRDP at current prices reached VND131.9 trillion in 2020, with GRDP per capita of VND76.97 million, equivalent to USD3,316 (an increase of USD182 over 2019). The economic structure shows that agriculture, forestry, and fisheries account for 15.93%, industry and construction account for 50.33%, and the service sector accounts for 27.22%.

#### 2) Investment

Investment at current prices earned VND43.4 trillion in 2020, an increase of 10.4% from 2019 and representing 32.9% of GRDP. In terms of investment by ownership, the state sector invested VND8.18 trillion, accounting for 18.9% of total investment, an increase of 20.8% from the previous year. The non-state sector invested VND26.12 trillion, accounting for 60.2%, an increase of 9.8%; and the foreign investment sector reached VND9.59 trillion, accounting for 20.9%, and an increase of 4.2% from the previous year.

As for FDI in 2020, there were 85 newly approved FDI projects with a registered capital of USD398.11 million. Compared to the previous year, the number of new projects decreased by 37.5%, while the registered capital increased by 4.2%. Manufacturing remained in the first place, attracting the most foreign investors with 73 projects and registered capital of USD219.5 million. In 2020, the top countries and regions investing in Long An were China with 19 projects and registered capital of USD25.48 million, South Korea with 17 projects and USD125.43 million registered capital, and Hong Kong with 14 projects and USD117.64 million registered capital.

#### 3) Primary Industry

Grain production recorded 2,832.76 thousand tons (53.96 thousand tons more than in 2019), of which paddy rice accounted for 2,830.24 thousand tons (55.32 thousand tons more than in 2019).

The area of new plantations in 2020 was 1,310.5 ha, decreased by 11.1% compared to 2019, consisting of 1,304.5 ha of production forestdeacreasd by11.2% and 6.0 ha of specialized forest (20% increase). Timber production was 138,715 $m^3$, a 2.0% increase.

Fishery production in 2020 reached 72,121 tons (a 4.9% increase from 2019), of which 62,138 tons were produced by aquaculture (a 10.2% increase), and 9,983 tons were produced by fishing (a 19.3% decrease).

[37] Statistical Yearbook of Long An Province, 2020

#### 4) Secondary Industry

The industrial production index for 2020 increased by 8.36% compared to 2019, of which manufacturing increased by 8.19%; electricity, gas, steam, and air conditioning supply increased by 12.93%; and water supply, sewerage, waste treatment, and water purification activities increased by 11.59%.

#### 5) Tertiary Industry

In 2020, the COVID-19 pandemic affected all aspects of socio-economic life. Trade and tourism promotion programs were not implemented. Production and business establishments' revenues decreased, affecting employees' labor and income, which led to a sharp decline in consumption and entertainment demand.

In 2020, the total retail sales of goods and services were estimated to reach VND92.126 trillion, increasing by 2.8% from the previous year. By type of economic activity, retail sales of goods recorded VND78.42 trillion, accounting for 85.12% of the total, an increase of 4.8%; accommodation and food service activities reached VND8.49 trillion, accounting for 8.74%, a decrease of 15.7%; and services and tourism activities reached VND5.65 trillion, accounting for 6.14% of the total, an increase of 7.6%.

#### 6) Labor and Employment

In 2020, the labor force aged 15 years and older in the province reached 1,029.3 thousand, a decrease of 27.5 thousand from 2019, of which 55% are men and 45% are women, with the urban and rural labor force accounting for 16.6% and 83.4%, respectively. The labor force aged 15 years and older working in 2020 was 995.4 thousand, a decrease of 6.1 thousand compared to 2019. The percentage of trained workers aged 15 years and older in 2020 was 15.90%, which is less than 0.83% in the previous year, with urban and rural areas accounting for 32.4% and 12.7%, respectively. The unemployment rate in 2020 was 2.15%, with 1.91% in urban areas and 2.46% in rural areas.

### 2.3.2. Tien Giang Province[38]

#### 1) Investment

The total investment made in 2020 at current prices reached VND36.74 trillion, up 11.4%, of which the investment capital of the state sector reached VND10.171 trillion, up 119.7%, the non-state sector earned VND22.3 trillion, down 4.5%, and FDI was VND4.268 trillion, down 14 .9% compared to the previous year.

In 2020, FDI totaled USD 138.9 million in registered capital with 11 new approved projects. The registered capital decreased by 60.3% compared to 2019.

Overall, the total number of licensed foreign projects that were valid until the end of December 2020 was 130, with a total registered capital of USD2.1 billion. Processing and manufacturing attracted the largest foreign investors with 116 projects, accounting for 39.2% of the total number of projects and total registered capital of USD2 billion, accounting for 95.2% of the total registered capital. South Korea had 30 projects with USD266 million in registered capital, accounting for 12.4% of investment capital. China also had 30 projects with a registered capital of USD745.5 million, accounting for 34.7% of the total investment capital.

[38] Statistical Yearbook of Tien Giang Province, 2020

### 2) Primary Industry

Grain production recorded 813,440 tons, a decrease of 323,918 tons from 2019, of which paddy rice production reached 801,176 tons, a decrease of 321,996 tons. The per capita food production was 459 kg/capita/year, down 185 kg/capita/year from 2019.

The planted trees reached 643.6 thousand, an increase of 1.6% compared to 2019. Wood production was 39,051 $m^3$, a decrease of 7.5% compared to 2019, and firewood production was 135,635 tons, a decrease of 11.2%. The forest area in the province reached 1,396 ha (excluding security and national defense forests).

In 2020, the aquaculture area reached 14,861 ha, or 94.7% of the plan, a decrease of 4.4% compared to 2019, of which the freshwater aquaculture area was 3,720 ha, a decrease of 21.2% compared to 2019. Fishery production reached 356,124 tons, 115.8% of the plan and 11.2% more than in 2019, among which aquaculture production was 213,725 tons, 62.9% more than in 2019.

### 3) Secondary Industry

Since 2020, the industrial production index has increased by 1.6% over the past year, of which the processing sector constituted 1.2%. The manufacturing and distribution of electricity, gas, hot water, steam, and air conditioning increased significantly by 5.2%. The water supply, waste management, and wastewater sectors increased by 7.2%.

In 2020, the industrial shipment index for the manufacturing sector decreased by 9.8 percentage points. Food production decreased by 7%, beverage production by 6.2%, wood and wood products production by 23%, and paper and paper products production by 48.9%.

### 4) Tertiary Industry

In 2020, the total retail sales of consumer goods and services reached VND64.9 trillion, up 4.7% from 2019. Among them, the retail sales of goods were VND52.786 trillion (a 7.4% increase) and VND5.80 trillion from accommodation and food and beverage services (a 10.8% decrease). Revenue from tourism was VND29 billion, a decrease of 78%, and VND6.0 trillion from other services, an increase of 1.4% compared to 2019.

The number of visitors to Tien Giang province reached 748 thousand in 2020, 34% of the plan and a 63.1% decrease compared to 2019. Among the visitors are foreign, accounting for 98.9 thousand and reaching 11% of the plan but an 84.8% decrease compared to 2019. Revenue from tourism was VND29 billion, a decrease of 78% compared to 2019.

### 5) Labor and Employment

In 2020, the labor force aged 15 and older reached 1,13 million, an increase of 0.2% over 2019. Of these, 0.60 million were male workers, accounting for 53.3%, and 0.53 million were female workers, 46.7%. The urban labor force was 0.14 million, accounting for 12.2%, and the rural labor force was 0.99 million, accounting for 87.8%.

In 2020, the employed population aged 15 and over engaged in economic activity was 1.1 million, accounting for 63.7%, a decrease of 0.1% from 2019. The share of trained and employed workers aged 15 and over was 15.3%. Of these, 24% were in urban areas and 14% in rural areas. The unemployment rate for the working-age population in 2020 was 3.02%, of which 4.12% and 2.87% were in urban and rural areas, respectively.

### 2.3.3. Ben Tre Province[39]

#### 1) Economic Growth

In 2020, the GRDP of Ben Tre Province increased slightly by 0.84% from 2019, a low level compared to the past. The GRDP in 2020 was at VND55.258 trillion at the current price. The GRDP per capita was VND42.75 million, equivalent to USD1,840 (an increase of USD108 compared to 2019).

#### 2) Investment

The total investment in socio-economic development was estimated at VND19,516 billion, an increase of 18.7% compared to 2019, or 35.3% of GRDP. The state capital was estimated at VND6.46 trillion, accounting for 33.1%. The non-state sector reached VND12.67 trillion, accounting for 64.9%, and FDI reached VND380 billion, accounting for 2% of total investment capital.

As for FDI, eight projects were newly approved in 2020, with a total registered capital and additional registered capital reaching $476.3 million, of which the capital for the power production and distribution industry was the largest at $453.9 million, accounting for 95.3% of the total registered capital in 2020.

#### 3) Primary Industry

Agricultural production in the province has been facing many challenges because of climate change. In particular, salinity intrusion was at historic levels in 2016, and salinity damage has continued since then, which significantly affects people's livelihoods and agricultural production. Although the provincial government has taken the initiative to implement response measures to minimize damage to crops and livestock, agricultural production still decreased severely in 2020 compared to the previous year.

Grain production in the province reached 59.7 thousand tons (a 72.3% decrease compared to 2019), of which rice production reached 59.1 thousand tons (72.4% decrease). The production of perennial crops in 2020 was 645.5 thousand tons of coconut (1.2% increase); 83 thousand tons of rambutan (15.4% decrease); 84.5 thousand tons of pomelo ( 15.4% decrease), 84.0 thousand tons (4.6% increase), 20.8 thousand tons of longan (a 10.1% decrease), 25.1 thousand tons of lemon (a 0.6%increase), and 13.7 thousand tons of citrus (10.2% decrease).

The area of new plantations in 2020 amounted to 21.3 ha of protected forest, an increase of 51.41% over the previous year. The total number of trees in the entire province was estimated at 686 thousand, a 2.04% increase from the previous year. Development of forest products is taking place as in previous years. Timber harvest was estimated at 2,618 cubic meters, down 0.08% from the previous year, and firewood harvest was 24,350 tons, down 16% from the previous year, due to the lack of thinning of planted forest firewood, resulting in fewer native scattered trees and a downward trend in harvest.

The situation of fisheries is basically good and developing. The annual catches reached 250.5 thousand tons, an increase of 11.5% from the previous year. On the other hand, the situation of aquaculture in the province still faces many difficulties due to the COVID-19 pandemic, drought, and saline intrusion. The total aquaculture production harvested in 2020 reached 280.8 thousand tons, a decrease by 1.5% from 2019.

[39] Statistical Yearbook of Ben Tre Province, 2020

#### 4) Secondary Industry

The industrial production development index for 2020 increased by 4% compared to the previous year. Among the industrial production, processing manufacturing increased by 3.4% and paper and paper products manufacturing increased by 122%. The increase was mainly because Dong Hai Ben Tre Joint Stock Company started its operation at the end of 2019. Other industries, including tobacco products manufacturing and bed, cabinet, table, and chair manufacturing, increased by more than 10% from the previous year. Other manufacturing industries experienced sharp declines in their production indices. Electricity and distribution increased 20.1% from the previous year; water supply, waste, and wastewater management increased 10.8%; and mining increased 11.4%. The growth index for beverage manufacturing increased significantly in 2019 but declined deeply in 2020 due to the COVID-19 epidemic situation and the strict enforcement of intoxicated driving.

#### 5) Tertiary Industry

Total retail sales of goods in 2020 reached VND41.136 trillion, an increase of 11.1% compared to 2019. Tourism activity faced many difficulties due to the impact of the Covid-19 epidemic, and revenues and tourist numbers decreased significantly compared to the past. In 2020, the number of tour tourists reached 3.4354 million, decreased by 53.1%. Total tourism revenue was VND44.6 billion, decreased by 47.1%. The total accommodation and food and beverage revenue was VND5,292 billion, which decreased by 9.7%, and the revenue from other services was VND3,173 billion, which decreased by 5.5%.

Annual passenger traffic is estimated at 42.5 million passengers, a decrease of 14.4% from 2019, and passenger turnover at 1,699.8 million passenger-km, a decrease also of 9.3%. Freight traffic is estimated at 8153 thousand tons, down 10.7%, and freight turnover at 783.8 million tons-km, a decrease of 13.2%.

#### 6) Labor and Employment

The province has created 18,382 jobs, 102.1% of the annual plan, though 11% from the previous year. Of which 1,202 were sent as overseas workers under labor contracts. Only 522 people left from overseas work (at the end of 2019 and in January and February 2020), because of the COVID-19.

The ratio of workers to the labor force aged 15 and older accounted for 98.1, of which 98.46% are in urban areas and 98.07% in rural areas. The share of trained workers aged 15 and older was 12.6%. The unemployment rate of the working age group was 2.16%, while the underemployment rate was 3.89%.

### 2.3.4. Tra Vinh Province[40]

#### 1) Economic Growth

The GRDP in 2020 increased by 2.87% compared to 2019, the lowest growth rate in 2015–2020. Despite the COVID-19 pandemic, the effects of saltwater intrusion and drought, and numerous storms, the provincial economy continued to grow and did not fall into negative growth conditions.

The industrial and construction sector maintained a high growth rate of 9.84%, contributing 3.37% to the provincial economy. The service sector grew by 1.00%, contributing 0.28%. In

[40] Statistical Yearbook of Tra Vinh Province, 2020

contrast, only the agriculture, forestry, and fisheries sectors declined by 2.82%, a negative growth of 0.89%.

### 2) Investment

The local government focused on the accelerated implementation of projects to ensure the disbursement of public investment capital to stimulate the economy of the province. In addition to the projects approved in the local budget, large projects such as the expansion of Duyen Hai 3 Thermal Power Plant, Duyen Hai 2 Thermal Power Plant, Korea Wind Power Plant - Travin, Chung Nam's solar power project, Hoang Quang Group's housing project, and Travin Trade Center and supermarket projects have been implemented.

The realized social development investment capital in 2020 is lower than the previous year. The estimated total is at VND26.917 trillion, a decrease of 5.47% from 2019. Of this amount, the state capital amounted to VND6.195 trillion (decreased by 13.28%), non-state sector capital amounted to VND7.877 trillion (decreased by 22.65%), and FDI at VND12.845 trillion (increased by 15.24%).

For FDI, there were two new approved projects with a registered capital of USD2.5 million, but three projects less from 2019 with a registered capital of USD98.2 million. Investments amounted to USD 2.5 million, mainly in processing and manufacturing, and realized FDI capital in 2020 was USD1 million, a decrease of USD1.1 million from 2019. The United Kingdom was the largest investor with a newly granted capital totaling USD 2 million, while China reached USD0.5 million in 2020.

### 3) Primary Industry

Agricultural production in 2020 has faced many difficulties such as drought and saline intrusion, causing heavy impacts on production. The COVID-19 pandemic has also caused complicated negative impacts. Agricultural product exports have been stalled and directly affected the production and consumption of the people. The market for agricultural products has worsened. Weaknesses in fragmented and small-scale production have not yet encountered and kept up with modern agriculture, large-scale, and high-quality commodity production according to market demand and adapted to the needs of the market.

The grain production of the province reached 960,323 tons, a decrease of 319,031 tons from 2019. The rice production reached 939,732 tons, a decrease of 319,155 tons. Outputs of perennial industrial plants and fruit trees in 2020 are as follows. Coconut reached 308,747 tons (increased by 13,090 tons), cashew reached 164 tons (decreased by 9 tons), mango reached 11,605 tons (increased 692 tons), oranges and tangerines reached 67,505 tons (increased by 7,815 tons), longan reached 10,392 tons (decreased by 915 tons), litchi and rambutan reached 1,760 tons (decreased by 1,595 tons from 2019).

The weather in the first months of 2020 was not favorable for new plantations and for developing forest products. Heat and drought lasted longer than in 2019, and provincial forestry production faced many difficulties. The area of new plantations reached 120.85 ha, a decrease of 33.31%, of which production forests accounted for 21.54 ha (a 50% increase) and protection forests accounted for 99.31 ha (43.89% decrease). Timber production reached 77,913 $m^3$, down by 2.98% compared to 2019, corresponding to a decrease of 2,394 $m^3$.

Fisheries production in 2020 reached 228.9 thousand tons, an increase of 4.26% from the previous year. Aquaculture production was 152.9 thousand tons, increased by 10.18%. Aquaculture activity was fairly good, especially in snakehead, white-leg shrimp, and black

tiger shrimp production. High-density intensive farming of white-leg shrimp has contributed to farmers' profitability, as productivity is more than four times higher than in intensive farming.

The first months of 2020 had strong winds, which lasted longer than in the same period of the previous year, which caused some vessels not to go far and had shorter sailing times, resulting in lower production of marine products. Shrimp and fish were less profitable due to their lower value, and fishermen were less likely to go offshore, resulting in lower profits for fishermen due to the lack of higher catches of marine products.

Some vessels were restricted from sailing because of the COVID-19 pandemic and social distancing measures. As a result, the output of marine fisheries declined. Another factor that contributed to lower catches in 2020 was the continuous storms from late September to early November, which prevented some fishermen from going out on small vessels.

#### 4) Secondary Industry

In 2020, the industrial production index increased by 11.52% over the previous year. The production and distribution of electricity, gas, hot water, steam, and air conditioning increased by 18.40%, which was mainly the province's manufacturing, leading to the overall industrial growth. Mining showed signs of improvement after a long period of decline with a 17.20% increase over the previous year as many sand mining companies were again licensed to operate. Water supply and waste and wastewater treatment industries grew by 10.34%. The processing and manufacturing industries were particularly affected by the COVID-19 pandemic, which had a significant impact on export industries, such as shoes, bags, and clothing, decreasing by 9.54%.

In 2020, the production of several industrial products increased more than in the previous year. The activated carbon and coconut shell charcoal were 7.6 thousand tons, increased by 12.29%. Tablet-type pharmaceuticals, including penicillin and antibiotics, were 111 million, increased by 20.65%; uninterruptible power supplies were 11.872 million units, increased by 25.58%; electricity production was 19.158 billion Kwh, increased by 18.77%; and commercial electricity was 1.08 million Kwh, increased by 7.22%. On the other hand, the production of the following decreased: RS sugar at only 12.4 thousand tons, decreased by 31.76% from the previous year; sea salt at 6 thousand tons, decreased by 20%; frozen shrimp at 7 thousand tons, decreased by 20.27%, frozen shrimp at 7.2 thousand tons, decreased by 6.60%; and ready-mixed concrete at 266.8 thousand cubic meters, decreased by 0.86%.

#### 5) Tertiary Industry

Trade activities in 2020 maintained stable growth but not as expected, especially services, which declined deeply due to the complex spread of Covid-19, forcing many service sectors, such as food and beverage, to suspend activity for some time.

Total retail sales of consumer goods and services grew favorably in 2020 by 1.08% at VND33.5 trillion compared to 2019. In the business sector, retail sales were VND23.4 trillion accounting for 69.68% of total sales, an increase of 8.95% from the previous year. Accommodation and food services were VND5.5 trillion, accounting for 16.34% (tourism income reached VND22 billion), decreased by 18.15%, and other services were VND4.7 trillion, accounting for 13.92%, decreased by 6.61%.

Tourism in 2020 decreased compared to the previous year due to the COVID-19 epidemic, as the province strictly controlled the number of domestic and foreign tourists. Currently, the province focuses on resuming orchard tourism to attract tourists, but the pandemic and saline

intrusion have prevented many fruit trees from being harvested, limiting visitors. The income from tourism was VND115.3 billion, a 20.61% decrease from the previous year, mainly due to the pandemic. Domestic tourists staying in overnight accommodations decreased by 15.27% to 386.4 thousand arrivals, while day-trip tourists decreased by 21.76% to 349.5 thousand tourists. Tourists who used accommodations totaled 735.9 thousand arrivals, a decrease of 18.48%. The number of tourists from travel agencies was 77,000, which decreased by 36.18%.

#### 6) Labor and Employment

In 2020, the labor force in the province aged 15 and over reached 561,343, a decrease of 17,361 compared to 2019. Thus, the labor force in the province is fairly abundant but tends to decline each year. Looking at the labor force structure, the participation rate for women is 43.78%, well below the 56.22% rate for men. The labor force structure in urban and rural areas is very different, with the labor force in the province mainly concentrated in rural areas, with a decreasing trend year by year. In 2020, 16.28% of the labor force aged 15 years and older was in urban areas and 83.72% in rural areas.

In 2020, 550,028 workers aged 15 and older worked in the economic sector, 13,715 fewer than in 2019. Among this, 5.7% or 31,413 employees worked in the state sector. The non-state sector accounted for 90.4% or 497,204 employees, and the foreign capital sector accounted for 3.9% or 21,411 employees.

The percentage of workers who received training, such as with a degree or certificate, was 11.6%, a decrease of 0.2% from 2019. Trained workers in the urban area are 25.1% and 8.9 in the rural area.

The unemployment rate of the working-age labor force in 2020 was 2.22%, of which 3.25% are in urban areas and 2.02% in rural areas. The underemployment rate of the working-age population in 2020 was 4.05%, of which 1.70% in urban areas and 4.50% in rural areas.

### 2.3.5. Vinh Long Province[41]

#### 1) Economic Growth

GRDP (2010 constant prices) in 2020 increased by 3.9% from 2019, of which agriculture, forestry, and fisheries increased by 9.53% and contributed 3.13% to the industrial sector, while construction decreased by 1.34% (industrial sector decreased by 3.06% and construction increased by 2.88%), a decrease of 0.26% to the total, and the services sector increased by 1.61%, contributing 0.67%.

The current GRDP is VND58.23 trillion and VND56.93 million per capita or equivalent to USD2,358, an increase of USD111 compared to 2019. Regarding the economic structure, the agriculture, forestry, and fishery sectors accounted for 36.24%, industry and construction at 17.25%, and services at 46.51%.

#### 2) Investment

Total investment at current prices in 2020 reached VND14.544 trillion, an increase of 2.52% from 2019. Of the total investment, the state capital accounted for 26.81% at VND3.899 trillion, an increase of 23.83% from the previous year. The non-state capital accounted for 62.85%, or VND9.141 trillion, an increase of 0.52%. The FDI was at 10.34% or VND1.504 trillion, a

[41] Statistical Yearbook of Vinh Long Province, 2020

decrease of 22.64%.

In 2020, there were five newly-licensed FDI projects with a registered capital of USS88.82 million. Compared to 2019, projects were fewer by seven and 23.8% less registered capital.

The total number of foreign projects in 2020 was 69, with a registered capital of USD86.34 million, mostly in the processing and manufacturing industries.

### 3) Primary Industry

Grain production was 898.8 thousand tons, which was down by 1.49%, of which rice production was 895 thousand tons (a decrease of 1.46%). The per capita grain production was 879 kg/person, which was a decrease of 13 kg/person from 2019.

In 2020, the total production of wood logging reached 16.5 thousand $m^3$, and firewood logging was at 376.4 thousand tons.

The production of aquatic products amounted to 153,303 tons, a decrease of 2.58% from the previous year. Of this amount, aquaculture production was 146,776 tons, a decrease of 2.71%, while the catch increased by 6,527 tons or 0.45%.

### 4) Secondary Industry

The industrial production index for 2020 was 2.48% lower than the previous year, with electricity, gas, steam, and air conditioning supply increased by 6.89%; water, sewage, waste disposal, and septic activities also increased by 9.42%, private mining and quarrying decreased by 29.21%, and manufacturing decreased by 3.13%.

### 5) Tertiary Industry

The total retail sales of goods and social services in 2020 were VND56.837 trillion, an increase of 5.22% from 2019. Among the total retail sales of goods and social services, retail sales increased by 9.74%; accommodation, food, and beverage decreased by 10.91%; tourism decreased by 43.54%; and other services decreased by 1.95%.

The total number of overnight stays and tourists reached 1.17 million, a decrease of 20.22% from the previous year, of which 1.13 million people were overnight visitors (16.79% decrease and 45 thousand were day visitors (a 60.99% decrease).

### 6) Labor and Employment

In 2020, the labor force aged 15 years and older in Vinh Long Province reached 603,596, a decrease of 3.02% compared to 2019. Of the total, 331,502 male workers accounted for 54.92%, and 272,094 female workers accounted for 45.08%. The labor force in the urban area was 121,795, accounting for 20.18%, and 481,801 in the rural area, accounting for 79.82%.

The number of workers in the economic sector reached 589,489, a decrease of 2.97% compared to 2019; the share of trained was 15.8%, of which 32.51% were trained in urban areas and 12.72% in rural areas.

The unemployment rate is 2.67%, of which 5.11% is in urban areas and 2.14% in rural areas.

### 2.3.6. Dong Thap Province[42]

#### 1) Economic Growth

The GRDP (2010 constant prices) of Dong Thap Province in 2020 increased by 2.50% from 2019, of which agriculture, forestry, and fisheries sectors increased by 2.47%, contributing 0.87% to the overall growth. The industry and construction sectors increased by 5.77% (industry sector increased by 4.92% and construction sector by 9.98%), contributing 1.34%. The services sector increased by 4.20%, contributing 0.29%.

The GRDP at current prices in 2020 amounted to VND86.5375 trillion, and the GRDP per capita was VND54.1 million per year, an equivalent of USD2,338 (USD115 more than in 2019). Regarding the economic structure in 2020, the agriculture, forestry, and fisheries sectors accounted for 36.16%, industry and construction at 19.62%, and services at 44.22%.

#### 2) Investment

The socio-economic investment at current prices in 2020 was VND18.779 trillion, increased by 6.39% from 2019. The state capital from the investment accounted for 23.27% at VND4.3694 trillion, a decrease of 14.42% from the previous year. The non-state sector accounted for 73.93% at VND13.8831 trillion, which was an increase of 12.71%, and FDI accounted for 2.80% at VND526.7 billion, an increase of 130.42%.

#### 3) Primary Industry

Grain production totaled 3,418.7 thousand tons, an increase of 0.75% over 2019. Among them, paddy rice production was 3,374.5 thousand tons, up 0.74%. Per capita of grain production was 2,137 kg/person, an increase of 14 kg/person compared to 2019.

Production of some fruit trees was as follows: oranges, tangerines, and grapefruit at 119.9 thousand tons longan at 53.5 thousand tons, mangoes at 129.6 thousand tons, and coconuts at 4.8 thousand tons.

In 2020, the plantation area was 110 ha, an increase of 8.11% compared to 2019. Production forest accounted for 78 ha of the area, concentrated in the Khao Lanh area (72 ha). The total production of timber harvested amounted to 109.4 thousand $m^3$, and the volume of firewood harvested reached 342.7 thousand tons.

The area for aquaculture in 2020 was 6,457 hectares. It decreased by 0.34% compared to 2019. Fisheries production was 565,837 tons, a decrease of 3.15%. Of this total, aquaculture production was 547,116 tons, which decreased by 3.34%, and fisheries production was 18,721 tons, which increased by 2.52%.

#### 4) Secondary Industry

Due to the COVID-19 pandemic, the Industrial Production Index (IIP) in 2020 did not increase much compared to the previous year. It only increased by 3.55% (8.30% in 2019), of which manufacturing increased by 3.43% (7.92% in 2019), electricity, gas steam, air conditioning supply increased by 2.91% (11.88% in 2019), water supply, sewerage, waste disposal and septic activities increased by 11.78% (11.89% in 2019), and mining and quarrying increased by 2.71% (27.56% in 2019).

The Industry Shipment Index for manufacturing in 2020 increased by only 0.59% over the previous year. Food production increased by 0.76%, textile production by 3.54%, wood and

[42] Statistical Yearbook of Dong Thap Province, 2020

wood and cork products production by 20.10%, beverages production by 22.12%, and apparel production by 27.12%. Meanwhile, tobacco products production decreased by 4.83% and pharmaceutical and medical products decreased by 16.99%.

In December 2020, the inventory index for the manufacturing sector increased by 38.21% from the previous year. Some of these industries showed higher growth in their inventory indexes. Clothing production increased by 57.95%, leather and related products by 47.08%, textiles by 42.33%, pharmaceuticals and medicinal chemicals products by 39.89%, food products by 38.36%, and wood and wood and cork products by 38.22%.

#### 5) Tertiary Industry

Trade and services had a negative growth rate in 2020. The total retail sales in 2020 were VND94.1957 trillion. Compared to 2019, it decreased by 0.18%. Of that total, retail sales of goods increased by 2.54%, accommodation and food services decreased by 8.03%, tourism decreased by 68.51%, and other services decreased by 12.56%.

The total number of tourists and sightseeing throughout 2020 was at 1,174.7 thousand, a decrease of 24.81% from the previous year. In particular, overnight visitors were at 1,160.6 thousand, decreased by 21.59%, while tourists by tour were at 14.2 thousand, decreased by 82.74%.

Trade activities also faced many difficulties due to COVID-19 pandemic, especially in foreign trade. In 2020, the total exports reached USD1,135.5 million, a decrease of 16.24% from 2019. The total imports, meanwhile, amounted to USD291.8 million, which decreased by 25.04%. The trade surplus of goods in 2020 was USD 843.6 million.

#### 6) Labor and Employment

In 2020, the labor force of the province aged 15 years and older reached 941,849, a decrease of 1.08% compared to 2019, of which 517,736 were male workers, accounting for 54,98%, and 420,413 were female workers, accounting for 45,02%. Of the total, the urban labor force was 168,590, accounting for 17,90%, and the rural labor force was 773,259, accounting for 82,10%.

The number of workers aged 15 years and older working in the economic sector in 2020 reached 924,122, a decrease of 1.08% compared to 2019. The percentage of trained workers in 2020 reached 14.97%, of which 26.50% were trained in urban areas and 12.49% in rural areas. The unemployment rate for the labor force aged 15 years old was 2.6%. The unemployment rate for the labor force aged 15 years old is 2.79%, of which 3.93% is in urban areas and 2.55% in rural areas.

### 2.3.7. An Giang Province[43]

#### 1) Economic Growth

GRDP in An Giang Province in 2020 increased by 2.46% compared to 2019. Among the sectors, agriculture, forestry, and fisheries increased by 1.97%, contributing 0.74% to overall growth. Industry and construction increased by 6.66%, contributing 0.98%, and the services sector increased by 1.48%, contributing 0.65%.

[43] Statistical Yearbook of An Giang Province, 2020

### 2) Investment

The investment capital in 2020 was VND18,833.6 billion, an increase of 6.43% from 2019 at current prices. The investment amounted to 21.22% of the province's GRDP. The state sector accounted for VND7.3419 trillion (38.98% of the investment capital realized in the region), an increase of 8.34%, and the non-state sector accounted for VND11,331.2 billion (60.16% of the total), an increase of 6.34%. The FDI was VND160.4 billion (0.85% of the total), which decreased by 61.08%.

### 3) Primary Industry

In 2020, the province had 687.8 thousand hectares planted, which is an increase by 1% compared to the previous year. Rice production took 637.2 thousand hectares, an increase of 1.76%, and the total rice production was 4 million tons, a 2.4% increase. The existing area of perennial crops was 19.3 thousand hectares, an increase of 5.0% (2.951 newly planted hectares). The production area of mango was 11.9 thousand ha, banana was 872 ha, citrus was 501 ha, and coconut was 1,269 ha. The harvest reached about 270 thousand tons, an increase of 6.53% over the previous year. Mango production increased by 8.25% to 178.1 thousand tons, banana by 77% at 11.5 thousand tons, orange by 17.61% at 1.8 thousand tons, and cashew by 72.5% at 1.2 thousand tons.

In the same year, the Pangasius exports was also affected by the COVID-19 pandemic. The exports encountered difficulties and sales prices were deeply below cost, resulting in a decrease in the yield compared to the previous year. The cultivated area (including seed production area) was 3,310 ha, a decrease of 4.23% compared to 2019. Of this total, the aquaculture area accounted for 1,764 ha (53.3% of the total).

Fishery production was 511.1 thousand tons, a decrease of 5.33%. The catch of Pangasius was at 413.6 thousand tons, a decrease of 5.36%, and The catch of other fish species such as snakehead, tilapia, and catfish was about 80 thousand tons.

### 4) Secondary Industry

The IPI for 2020 increased by 3.28% from 2019, the lowest increase since 2015. The industries with the highest increase in the production index were electricity generation and distribution (most new products are solar power), with a 19.17% increase; processing and manufacturing had the lowest index at 0.61%; water supply, wastewater and waste treatment, which has been developing steadily, increased 9.22%; and mining increased 9.94%.

### 5) Tertiary Industry

In 2020, the total retail sales of consumer goods and services were VND80.657 trillion, an increase of 6.29% from 2019. Retail sales of goods were VND57.379 trillion, an increase of 11.59%; accommodation and food services were VND13,081.8 billion, an increase of 10.66%; and other services were VND9,428 billion, a 5.41% increase.

Import/Export activity was negatively affected by the COVID-19 pandemic and global supply chain disruptions, but import/export transaction volume still maintained stable growth. Total import and export turnover of goods reached USD 1,101.6 million, an increase of 4.92% compared to 2019. In particular, merchandise exports reached USD 930 million, an increase of 4.49% compared to 2019. Among them, exports reached USD 852 million (accounting for 91.61% of total exports), an increase of 5.14%.

Rice had the largest export value of USD270.1 million in 2020, an increase of 18.60% over 2019. Exports of fishery products reached USD281.9 million, increased by 1.42%; vegetables

and fruits reached USD16.7 million, increased by 4.38%; and textiles and garments reached USD135.4 million, increased by 4.17%.

Imports of goods in 2020 reached USD171.61 million, an increase of 7.26% over 2019. Imported goods were mainly capital goods at USD145.61 million, an increase of 5.37%, and consumer goods were USD26.01 million, an increase of 19.19%.

#### 6) Labor and Employment

In 2020, the labor force aged 15 years and older reached 985,550, 16,947 fewer than in 2019, consisting of: 58.73% male workers, 41.27% female workers, 30.86% urban workers, and 69.14% rural workers.

The number of workers aged 15 years and older working in 2020 was 962,445, decreased by 9,714 compared to 2019. There are 59,989 in the state economic sector, accounting for 6.23% of the total number of workers in the province, 895,082 in the non-state economic sector, accounting for 93%, and 7,374 in FDI, accounting for 0.77%.

In 2020, the percentage of working trained workers aged 15 and over was 13.86% (lower than the province's 14.56% in 2019), with 19.09% in the urban area and 11.53% in the rural area.

The unemployment rate considering all age groups in 2020 was 2.53% (lower than 3.18% in 2019) with 2.59% in the urban area and 2.50% in the rural area. The underemployment rate, on the other hand, was 2.72% (higher than 2.0% in 2019) with 1.13% in the urban area and 3.43% in the rural area.

### 2.3.8. Kien Giang Province[44]

#### 1) Economic Growth

GRDP (2010 constant prices) for 2020 is VND68,956.9 billion, reaching 96.10% of the annual plan, which was an increase of 3.05% from the previous year

#### 2) Investment

The total socio-economic investment capital in 2020 reached 46.319.65 trillion dong, or 96.50% of the plan, a decrease of 3.37% from 2019. The development investment capital by the province amounted to VND41.44 trillion, reaching 93.39% of the plan, which was a decrease of 1.35% from 2019. The investment capital by provincial departments amounted to VND4.879 trillion, 134.61% of the plan, a decrease of 17.71%. Of the total development investment capital managed by the province, the state budgeted capital amounted to VND6,573.2 billion, reaching 107.6% of the plan, an increase of 20.57% over the previous year.

For the investment and production situation in the economic zones in 2020, the total investment in industrial zones reached VND809.56 billion, an increase of 6.96% compared to 2019. Among them, the investment in Thanh Loc Industrial Zone amounted to VND803.94 billion, an increase of 7.11% (mainly from the capital sources of enterprises). The increase in investment was mainly attributed to the construction of new projects such as the Thanh Loc garment factory project at VND178.3 billion; the Thanh Loc shoe sole processing factory project at VND138 billion; and PT Mekong's electrical equipment, water, and plastic pipe manufacturing and assembly project at VND117 billion. The Thanh Loc Industrial Park Project

[44] Statistical Yearbook of Kien Giang Province, 2020

has an annual output and business value of VND5.16 trillion, mainly producing beer, building materials, leather shoes, and processing frozen seafood products.

### 3) Primary Industry

Agriculture and fisheries production reached VND22.907.56 trillion, 102.20% of the plan and an increase of 3.43% from the previous year, contributing to the province's overall growth. Specifically, agricultural production was VND15.5231 trillion, increased by 3.70% from the previous year, contributing 0.83 percentage points to the growth rate. Fisheries production was VND7.2154 trillion, increased by 3.05% from the previous year, contributing to a growth rate of 0.31 percentage points. The growth rate of the agriculture industry increased by 0.33%, causing a 1.29% increase in the agricultural sector, which was driven by a steady increase in rice production. On the other hand, the fisheries sector decreased by 1.61% due to a more than 4% decrease in fisheries.

### 4) Secondary Industry

The output of the secondary industry amounted to VND13.8096 trillion, or 97.55% of the planned output, an increase of 5.81% over the previous year. The secondary industry contributed 1.13 percentage points to the overall growth, of which the industrial sector grew by 5.23% at ND8.9466 trillion. On the other hand, the processing industry decreased by 4.80%, resulting in a lower growth rate in this sector.

### 5) Tertiary Industry

In 2020, the retail sales of consumer goods and services totaled VND110.8 trillion, an increase of 2.28% from the previous year. By industry, the retail sales of goods were VND82.706 trillion, accounting for 74.64% of the total, an increase of 4.86% from the previous year. Accommodation and food services accounted for 13.14% of the total at VND14,552 billion, an 8.52% decrease; travel and tourism accounted for 0.20% at VND221 billion, a 50.69% decrease; and other services accounted for 12.02% at VND13.321 trillion, a 1.67% increase. In 2020, revenues from accommodation reached VND4.272 trillion, an 8.05% decrease compared to 2019.

In 2020, merchandise exports amounted to USD707.39 million, an increase of 3.93% over 2019. The province's main export commodities are agricultural products with USD236.15 million, an increase of 19.85% from the previous year; fisheries products at USD242.87 million increased by 14.34%, leather shoes, at USD 147.23 million, decreased by 18.32%; electricity production at USD 8.58 million, a 12.76% decrease; and other goods at USD72.58 million, a 10.53% decrease.

The import transaction of goods in 2020 reached USD130 million, a decrease of 5.05% compared to 2019. Some of the largest imports in 2020 were machinery, equipment, and spare parts, amounting to USD87.36 million, a decreased of 4.02% from 2019, and raw materials and materials at USD42.64 million, a decrease of 7.08%.

### 6) Labor and Employment

In 2020, the labor force aged 15 and older (preliminary figures) was 950,376, which was 2,186 fewer than in 2019. Males accounted for 567,527 or 59.72%, while females accounted for 382,849 or 40.28%. By region, urban areas have 262,060 labor force members, representing 27.57%, and rural areas have 688,316, representing 72.43%.

In 2020, the percentage of 15 years and older working is 14.90% (higher than in 2019 at 13.60%), with 23.80% in urban areas and 11.60% in rural areas.

The estimated labor force unemployment rate by age was 4.22% (3.56% in 2019), of which 3.92% (3.52% in 2019) is in the urban areas and 4.83% (3.57% in 2019) in rural areas. The labor shortage rate was 2.58% (2.69% in 2019), of which 2.02% (0.77% in 2019) were in the urban areas and 3.21% (3.47% in 2019) were in rural areas.

### 2.3.9. Can Tho City[45]

#### 1) Economic Growth

GRDP (2010 prices) in 2021 decreased by 2.79% from 2019. Given that percentage, the agriculture, forestry, and fisheries sectors increased by 1.12%, contributing 0.13% to the overall increase; industry and construction decreased by 10.70%, a decrease of 3.31%; and services increased by 0.79%, contributing 0.40%. The gross domestic product growth for the region in 2021 is projected to decrease by 2.79%, failing to reach the plan.

#### 2) Investment

Investment funds from the state budget capital managed by the city in 2021 were at VND673.26 billion, while the realized FDI was at VND100.1 billion, other capitals were at 34.42 billion VND, and local budget was at 255.96 billion VND. Investment capital from state budget capital managed by the city amounted to VND4.2141 trillion in 2021, 67.31% of the city's annual plan. The city converted one domestic project from FDI (a project for an auto maintenance center, auto dealership, and rental office building with a registered capital of USD 6 million) and the city approved five new FDI projects with a registered capital of approximately USD 1,316.8 million. There were 85 FDI projects with a registered investment capital of approximately USD 2,043 million and executed capitals of approximately USD 531.58 million, representing 26% of the total registered capital as total.

#### 3) Primary Industry

Agricultural, forestry, and fisheries production in 2021 had relatively favorable weather conditions, resulting in good productivity in crops, livestock production, and aquaculture. The number of forestry trees planted was 867,000 trees, an increase of 7,000 trees over the same period in 2020. The increase was mainly due to the planting of trees used in gardens. The reason for this increase can be attributed to increasing urbanization. 2021 forest development products did not increase or decrease much when compared to the previous year. Lumber decreased by 0.10%, firewood decreased by 0.72%, bamboo decreased by 3.13%, construction increased by 0.23%, bamboo shoots decreased by 6.25%, and nipa leaves decreased by 13.33%.

The area of aquaculture was about 8,253 ha, an increase of 322 ha compared to 2020. Of this total, catfish intensive and semi-intensive aquaculture area was 721 ha (a decrease of 2.04% from 2020), the remaining species was about 7,495 ha (an increase of 4.66%), shrimp aquaculture area for storage was 9.6 ha (a decrease of 2 ha from 2020), and other aquaculture area was 27.85 ha, almost unchanged compared to 2020. The total fishery production amounted to 217,345 tons, a decrease of 7,746 tons or 3.44% from 2020. Domestic fisheries production was about 6,627 tons, an increase of 276 tons or 4.34% over 2020. Aquaculture production was about 217,718 tons, a decrease of 3.67% from 2020. Of this amount, production from freshwater farmed fish amounted to 209,463 tons, a 3.77% decrease from 2020.

[45] Website of Can Tho City

#### 4) Secondary Industry

The IPI decreased by 10.11% in 2021 compared to the previous year. Major industries experienced steeper declines in the industrial production index in 2021 than in the previous year. Among them, processing and manufacturing decreased by 9.98%, electrical distribution decreased by 12.03%, and water supply and waste management and treatment activities decreased by 6.92%. Major industrial products still declined, with frozen fillet products down 9.03%, rice milling down 22.47%, beer cans down 19.4%, pharmaceutical tablets down 25.6%, cement down 33.33%, and nails, caps, staples, and screws down 40.8%. The situation of industrial production activities of the city's enterprises showed a positive change from the previous month, but the number of enterprises engaged in production and sales activities and the number of employees working in these enterprises are still at low levels compared to the same period of the previous year.

#### 5) Tertiary Industry

In 2021, the number of newly registered enterprises reached 1,250 with total capital of VND16 trillion, which reached 78.12% of the plan in terms of number of enterprises and over 23.07% of the plan in terms of capital, decreased by 16.56% in terms of number of enterprises and increased by 30% in terms of capital compared to 2020.

#### 6) Labor and Employment

In December 2021, the employment index for employees in industrial enterprises increased by 1.67% over the previous month, of which state-owned enterprises increased by 0.33%, non-state-owned enterprises decreased by 0.29%, and FDI enterprises increased by 15.96%. The labor force in enterprises changed little compared to the previous month but still decreased compared to the previous year due to COVID-19. The labor participation rate decreased compared to the same period.

### 2.3.10. Hau Giang Province[46]

#### 1) Economic Growth

In 2020, GRDP of Hau Giang Province has increased by 4.53% over 2019, of which agriculture, forestry, and fisheries sectors increased by 3.09% with a contribution of 0.85 percentage points; industry and construction increased by 14.62% with a contribution of 3.40 percentage points; and the service sector increased by 1.41% with a contribution of 0.55 percentage points.

The GRDP at current prices in the same yar reached VND38,362,167 million, with a GRDP per capita of VND52.78 million. The GRDP per capita was equivalent to USD2,275, an increase of USD177 compared to 2019. Regarding the economic structure in 2020, agriculture, forestry, and fisheries accounted for 26.53%, industry and construction 24.58%, services 39.13%, and product taxes minus product subsidies 9.76% (25.86%, 22.97%, 40.95%, and 10.21%, respectively, in 2019).

#### 2) Investment

The total investment capital amounted to VND21,369,240 million at current prices, an increase of 10.72% over 2019. Of this amount, the state capital reached VND5,188,515 million, a decrease of 1.19% from the previous year, while the non-state sector capital reached

[46] Statistical Yearbook of Hau Giang Province, 2020

VND15,030,233 million, an increase of 20.36%. FDI capital was VND1,150,492 million, a decrease of 26.35%.

### 3) Primary Industry

Grain production was 1,312,712 tons, an increase of 34,823 tons over 2019, of which rice production was 1,294,044 tons, an increase of 35,120 tons.

For annual crop production, the production of sugarcane was 590,450 tons (decreased by 299,967 tons), while vegetables and legumes were 249,178 tons (increased by 8,426 tons). For the production of perennial industrial plants and fruit trees, palms were 9,855 tons, increased by 78 tons, oranges were 104,751 tons, increased by 6,377 tons, and mangoes were 12,673 tons, increased by 470 tons.

The area of the newly planted forest was 420.62 ha, while the production forests and timber production increased by 14,192 $m^3$ or 2.11%.

Aquaculture production totaled 73,594 tons, an increase of 5.23% over the previous year, of which fish production was 73,921 tons (an increase of 4.68%) and shrimp production was 42 tons (an increase of 0.84%). Fisheries production, mainly freshwater fish, totaled 2,666 tons, a decrease of 2.31% from the previous year.

### 4) Secondary Industry

In 2020, the IPI increased by 7.80% over 2019, including a 7.77% increase for processing and manufacturing, 8.55% for electricity production and distribution, and 12.41% for water supply and waste and wastewater management and treatment activities. In 2020, many industrial products increased compared to the previous year. Fresh and chilled fish fillets and other fish meat reached 11,267 tons (a 3.30% increase), canned pineapple reached 15,266 tons (9.03% increase), rice (milled or not) reached 761,220 tons (17.04% increase), and animal feed reached 220,500 tons (7.43% increased).

### 5) Tertiary Industry

In 2020, the total retail value of consumer goods and services was VND39.527.15 trillion, an increase of 0.14% over the previous year. Of this total, the retail goods industry totaled VND30.128 trillion, accounting for 76.22%, which was an increase of 2.37% over 2019. Accommodation and food services reached VND5.943 trillion, accounting for 15.04% of the total and decreased by 5.71%, and services and tourism amounted to VND3.4501 trillion, accounting for 8.74% of the total (a 7.53% decrease from the previous year). Revenue from accommodations amounted to VND110.04 billion (an 11.39% decrease from the previous year). The number of tourists served by accommodation facilities totaled VND506.65 million.

### 6) Labor and Employment

In 2020, the labor force population aged 15 years and older was 402,327, which was 17,973 lesser than in 2019, of which 58.05% were males and 41.95% were females. The urban labor force was 23.83% and the rural labor force was 76.17% of the total labor force, while the labor force aged 15 years and older decreased by 15.8% compared to 2019. The labor force in rural areas decreased by 20,000 in 2020.

Workers in the economic sector in 2020 is at 391,394, a decrease of 16,806 from 2019, of which 90,302 were in urban areas and 301,092 in rural areas.

The unemployment rate for the working age group in 2020 was 3.05%, of which 6.57% were in urban areas and 1.93% in rural areas.

### 2.3.11. Soc Trang Province[47]

#### 1) Economic Growth

The preliminary GRDP at constant 2010 prices was VND35,035 billion, an increase of 1.71% over 2019. Of this amount, the agriculture, forestry, and fisheries sectors totaled VND15.942 trillion (a 0.29% decrease), industry and construction at VND5.823 trillion (a 12.60% increase), and the services sector at VND12.85 trillion (a 0.41% decrease).

#### 2) Investment

In the first six months of 2020, due to the COVID-19 pandemic, the execution of investment capital from locally controlled capital sources was still delayed, and the execution of social investment capital was relatively low. In the latter half of 2020, the pandemic situation in the country was under control. The construction progress of projects and works was accelerated, and at the same time, several projects with large total investment value (especially wind power projects) were launched. The realization of development investment capital in the province was VND14.9604 trillion at current prices, an increase of 11.58% over the previous year (of which state capital is VND4,591.65 billion, an increase of 11.93%, non-state capital VND10,234.1 billion, an increase of 11.72%, and FDI was VND1346.9 billion, an increase of 18.93% over the previous year).

#### 3) Primary Industry

In 2020, rice crop areas totaled 353,687 ha. Rice production reached 2,079,945 tons, 1.66% above the plan but a 4.24% decrease from the previous year.

Annual crops occupied 49,958 ha, or 12.38% of the total area planted. In 2020, annual crop production was negatively affected by weather and natural disasters. The first months of the year are marked by long periods of heat and deep seawater penetration, and the last months by heavy rains and high tides. Fruit trees totaled 27,781 ha, with 7,276 ha of oil-bearing fruit trees, mostly palm, totaling 1,383 ha, an increase of 23.47% over the previous year.

Forestry activities focused mainly on replanting exploited forest areas, planting new forest areas, and caring for planted forest areas. In 2020, the area of new plantations was 835 hectares, a decrease of 11.16% from the previous year. Wood production was 98,567 $m^3$, an increase of 3.48% over the previous year. Firewood production was 105,762 tons, an increase of 1.50% over the previous year.

Total fishery production in 2020 was 325,295 tons, an increase of 3.69% over the previous year. Fish production totaled 149,686 tons, accounting for 46.02% of total production, an increase of 12.55% over the previous year. Shrimp production amounted to 162,090 tons, representing 49.83% of total production, decreased by 3.71% from the previous year, or 6,238 tons, while the production of other fishery products amounted to 13,519 tons, 4.16% of total production, increased by 9.15% from the previous year, or 1,333 tons. Fisheries production totaled 66,987 tons, representing 20.59% of total production, or 2,805 tons, an increase of 4.37% over the previous year. Aquaculture production totaled 258,308 tons, representing 79.41% of total production, or 8,784 tons, increased by 3.52% over the previous year. In 2020, the area under aquaculture was 76,270 ha, which decreased by 3.42% from the previous year. By fishery type, the shrimp aquaculture area was 51,738 ha, which decreased by 10.16% from the previous year, the fish aquaculture area was 22,872 ha, which increased by 13.64%

[47] Statistical Yearbook of Soc Trang Province, 2020

from the previous year, and other aquaculture was 1,160 ha, increased by 32.27%.

### 4) Secondary Industry

In 2020, the province's industrial production was not as strongly affected by the COVID-19 pandemic due to the relatively large share of the fish processing industry. Industrial production still maintained a favorable growth rate. Among them, the food processing industry (mainly processing of marine products for export) accounted for 84% of the total value and made an important contribution to the overall growth of the province's industry.

In the same year, the industrial production index increased by 17.48% (of which processing and manufacturing increased by 18.14%; food processing increased by 24.12%; processing and preservation of products, such as seafood products, increased by 24.79%; production and distribution of electricity, gas, hot water, steam, and air conditioning increased by 6.22%; and water supply, waste management, and water treatment activities increased by 2.58%). Several industries experienced sharp declines, including a 14.61% decrease in beverage production and a 29.26% decrease in apparel production (mainly by foreign direct investment firms) due to the dual effects of the COVID-19 epidemic and the decline in alcohol consumption.

### 5) Tertiary Industry

In 2020, total retail sales of consumer goods and services was VND48.0059 trillion, a decrease of 9.16% from 2019 (of which goods retail sales decreased by 3.07% and accommodation and food services decreased by 3.07%). Other services decreased by 26.18%.

Total retail sales in 2020 were VND33.0832 trillion, a decrease of 3.07% from 2019. The food group increased by 7.33%, but overall sales decreased only slightly.

Revenue from accommodation and travel services in 2020 was VND7,673.5 billion, a decrease of 16.01% from 2019. Revenue from other services was VND6,500.3 billion, which decreased by 26.18% from the previous year. Accommodation, food and beverage, as well as service activities, especially entertainment services and education and training services, are again increasing in the fourth quarter of 2020but are heavily impacted by the pandemic and are generally still declining very strongly for the full year of 2020.

The actual export value of merchandise in 2020 is USD1.115 billion, a 23.89% increase over the 2020 plan and a 28.73% increase over the previous year. The actual total imports of merchandise in 2020 was USD192 million, an increase of 28% over the plan for 2020 and 78.66% over the previous year.

### 6) Labor and Employment

The province created 27,614 jobs (106.07% of planned), which decreased by 13.43% from the previous year. It provides counseling for employees to find employment at home and abroad, introduces and supplies workers to work in and outside the province, instructs workers who wish to register to work overseas under a contract for a certain period, introduces the supply of workers to the overseas labor market, holds job fairs, and accepts and processes unemployment insurance registration documents in accordance with regulations.

### 2.3.12. Bac Lieu Province[48]

#### 1) Economic Growth

The GRDP in 2020 was 4.08% higher than in 2019. Of this increase, agriculture, forestry, and fisheries increased by 3.52%, industry and construction increased by 7.71%, services increased by 2.79%, and product taxes, net of subsidies on production, increased by 4.21%.

The GRDP per capita was VND54.37 million. The economic structure in 2020 continued to move toward industrialization, of which agriculture, forestry, and fisheries accounted for 42.57%, industry and construction for 19.20%, services for 33.15%, and production taxes net of production subsidies for 5.08%.

#### 2) Investment

Total realized investment in Bac Lieu Province in 2020 amounted to VND27.5423 trillion at current prices, a 17.83% increase over 2019. The state sector reached VND3.768 trillion (accounting for 13.68% of the province's total realized investment), increased by 10.74% over the previous year; the non-state sector was VND23.6141 trillion (85.74% share), increased by 18.71%; the FDI sector surged to VND159.7 billion (0.58%), 101.38% over the previous year. Regarding the FDI in 2020, the province launched one new project with a total registered investment of USD4 billion.

#### 3) Primary Industry

Grain production in 2020 reached 1,172.18 thousand tons, an increase of 2.05% over the previous year. Among them, rice production amounted to 1,171.13 thousand tons, which was an increase of 2.05%.

Newly and intensively planted forests amounted to 1.57 ha. Wood production reached 4,320 $m^3$, an increase of 2.49% over the previous year.

Marine products production reached 380.75 thousand tons, increased by 5.74% from 2019. Aquaculture production harvested 257.68 thousand tons, an expansion of 6.54%. Aquatic capture production reached 123.07 thousand tons, an increase of 4.11%. During the year, under the direction of the Prime Minister, Bac Lieu Province invested in the construction of a "high-tech agricultural zone for the shrimp industry" with the goal of "making Bac Lieu the center of the shrimp industry in the country." Currently, the project has completed 90% of the first phase of technical infrastructure and has selected 9 investment companies.

#### 4) Secondary Industry

The IPI for 2020 increased by 4.11% compared to 2019. Of this increase, the index for mining (salt mining) increased by 11.17%, processing and manufacturing increased by 5.13%, and the index for the production and supply of electricity, gas, steam, and air conditioning was 92.85%, the same as the previous year's index. In addition, the index for water supply, waste treatment, and purification increased by 12.61% over the previous year.

Production of several key industrial products in the province increased significantly over the previous year. For example, frozen seafood products for export reached 97,146 tons, an increase of 9.80%; iodized salt reached 10,152 tons, an increase of 5.09%, commercial electricity reached 1,101.4 million kWh, an increase of 5.21%; tap water reached 19,288,900 $m^3$, an increase of 80.49%; and various types of beer reached 31.98 million liters, an increase

[48] Statistical Yearbook of Bac Lieu Province, 2020

of 66.03% over the previous year.

#### 5) Tertiary Industry

In 2020, the total retail sales of consumer goods and services reached VND63.8386 trillion, an increase of 3.69% over the previous year.

Tourism reached VND4.64 billion, an increase of 87.05% over the previous year. Overnight visitors totaled 620.81 thousand (87.51% increase), and day tourists totaled 2,400.15 thousand (91.15% increase).

Passenger traffic in 2020 reached 128.22 million, an increase of 4.67% over the previous year, and passenger traffic was 3,062.29 million passenger-km, an increase of 4.32%. Cargo traffic reached 17.33 million tons, an increase of 5.44% from the previous year, and freight traffic was 821.91 million tons/km, an increase of 4.75%.

#### 6) Labor and Employment

In 2020, the province's working population over 15 years old reached 525,275, an increase of 915 compared to 2019. In the same year, the working population over 15 years old was 508,135, an increase of 502 compared to 2019, of which the state sector had 27,336 people, accounting for 5.38%. The non-state sector had 21 477,647 employees, accounting for the highest share at 94%, and the FDI sector had 3,152 employees, accounting for 0.62%.

The unemployment rate for the working age population in 2020 was 3.26%, of which 3.09% were men and 3.44% were women, 2.84% in urban areas and 3.34% in rural areas. The underemployment rate for the working-age population was 0.6%, 0.58% for men and 0.62% for women, 0.55% for urban areas and 0.62% for rural areas.

### 2.3.13. Ca Mau Province[49]

#### 1) Economic Growth

GRDP for 2020 was VND59,272 billion, (2010 constant prices) increased 0.6% over 2019. Agriculture, forestry, and fisheries decreased by 2.2%, industry and construction increased by 3.5%, and services increased by 1.4%. Of which agriculture, forestry, and fisheries accounted for 36.4%, industry and construction 28.6% and services 28.8%.

GRDP at current prices in 2020 reached VND99.544 trillion, and GRDP per capita was VND56.1 million, an increase of VND1.5 million compared to 2019. In USD, GRDP per capita in 2020 reached USD 2,397, an increase of 2.3% or 189 USD compared to 2019.

#### 2) Investment

Socio-economic development investment amounted to VND36.74 trillion, or 98.5% of the plan, increased by 11.4% from the previous year. The non-state sector amounted to VND22.3 trillion, decreased by 4.5%; FDI was VND4.268 trillion, decreased by 14.9%, and the state sector was VND6.41 trillion, increased by 80.5%.

#### 3) Primary Industry

Grain production was 13,440 tons, less 323,918 tons from 2019, of which paddy rice production was 801,176 tons, down 321,996 tons.

Fruit production was 7,800 tons of mangoes, a decrease of 4.3%; 91,560 tons of grapefruit,

[49] Statistical Yearbook of Ca Mau Province, 2020

an increase of 4.5%; 249,692 tons of pineapple, an increase of 0.03%; and 248,621 tons of dragon, an increase of 24%.

The number of trees planted was 643.6 thousand, an increase of 1.6% over the previous year. Wood production was 39,051 $m^3$, which decreased by 7.5%, and firewood production was 135,635 tons, which decreased by 11.2%.

In 2020, the aquaculture area reached 14.861 hectares, or 94.7% of the plan, a decrease of 4.4% from the previous year. The freshwater aquaculture area was 3,720 ha, a decrease of 21.2%. Fishery production reached 356,124 tons, 115.8% of the plan, an increase of 11.2%, among which aquaculture production was 213,725 tons, an increase of 62.9%.

**4) Secondary Industry**

The IIP in 2020 increased by 1.6%. Electricity production and distribution, gas, hot water, steam, and air conditioning increased by 0.2%. The water supply, waste management, and wastewater sectors increased significantly over the previous year, with an increase of 7.2%.

In 2020, the industrial shipment index for the manufacturing sector decreased 9.8% from the previous year. However, some industries had higher consumption indices, such as costume production increased by 24.1%, metal minerals by 25%, metal production by 10.7%, and electrical equipment manufacturing by 52.4%. On the other hand, some industries saw their consumption indexes decline, such as food manufacturing by 7%, beverage manufacturing by 6.2%, wood and wood products manufacturing by 23%, and paper and paper products manufacturing by 48.9%.

**5) Tertiary Industry**

In 2020, total retail sales of consumer goods and services reached VND64.893 trillion, increased by 4.7%. Among them, retail sales of goods amounted to VND52.786 trillion, an increase of 7.4%; income from accommodation and food services was VND5.8080 trillion, decreased by 10.8%; tourism income was VND29 billion, decreased by 78%; and income from other services reached VND6.027 trillion, increased by 1.4%.

The number of visitors to Ca Mau Province reached 748 thousand, 34% of the plan, decreased by 63.1% from the previous year. Among them were 98.9 thousand foreign visitors, reaching 11% of the plan, decreased by 84.8% from the previous year. Tourism revenue was VND29 billion, decreased by 78% from the previous year.

**6) Labor and Employment**

In 2020, the province's working population aged 15 and over reached 1,129,504, an increase of 0.2% over 2019, of which 601,470 were male workers (accounting for 53.3%) and 528,034 female (accounting for 46.7%). The number of urban workers is 137,687 (accounting for 12.2%) and rural workers at 991,817 (accounting for 7.8%).

In 2020, the employed population aged 15 and over engaged in economic activities reached 1,105,056, accounting for 63.7%, which decreased by 0.1% compared to 2019. The share of trained employed workers aged 15 and over reached 15.3%, of which 24% were in urban areas and 14% in rural areas.

The unemployment rate for the working-age labor force in 2020 was 3.02%, of which 4.12% and 2.87% were in urban and rural areas, respectively.

## 2.4. Natural Conditions

### 2.4.1. Geographical Features

#### 1) Topographical features in Mekong Delta (13 City/Provinces)

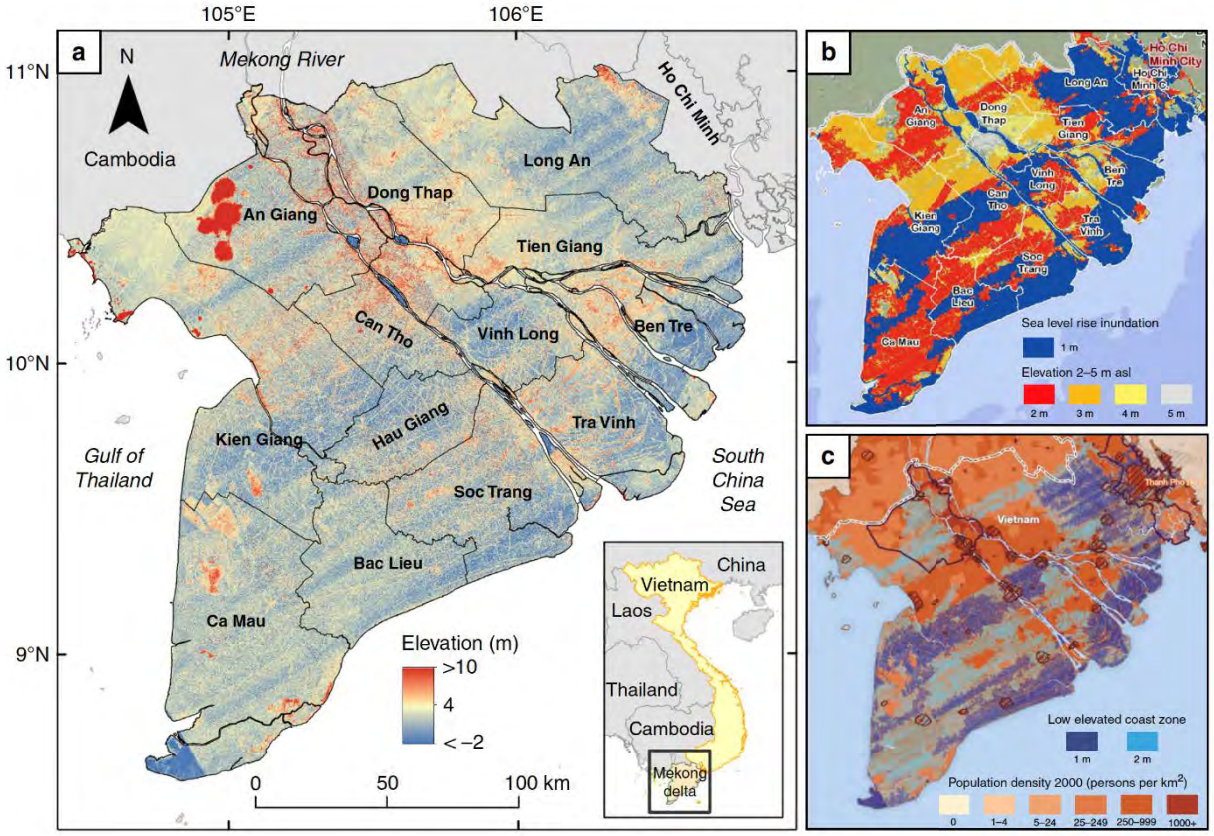
The Vietnamese part of the Mekong Delta is the region in the far south of Vietnam. The delta roughly forms a triangle of 3.9 million ha, stretching from My Tho in the East to Chau Doc and Ha Tien in the northwest, down to Ca Mau at the southernmost tip of Vietnam. More upstream, the delta stretches out to the division into the two branches, Bassac (Hau River) and Mekong (Tien River), near Phnom Penh (1.6 million ha more). Administratively, the delta is divided into 13 provinces. The city of Can Tho could be regarded as the center of the delta. (Mekong Delta Plan, 2013).

The Mekong Delta region is a relatively young, flat, and low delta, with an average elevation of 0.5 to 1.2 m above sea level. This topography makes one of the region's greatest features of its great interconnection through the water element, which some scholars have likened to the area as a swamp, to represent the submerged nature of this region.

Although the elevation between areas is not much different, there is also a common feature that is slightly higher than in riverside and coastal areas due to the nature of alluvial sedimentation from rivers and sand from the sea. In the western region, the Ca Mau peninsula is the lowest. The northern area, along the border with Cambodia, is relatively higher, but it becomes a floodplain during the rainy season because the coastal area forms a high belt. The lower catchments of Cai Lon–Cai Be and U Minh Thuong and U Minh Ha rivers, with the lowest land areas with elevations from 0.1 to 0.7 m, are always flooded during high tide and heavy rain.

The coastal area has high sand dunes, alternating with low tide flooded areas, most commonly in the provinces of Ben Tre, Tra Vinh, and Soc Trang. Dong Thap Muoi is a low-lying area, so it is often flooded during the flood season. Some areas in An Giang and Kien Giang provinces near the border with Cambodia have many mountains, rocky mountains, and high terrain.

With the dominance of the wetland at the end of the large river basin, the Mekong Delta has nearly 20 geomorphologic units: coastal area, mangrove area, alluvial area, floodplain area, tidal zone, floodplains, and swamp areas, etc.




Remarks:
a. Shuttle Radar Topography Mission Digital Elevation Model of the Mekong delta in Vietnam
b. Inundation areas with 1–5 m sea rises. This map was included in several policy documents, the Asian Development Bank's Mekong River Commission Technical Paper; World Wildlife Fund Risk Assessment Mekong, and the Dutch-Vietnamese Mekong Delta Plan, which is now a leading document for major World Bank projects in the delta.
c. Low-elevated coast zones with population density. This map was included in, among others, the Risk Assessment Mekong by the World Wildlife Fund.

Source: "Mekong delta much lower than previously assumed in sea-level rise impact assessments," P. S. J. Minderhoud, L. Coumou, G. Erkens, H. Middelkoop & E. Stouthamer, Nature Communications.

**Figure 2.4.1 Topographical Features in Mekong Delta**

### 2) River system

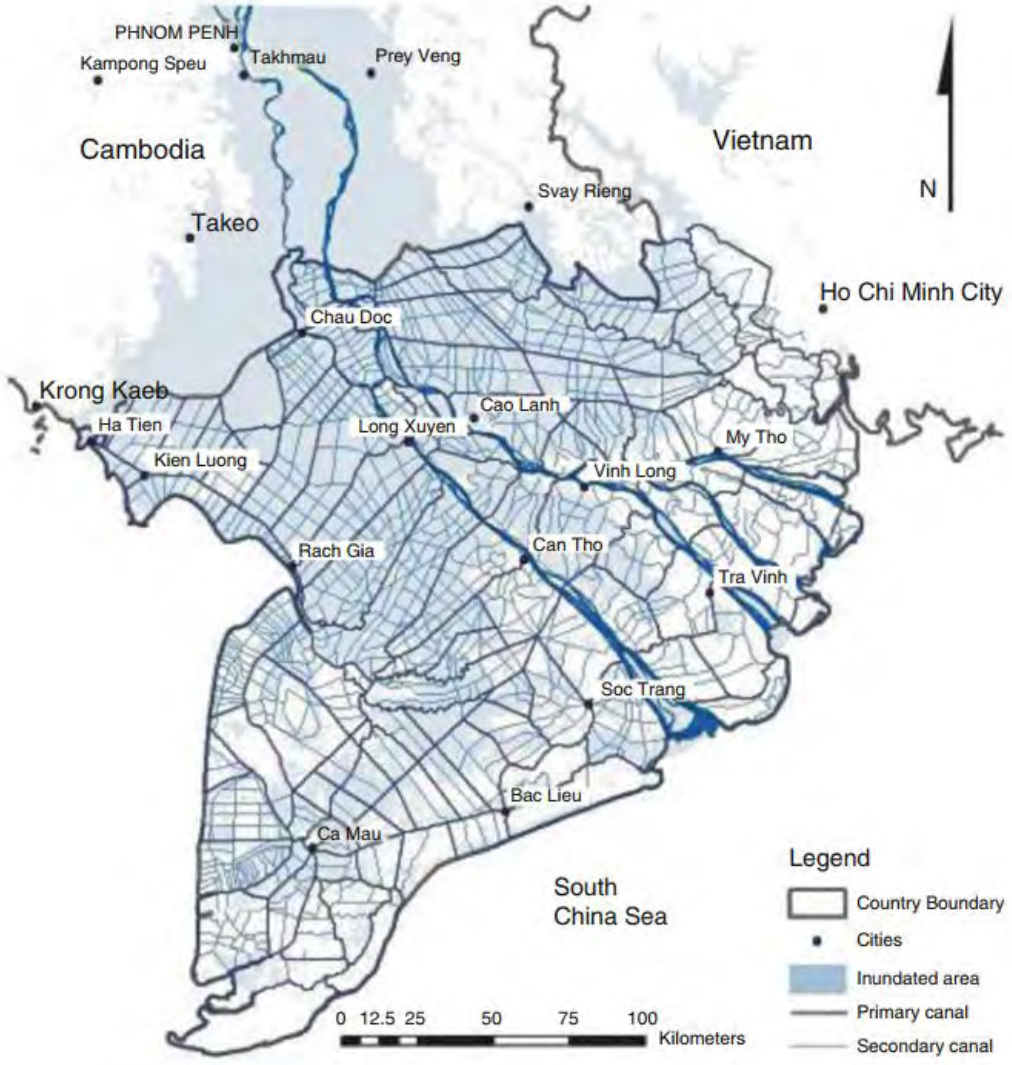
The hydrological regime in the Mekong Delta is directly affected by upstream currents, the East Sea tidal regime, and part of the Gulf of Thailand tide and is divided into three main regions: (i) area mainly influenced by the upstream flood flow, (ii) flood-tidal affected area, and (iii) main tidal influence zone. The flow on the Mekong mainstream is divided into two distinct seasons. In the flood season, the maximum flow is 38,000-40,000 $m^3/s$, causing about 1.2–1.9 million ha of inundation, with a depth of 0.5m–4.5m. During the dry season, the minimum discharge is from 2,000 to 2,400 $m^3/s$.

The Mekong River flows into the Mekong Delta through the Cambodian border in two major distributaries: the Mekong River (or Tien River) and the Bassac River (or Hau River). Both rivers split into nine branches that form the shape of the delta before running into the East Sea.

The Mekong Delta River network is relatively dense and complex and includes natural river systems as well as manmade canals. The seasonal flow, the hydrological regime of the rivers, and the canal network are affected strongly by the upstream flow, internal rainfall, and the

tidal regime of the East Sea and West Sea.

However, serious floods in the wet season and salinity intrusion in the dry season are natural disasters that have constrained the economic development of the Mekong Delta. Other problems such as water pollution, erosion, and river sedimentation have also seriously affected the lives of Mekong Delta residents. Recently, the hydrological mechanism of the Mekong Delta has changed critically by the development of hydropower dams and changes in land use of the upstream countries.




Source: Renaud, Fabrice G., and Claudia Kuenzer, eds. The Mekong Delta system: Interdisciplinary analyses of a river delta. Springer Science & Business Media, 2012.

**Figure 2.4.2 River System in Mekong Delta (13 City/Provinces)**

## 2.4.2. Land Use

Economic development determines the impact on land and water use. On the other hand, the desired land and water use system should influence the desired economic development. The Mekong Delta seems particularly conducive to such a strategy as the water and land use have been highly dynamic over the past decade.

From 1990 to 2015, along with the strong development of the economy towards industrialization and modernization, the economic and labor restructuring has led to a shift in

the land use structure of the region. Agricultural and non-agricultural land both increased, and unused land decreased compared to natural land.

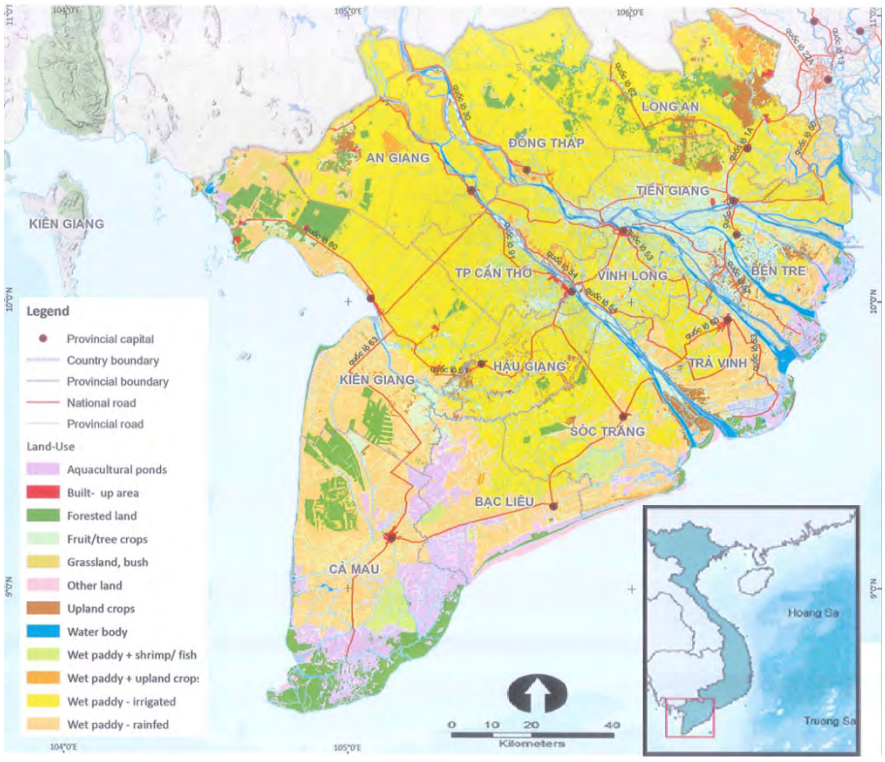
However, the change of land use purpose is not according to the master plan or land use plan, but spontaneously according to the market mechanism (conversion of rice and forest land to aquaculture land) rice, decreased forest land leading to saline intrusion, landslides, etc., which increased in recent years. Although infrastructure land has increased, it still does not meet the requirements of the economic development of the region and international integration. Even if the land area of industrial parks has increased sharply, the occupancy rate in industrial parks is still low.

**Table 2.4.1 Existing Land Use in Mekong Delta (13 City/Provinces)**

Unit: 1000 ha

| No. | Province / City | Total area | Agricultural production land | Forestry land | Specially used land | Homestead land |
|---|---|---|---|---|---|---|
| 1 | Long An | 449.5 | 317.3 | 29.1 | 39.4 | 26.9 |
| 2 | Tien Giang | 251.1 | 179.3 | 3.0 | 14.3 | 10.0 |
| 3 | Ben Tre | 239.5 | 140.4 | 7.0 | 11.1 | 8.1 |
| 4 | Tra Vinh | 235.8 | 147.7 | 7.9 | 13.8 | 4.9 |
| 5 | Vinh Long | 152.6 | 119.6 | - | 10.2 | 6.1 |
| 6 | Dong Thap | 338.4 | 260.2 | 11.1 | 25.7 | 14.6 |
| 7 | An Giang | 353.7 | 282.6 | 11.6 | 24.3 | 13.5 |
| 8 | Kien Giang | 634.9 | 463.0 | 71.1 | 29.8 | 13.8 |
| 9 | Can Tho | 143.9 | 112.2 | - | 119 | 8.3 |
| 10 | Hau Giang | 162.2 | 135.8 | 4.3 | 11.3 | 4.5 |
| 11 | Soc Trang | 331.2 | 212.6 | 10.2 | 20.8 | 5.8 |
| 12 | Bac Lieu | 266.9 | 101.8 | 3.6 | 12.0 | 5.1 |
| 13 | Ca Mau | 522.1 | 143.1 | 95.1 | 23.6 | 66 |
| **Total** | | **4081.6** | **2651.6** | **254.0** | **248.2** | **128.2** |

Source: General Department of Land Administration, MONRE




Source: Land-use 2002, Sub-National Institute of Agriculture Planning and Projection (Sub-NIIAPP)

**Figure 2.4.3 Land Use Map in Mekong Delta (13 City/Provinces)**

### 2.4.3. Vegetation and Forest

The remaining natural or relatively natural vegetation reflects the patterns of topography, soil, and hydrological conditions found in the delta. Freshwater communities include swamp forest vegetation, herbaceous grasslands and sedge land, riverbank vegetation, and aquatic vegetation. Saline communities consist largely of mangrove forests.

Swamp forests are largely composed of pure stands of *Melaleuca cajuputi*. While some apparently seminatural stands exist, most swamp forests today are plantations. Regenerating Melaleuca Forest is largely found on acid sulfate soil and old alluvial sediments and consists of trees 2–6 m tall, which can reach 10–12 m. The benefits of Melaleuca planting have been widely recognized, and the area of this forest type has increased in recent years. Although Melaeuca swamps are low in plant diversity, they have a great significance in maintaining the natural ecosystem function. It reduces water flow during the wet season, thus minimizing flooding, storing freshwater water, reducing soil acidification, promoting biodiversity of many aquatic organisms, and providing a sustainable source of wood for construction and fuel.

Herbaceous vegetation includes extensive areas of seasonally inundated wetlands dominated by grasses and sedges. These have been subdivided into four main groups separated by the amount and duration of flooding during the wet season. The first are wetlands on areas of deep and prolonged freshwater inundation on acid sulfate soils and dominated by *Eleocharis dulcis*, *Oryza rufipogon*, and *Phragmites vallatoria*. A second wetland community inundated with freshwater to a moderate depth and for a shorter duration is dominated by E. dulcis, Eleocharis ochrostachys, Ischaemum rugosum, and Lepironia articulate. Grasslands on sandy and old alluvium soils inundated to only a shallow depth and for a short time are dominated by *Eragrostis atrovirens*, *Setaria viridis*, *Mnesithea laevis*, and *Panicum repens*. Finally, wetlands are affected by brackish water that is dominated by *Paspalum vaginatum*, *Scirpus littoralis*, *Zoysia matrella*, *E. dulcis*, and *Eleocharis spiralis*.

The Ha Tien plain is the last remaining extensive area of relatively intact seasonally inundated grassland in the Mekong Delta, as well as having stands of Melaleuca scrub and Nypa fruticans swamp. The area has no official conservation status and is mostly earmarked for resettlement. The aggressive prevalence of M. pigra has become widely established in wetlands of the Mekong Delta. The invasion of Mimosa is particularly troublesome in protected areas, such as the Tram Chim National Park, as it threatens to reduce biological diversity. Mangroves once covered an area of about 4000 $km^2$ in Viet Nam, with more than half within the Mekong Delta. The extensive military use of defoliants and napalm during the Vietnam War (1962–1972) destroyed more than 1000 $km^2$ of mangrove in the delta area. Mangrove forests had been slowing recovering under active programs of reforestation, but much of this area has scrubby growth or open mangrove plantations rather than the closed canopy cover that once existed. However, rapid expansion of shrimp farming has strongly reduced the area of mangroves. Mangrove diversity in the Mekong Delta area is relatively high. Among the approximately 50 species of true mangroves distributed in South and Southeast Asia, including Indonesia, 29 species are found in Viet Nam. Mangrove forests typically exhibit strong patterns of zonation. The pioneer species along the open coastline is typically *Avicennia alba (Avicenniaceae)*. Next, along a gradient of decreasing relative exposure and submergence by seawater are the *Rhizophora apiculata* and *Brugiera parviflora (Rhizophoraceae)*, which form after 5–6 years and grow to replace *Avicennia* after about 20 years. The higher ground subject to conditions of brackish water is dominated by *Avicennia officinalis (Avicenniaceae), Sonneratia caseolaris (Sonneratiaceae), N. fruticans (Arecaceae),*

and *Phoenix paludosa (Arecaceae)*.

The upper elevational distribution of mangrove forests grade into swamp forests with dominates that are not classic mangrove species. These include *M. cajuputi (Myrtaceae)*, *Acronychia laurifolia (Rutaceae), Canthium didynum (Rubiaceae), Alstonia spathulata (Apocynaceae),* and the ferns *Stenochlaena palustris (Blechnaceae)* and *Polybotrya appendiculata (Aspleniaceae)*.[50]

**Table 2.4.2 Forest Area in Mekong Delta (13 City/Provinces)**

| ty/ Province | Natural Forest (1000 ha) | Planted Forest (1000 ha) | Proportion of Forest Coverage (%) | Total (1000 ha) |
|---|---|---|---|---|
| Can Tho | - | - | - | - |
| Long An | 0.8 | 21.8 | 3.4 | 22.6 |
| Dong Thap | 0 | 6.2 | 1.7 | 6.2 |
| An Giang | 1.1 | 12.7 | 3.7 | 13.8 |
| Kien Giang | 58.0 | 18.4 | 12.0 | 76.4 |
| Tien Giang | 0 | 2.6 | 1.0 | 2.6 |
| Ben Tre | 1.2 | 3.2 | 1.8 | 4.4 |
| Vinh Long | - | - | - | - |
| Tra Vinh | 2.9 | 6.3 | 4.0 | 9.2 |
| Hau Giang | 0 | 3.6 | 1.6 | 3.6 |
| Soc Trang | 1.9 | 8.8 | 2.7 | 10.7 |
| Bac Lieu | 2.0 | 2.8 | 1.8 | 4.8 |
| Ca Mau | 11.9 | 84.2 | 18.4 | 96.1 |
| Total | 250.4 | 79.8 | 170.6 | 4.9 |

Source: Statistical Yearbook of Vietnam

### 2.4.4. Protected Areas

The Mekong Delta is one of the largest river deltas in the world, beginning at Phnom Penh city in Cambodia, where the Mekong main channel bifurcates into the Mekong and the Bassac. The following table shows the protected areas in Vietnam territory.

**Table 2.4.3 Existing Protected Wetlands and Important Bird Areas in the Mekong Delta 1)**

| No. | Name | Major wetland types | Location | Area (ha) | Protection status |
|---|---|---|---|---|---|
| 1 | Lang Sen | Melaleuca swamp forest and freshwater marshes | Long An | 5,030 | Provincial protected area (Ramsar site) |
| 2 | Dong Thap Muoi | Melaleuca swamp forest and freshwater marshes | Long An | 633 | Provincial protected area |
| 3 | Tram Chim | Melaleuca swamp forest and freshwater marshes | Dong Thap | 7,300 | National park (Ramsar site) |
| 4 | Xeo Quyt | Melaleuca swamp forest and freshwater marshes | Dong Thap | 50 | Provincial nature conservation and historical site |
| 5 | Tra Su | Melaleuca swamp forest and freshwater marshes | An Giang | 850 | Provincial protected area |
| 6 | Lung Ngoc Hoang | Melaleuca swamp forest and freshwater marshes | Hau Giang | 790 | Provincial protected area |
| 7 | U Minh Thuong | Peat swamp forest | Kien Giang | 8,038 | National park |
| 8 | U Minh Ha | Peat swamp forest | Ca Mau | 7,926 | National park |
| 9 | Thanh Phu | Mangrove forests | Ben Tre | 2,584 | Provincial protected area |
| 10 | Bac Lieu bird colony | Mangrove forest | Bac Lieu | 385 | Provincial protected area |
| 11 | Dam Doi bird colony | Mangrove forest | Ca Mau | 130 | Provincial protected area |
| 12 | Mui Ca Mau | Mangrove forest | Ca Mau | 41,089 | National park |
| 13 | Phu My | Melaleuca swamp forest and freshwater marshes | Kien Giang | 1,106 | Provincial protected area |
| 14 | Tri Ton protected forest | Melaleuca swamp forest | An Giang | 1,900 | Provincial protected area |
| 15 | Bung Binh Thien | Shallow freshwater lake | An Giang | 500 | Provincial fishery conservation area |
| 16 | Dong Ho Lagoon | Brackish water lagoon | Kien Giang | 1,597 | Provincial protected area |
| 17 | Thi Tuong Lagoon | Brackish water lagoon | Ca Mau | 700 | |
| 18 | Cu Lao Dung | Mangrove forests | Tra Vinh | 25,333 | Provincial protected area |
| 19 | Long Khanh protected forest | Mangrove forests | Tra Vinh | 828 | Provincial protected area |
| 20 | Ba Lai estuary | Estuary | Ben Tre | 10,000 | Provincial protected area |
| 21 | Ham Luong estuary | Estuary | Ben Tre | 10,000 | Provincial protected area |

Source: Government of Vietnam and Transboundary Mekong River Delta (Cambodia and Vietnam) 2014
1) The above data was updated in 2020.

[50] Rundel, Philip W. "Vegetation in the Mekong basin." The Mekong. Academic Press, 2009. 143-160.


Remark: The figure was prepared in 2014, but the updated data in 2020 has not been included. Thus, some inconsistency remains between this figure and the table.
Source: Transboundary Mekong River Delta (Cambodia and Vietnam), 2014

**Figure 2.4.4 Locations of some existing protected wetlands in the Mekong Delta**

### 2.4.5. Flood Prone Areas

The Mekong River Delta in Vietnam receives the whole Mekong River water flow before flowing into the East Sea. Climatically, this area has only two distinct seasons: the rainy season (May to December) and the dry season (January to April). The last months of these two seasons are the extreme events of river hydrology: floods and drought occur. These meteorological and hydrological features greatly affect not only agriculture and aquaculture cultivation but also the residential habits throughout the delta.

Over the past two decades, the Mekong River basin in general and the Mekong Delta in particular, have witnessed many extremely climatic phenomena, breaking the previously recorded meteorological and hydrological regulations.

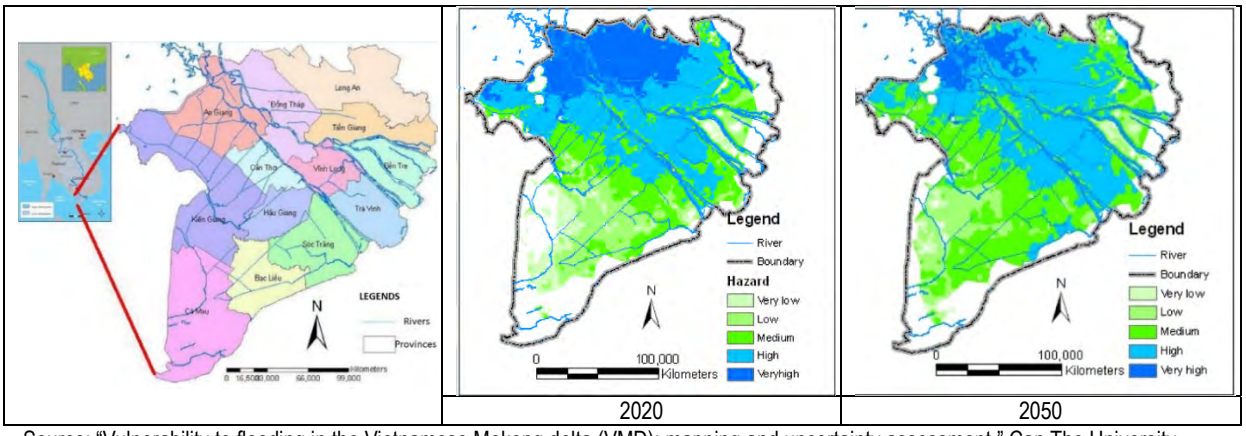
From 2000 to 2006, a series of key irrigation projects of the MARD, Vietnam was formed under the censorship plan of the Long Xuyen Quadrangle and Dong Thap Muoi, approved by the Prime Minister. In 1998, a series of dykes for flood control and protection was built in line

with the policy of strengthening the power of three consecutive rice crops per year for high rice production to turn Vietnam into one of the leading countries in exporting to the world market. This narrows the flood storage space of two low-lying areas, as in the Long Xuyen Quadrangle, the flood absorption capacity has decreased from 9.2 billion $m^3$ in 2000 to 4.5 billion $m^3$ in 2011 (reduced by 4.7 billion $m^3$).

Flood water due to reduced absorption space has overflowed more downstream, partly combined with high tides, sea-level rise, and subsidence, which has increased the level of flooding in areas such as Can Tho, Hau Giang, and Can Tho. In Vinh Long, this increases the flood tendency in the downstream area.

According to the assessment of the study, "Has dyke development in the Vietnamese Mekong Delta shifted flood hazard downstream." The increase in inundation caused Can Tho City to lose USD3–11 million in the 2011 flood. With big flood years like 2011, the peak water level in Chau Doc recorded 427 cm, 63 cm lower than the flood peak of 490 cm in 2000, but the flood level in Can Tho City in 2011 was 215 cm, which was 36 cm higher than the recorded flood peak of 179 cm in 2000. According to MARD, the 2011 flood season expanded the flooded area in the Mekong Delta by more than one-third compared with the flooded area in 2000.

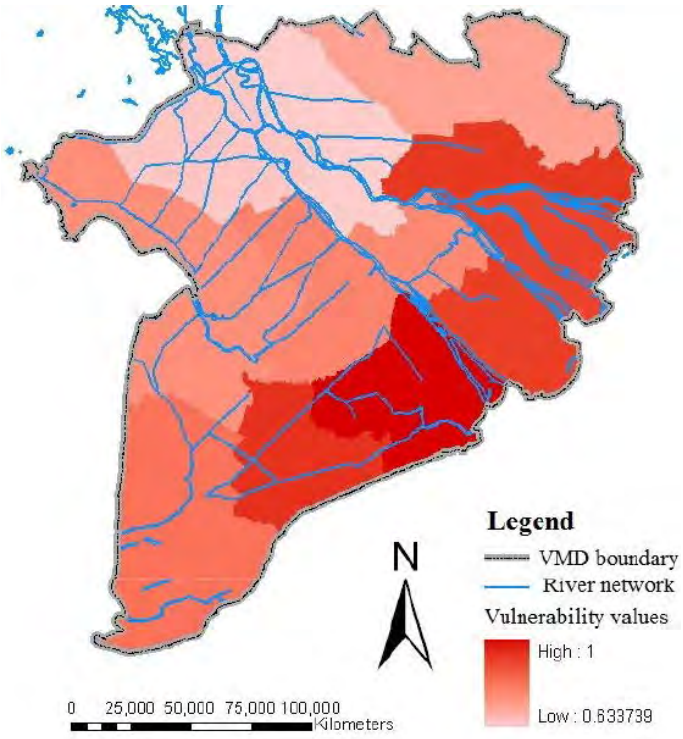
Within the research framework of Can Tho University in 2012, the "Vulnerability to flooding in the Vietnamese Mekong Delta (VMD): mapping and uncertainty assessment," the flood map of the Mekong Delta region was built based on the historical flood in 2000, and the flood scenarios were calculated up to 2050, in which flood patterns would be changed due to climate change and sea-level rise, so flood hazards and flood risks also change. Therefore, the objectives of the study were (i) to identify priority areas for flood adaptation and mitigation and (ii) to provide an insight to local governments in the VMD in changes to future floods. The mapping is shown below:




Source: "Vulnerability to flooding in the Vietnamese Mekong delta (VMD): mapping and uncertainty assessment," Can Tho University

**Figure 2.4.5 Provinces and maps of the recent large flood (2000) and predicted future flood (2050)**

Within the study of Can Tho University, the hazard map was also provided, where provinces in the coastal areas along the East Sea had higher vulnerabilities than other provinces due to sea-level rise, long coastal lines, and storm surges, which is shown in Figure 2.4.5.




Source: "Vulnerability to Flood in the Vietnamese Mekong Delta: Mapping and Uncertainty Assessment," Can Tho University

**Figure 2.4.6 Vulnerability map of the Mekong Delta**

As reported by the Mekong River Commission (MRC) in 2019, in Viet Nam's Lower Mekong Basin regions, the rain season started late and ended earlier than the long-term average conditions. Particularly in August (the peak period of the rainy season), the total rainfall in the Central Highlands and the south was 20% to 50% higher than the long-term average. In other months, the rainfall is often lower than the long-term average. The total annual rainfall in the Central Highlands and the South in 2019 was 10–25% lower than the long-term average.

In the same year, riverine floods were mainly small and medium during the wet season in the central highlands, but floods and landslides occurred in some provinces. In the Mekong Delta, the flood season in 2019 in the lower region occurred about a month later than usual. Due to the lack of precipitation in the upper region, the water level of the Mekong River fell quickly and remained at the lowest recorded level.

### 2.4.6. High/Flood Tide

Flooding in the urban areas in the middle of the Mekong Delta occurs regularly. Every year, in the middle and the end of August, September, and October of the lunar calendar, the tide is said to be the highest in the year because the tides from the East Sea meet the floodwater from the upstream of the Mekong River to cause flooding. Other factors make the flood situation worse.

The risk of flooding due to sea-level rise due to climate change will likely increase due to the resonance of other factors such as geological uplift, topographic changes, subsidence, tides, and storm surge. In particular, the phenomenon of land subsidence takes place in the Mekong Delta and Ho Chi Minh City with the lowest terrain in the country.

Regarding the rising water level, as mentioned in the "Ocean Tides and the Influence of Sea-

Level Rise (SLR) on Floods in Urban Areas of the Mekong Delta," ocean tides predominantly determine water elevation even in an upstream location such as Can Tho City, 80 km inland from the river mouth, and that the river flow causes tidal damping and effectively reduces the energy of the incoming tides. This tidal damping is especially pronounced during the rainy season.

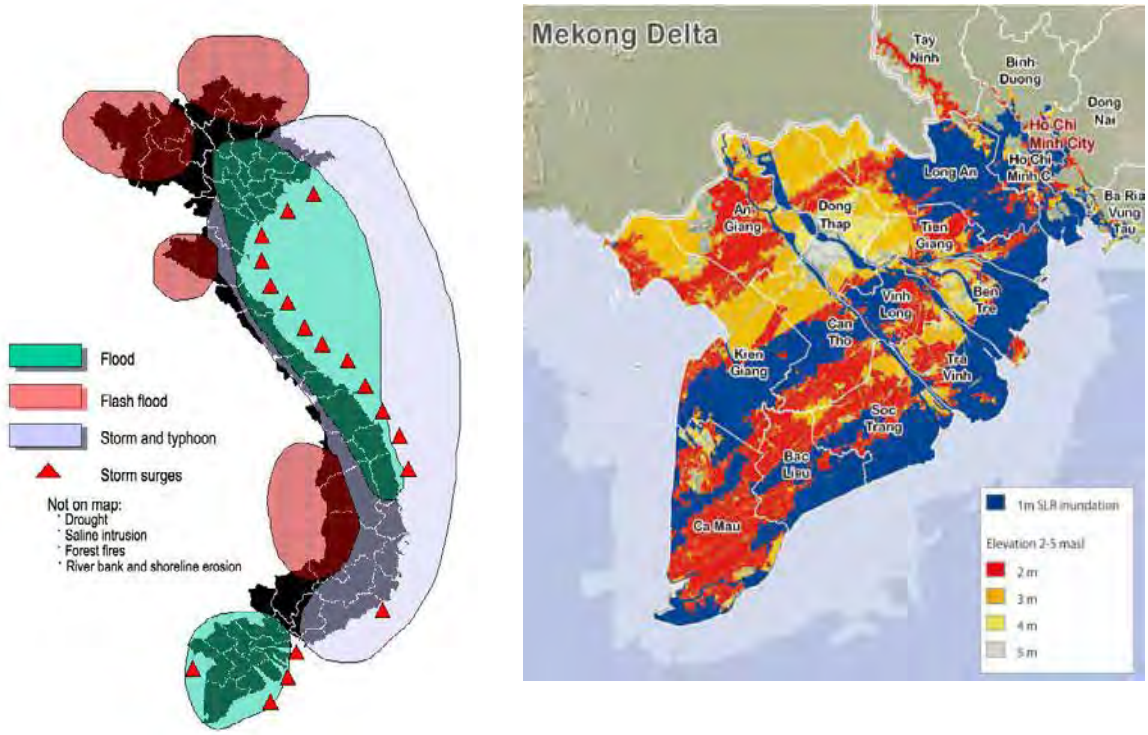
Analysis based on the water level monitored by the MRC revealed that the ground near the riverbank of Can Tho had experienced inundation for a total of 215 hours between July 2009 and June 2010 (2.5 % of the time over this one year), and the inundation depth reached up to about 40 cm. In the future, it is feared that inundation can occur during any season of the year, whereas it is mostly limited to the rainy season under present sea levels. The field survey carried out by the authors showed that the inundation reached up to a height of 47 cm above the road for the downtown of Can Tho in November 2009.

According to the MRC analysis in annual flood reports, in Vietnam, and Mekong Delta, floods occur annually with long duration and low intensity. The causes for flooding in the Mekong Delta are the natural flood pulse of the Mekong, the natural contribution from Tonle Sap, local rainfall, and backwater effects due to the tide. Nowadays, it seems the annual flood pattern has changed, apparently because of water infrastructure development upstream. Flooding occurs late, is usually lower than long-term means, and shows a decreasing tendency.

The water level of the Mekong River flow varies in the delta according to the influence of the tides. The water levels on Tien River and Hau River reached their highest peak on 8 October 2017, which was 3.43 m at Tan Chau station and 3.07 m at Chau Doc station.

Due to the changes in the climate, there will be several implied impacts on the Mekong Delta, such as more floods and droughts (less water during the dry season), possible permanent inundation for some areas, increased salinity intrusion (area and duration), and increased risks of infectious diseases.[51]

[51] From the presentation of Mr. Toru Konishi regarding climate change in Vietnam, Mekong Delta under the World Bank's project in 2009.




Source: Toru Konishi, World Bank Study

**Figure 2.4.7 Storm Surge and Inundation Areas with 1–5 m Sea Rise**

### 2.4.7. Salt Damage Records to Agriculture Products

One of the main natural obstacles in the Mekong Delta is the saline intrusion during the dry season, affecting not only agricultural production but also water supply and living standards for millions of coastal households. In the context of rapid development in both the upstream and the interior of the Mekong Delta (hydroelectricity dams), along with the impact of climate change (sea level rise), the saline intrusion is becoming more and more complicated and greatly affects the productivity and life of people in the 13 provinces/cities in the MDR.

Saline intrusion is a natural phenomenon that occurs annually in the Mekong Delta and depends on factors like the low flow from the Mekong River upstream; water storage capacity at the end of the flood season of the Mekong Delta; coastal sea water level changes; status of water usage in the Mekong Delta. Every year, saline intrusion often occurs in the estuaries of the Mekong Delta from about December of the previous year to May of the following year, with a peak in late April and early May.

The high peak of saline intrusion has been recorded in the provinces of the Mekong Delta in the periods 2015–2016 and 2019–2020.

#### 1) Record of salt damage during 2015-2016 session

According to the statistics, saline intrusion affected over 9 of the total 13 provinces and city in Mekong Delta in 2016. The estimated damage during the 2015–2016 drought-salt season in the whole Mekong Delta is up to VND5,500 billion. The recorded salt damage to agriculture of Mekong Delta in 2015–2016 is summarized in the table below.

**Table 2.4.4 Record of Salt Damage to Agriculture Products in Mekong Delta 2015–2016**

| No. | Province / city | Total affected area (ha) |
|---|---|---|
| 1 | Kien Giang | 55,000 |
| 2 | Ca Mau | 50,000 |
| 3 | Long An | 9,000–15,000 |
| 4 | Tra Vinh | |
| 5 | Soc Trang | |
| 6 | Bac Lieu | |
| 7 | Ben Tre | |
| 8 | Tien Giang | 1,000 |
| 9 | Hau Giang | 1,000 |

Source: Report of Mr. Nguyen Ngoc Anh – SIWRP

In addition to the localities affected by saline intrusion mentioned above, there are other provinces/ city such as An Giang, Dong Thap, Long An and Can Tho which are not affected by salinity, but due to drought - lack of water for irrigation, it has also affected the yield of rice and other crops.

### 2) Record of Salt Damage During 2019–2020 Session

The dry season in 2019–2020 appeared earlier than the average of many years. Another unusual point was that during the duration of the drought, the saline intrusion was twice as long as that of the 2015–2016 dry season. The level of severity continuously remained high during the whole dry season. Salinity in Cua Tieu, Cua Dai, and Ham Luong rivers has continuously maintained at its peak and was high from February to May. It almost did not decrease or decrease insignificantly during low tides. Saline intrusion in the dry season in 2019–2020 in the Mekong River Delta was at the most serious level in its history.

Regarding agricultural production, saline intrusion had directly affected 10 out of the 13 provinces/city in the MDR. About 41,900 ha of the total winter-spring rice crop in the MDR in 2019–2020 was damaged by the saline intrusion and drought, of which 26,000 ha were totally lost from the following provinces: Tra Vinh, Tien Giang, Soc Trang, Kien Giang, Long An, and Ca Mau (specific affected areas for each province are shown in the table below). The area of the 2019–2020 winter-spring rice crop was damaged by drought, water shortage, and saline intrusion, mainly in places where sowing was late after December 2019, spontaneously performed by farmers and not following the recommendations of specialized agencies. Additionally, the area of fruit trees affected by drought and saline intrusion is about 6,650 ha. Concerning vegetable crops, the affected area is about 1,241 ha. The table below is a summary of the salt damage record to the agriculture of MRD during the 2019–2020 season.

**Table 2.4.5 Record of Salt Damage to Agriculture Products in Mekong Delta 2019–2020**

| No. | Province / city | Total affected area (ha) |
|---|---|---|
| I | 2019–2020 Winter-Spring Rice crop | 26,000 (totally lost) |
| 1 | Tra Vinh | 14,300 |
| 2 | Tien Giang | 4,500 |
| 3 | Soc Trang | 4,100 |
| 4 | Kien Giang | 1,600 |
| 5 | Long An | 800 |
| 6 | Ca Mau | 600 |
| II | Fruit trees | 6,650 |
| 1 | Long An | 2,397 |
| 2 | Tien Giang | 2,297 |
| 3 | Ben Tre | 931 |
| 4 | Vinh Long | 740 |
| 5 | Tra Vinh | 267 |
| 6 | Soc Trang | 18 |
| III | Vegetable crops | 1,241 |
| 1 | Long An | 100 |
| 2 | Tien Giang | 810 |
| 3 | Ben Tre | 168 |
| 4 | Tra Vinh | 87 |
| 5 | Soc Trang | 44 |
| 6 | Ca Mau | 32 |

Source: Crop production Department – MARD

### 2.4.8. Vulnerability against Climate Change

Climate change is one of the biggest challenges humanity faces in the 21st century. Abnormal weather events, natural disasters, storms, floods, and droughts increase in most of the world. The global average temperature continues to increase rapidly and accelerates the melting of ice at the poles, causing sea-level rise.

The Mekong River Delta, where the Mekong River's turbid water flow passes through before reaching the sea, is Vietnam's greatest rice, fruit, and fisheries production area. The MDR is one of the most susceptible regions in Vietnam to climate change. Climate change, drought, saline intrusion, sea-level rise, and landslides have all had a significant impact. Its economy, ecosystems, sustainability, and social peace are all at risk.

Climate change has clear consequences. Rising temperatures, changing rainfall patterns, river flows, floods, and droughts are wreaking havoc on homes, infrastructure, crops, and fisheries. As a result, food shortages and reduced livelihoods affect vulnerable people. Furthermore, expected sea level rises may exacerbate salinity and floods in the Mekong Delta, causing crop devastation in the basin's most productive section.

Vulnerabilities against climate change of the Mekong Delta has been listed below.

**Population vulnerability.** Population growth is a major driver for change in the delta in terms of increasing the exposure of people and households to climate change hazards and the demands placed on available natural resources and their implications on sustainable livelihoods. Over the long term, population growth is likely to contribute to and exacerbate not only the vulnerability to climate change as well as the difficulties in adapting to any detrimental changes in climate. In this context, a locality is vulnerable if it exhibits characteristics such as high population numbers, rates of growth, or large family size.

**Poverty Vulnerability.** Poor and near-poor households and people in the MDR are vulnerable to the effects of climate change. Incidence of poverty varies across the region due to a range

of “special difficulties,” such as ethnicity, lack of access to agricultural land, education and health services, fresh drinking water, power, and markets. Poverty diminishes the resilience and adaptive capacity of people and households, as people lack savings and capital for investment to adopt better production technology and lack awareness and knowledge of adaption options available. Like population, poverty encompasses dimensions relevant to climate change vulnerability, such as the vulnerability to impacts and future shocks – and the ability to build resilience and adapt to climate change. Climate change is expected to cause an increase in diseases. As such, pregnant women and children are particularly vulnerable to negative effects. In turn, health costs form a burden on poor households, reducing their ability to cope with economic shocks caused by environmental change. Low levels of education were linked to low awareness of climate change effects, which increases vulnerability. Further, low skill levels restrict poor producers’ capacity to cope with the loss of land or livelihood.

**Agriculture and Livelihood Vulnerability.** Agricultural farms, infrastructures, and livelihood systems are affected by climate change. Livelihood impacts are a central concern, as poor households depend on wage labor and agricultural and aquacultural livelihoods, which are significantly affected by environmental change. In addition, the labor market is concentrated in areas affected by climate change, making incomes insecure. Debt and lack of access to resources are major constraints on coping capacities and livelihood adaptation. Impoverished areas are made more vulnerable by insufficient or temporary infrastructure and are hit hardest by the negative impacts of extreme weather on infrastructure.

**Urban settlement and Transportation Vulnerability.** Landless and land-scarce households are particularly vulnerable. Further, loss of land due to development or riverbank erosion is a particular concern that both impacts the most vulnerable groups and increases vulnerability to other negative effects.

# 3. Existing Transport Network and Infrastructure in Mekong Delta

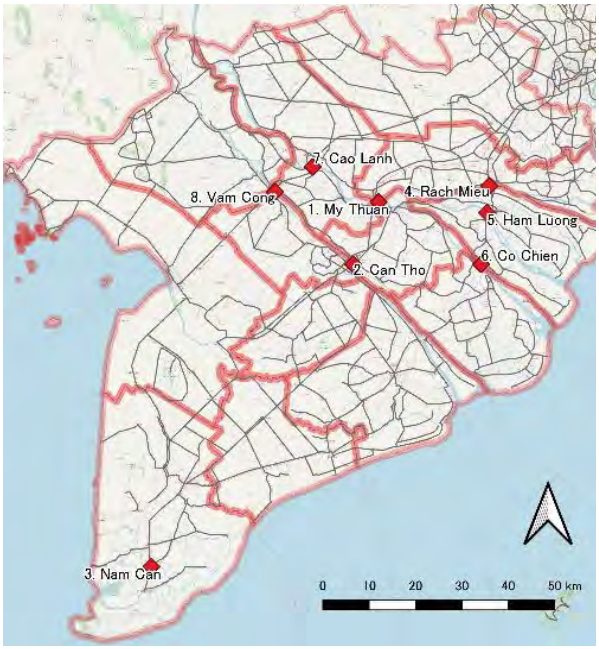
## 3.1. Existing Transport Network and Infrastructure[52]

### 3.1.1. Road

The main road network includes nearly 170.1 km of highways, 2,539 km of national highways, and 4,559 km of provincial roads. All major points in the Mekong Delta have road connectivity but have not yet played a strategic role in regional development. The regional transport infrastructure system has just begun to focus on investment recently, triggered by Resolution No. 120/NQ-CP on "Sustainable and Climate-Adaptive Development of Mekong Delta Region." The intra-regional and inter-regional connection system based on the new national highways is basically complete, but the technical grade and road surface quality have not fully met the requirements. The ratio of the four-lane road length is only 13.13%, the road surface quality is mainly average at 65.37%, and the ratio of bad and very bad pavement is still high at 18.71%.

The main problems identified with the road network are as follows:

- Poor road quality,
- undeveloped expressway network,
- traffic congestion, especially around Ho Chi Minh city area,
- insufficient budget for road system maintenance,
- insufficient connectivity in the aquicultural areas: the freight transport must depend on the inland water transport, and
- lack of synchronous connection between road and inland waterway.




Source: Worked by the Survey Team based on various sources

**Figure 3.1.1 Existing Long Span Bridges in Mekong Delta Region**

The road is shared by both fast and slow traffic, thus not only affecting the speed but also causing safety and environmental problems for people living along the road. Many national highways have not yet achieved the planned level, operating interruptedly and shared with local roads. Weak and low-capacity bridges on the national highways become bottlenecks that affect the traffic capacity of the whole corridor. Many sections of the road (e.g., National Highway No. 91) are at risk of landslides, especially during the rainy season. Although road development is not a typical solution for the region, the road system is capable of easy investment divergence, showing better cost efficiency, and has been prioritized in the development of investment in regional infrastructure.

The Mekong Delta is divided by rivers. Although there are eight long-span bridges (longer than 800 m), they are insufficient to serve the active movements of the 17 million regional population to enhance economic development (Figure 3.1.1 and Table 3.1.1)

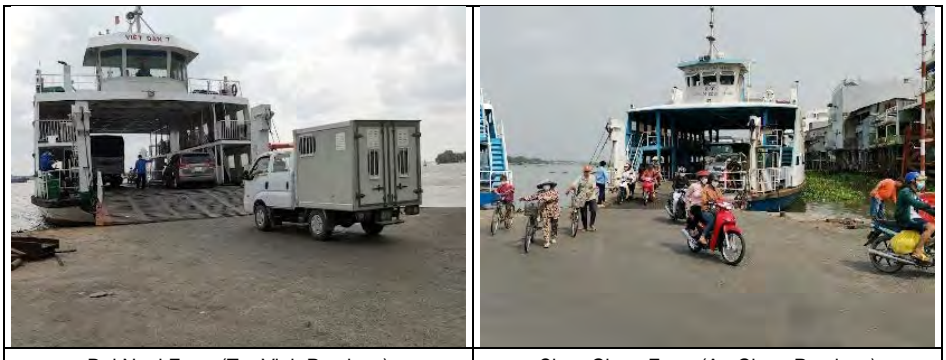
[52] Mekong Delta Region Plan for 2021–2030, Vision by 2050 (World Bank, 2022)

**Table 3.1.1 Existing Long Span Bridges in Mekong Delta**

| No | Name | Road | River (Province) | Profile | Status |
|---|---|---|---|---|---|
| 1 | Mỹ Thuan | NH 1A | Tien River (Tien Giang–Vĩnh Long) | 4-lane cable-stayed bridge<br>Length: 1,535 m<br>Clearance: 37.5 m | Operation since 2000<br>Main Fund: AUD91 million<br>Finance: AusAID |
| 2 | Can Tho | NH 1A | Hau River (Hau Giang–Can Tho) | 4-lane cable-stayed bridge<br>Length: 2,750 m<br>Clearance: 39.0 m | Operation since 2010<br>Main Fund: JPY29,473 mil.<br>Finance: JICA |
| 3 | Nam Can | NH 1A | Cửa Lớn (Ca Mau) | 2-lane box girder bridge,<br>Length: 817 m<br>Clearance: 30 m | Operation since 2015<br>Main Fund: VND640 bil.<br>Finance: State Budget |
| 4 | Rạch Miễu | NH 60 | Tien River (Tien Giang–Ben Tre) | 2-lane cable-stayed bridge,<br>Length: 2,868 m<br>Clearance: 37.5 m | Operation since 2009<br>Main Fund: VND1,400 bil.<br>Finance: State Budget |
| 5 | Ham Luong | NH60 | Ham Luong (Ben Tre) | 4-lane box girder bridge,<br>Length: 1,280 m<br>Clearance: 20.5 m | Operation since 2010<br>Main Fund: VND787 bil.<br>Finance: State Budget |
| 6 | Co Chien | NH60 | Co Chien (Ben Tre–Tra Vinh) | 4-lane cantilever bridge,<br>Length: 1,599 m<br>Clearance: 25.0 m | Operation since 2015<br>Main Fund: VND2,308 bil.<br>Finance: State Budget |
| 7 | Cao Lãnh | Central Mekong Delta Connectivity Project | Tien River (Dong Thap) | 6-lane cable-stayed bridge,<br>Length: 2,010 m<br>Clearance: 37.5 m | Operation since 2018<br>Fund: AUD160 mil.<br>Finance: AusAID<br>Officially called the Cao Lanh Friendship Bridge |
| 8 | Vam Cống | | Hau River (Dong Thap–Can Tho) | 4-lane cable-stayed bridge<br>Length: 2,970 m<br>Clearance: 39.0 m | Operation since 2019<br>Fund: KRW240 bil.<br>Finance: KOICA |

Source: Worked by the Survey Team based on various sources

On Hau River, several ferry services operate to supplement the network. The number of ferry fleets is limited, and the operation frequency is around 15–30 minutes. This means passengers might wait for an extended time, creating a long queue. For Dai Ngai Ferry, the operation is not 24 hours and there's no operation in the midnight.



Dai Ngai Ferry (Tra Vinh Province) | Chau Giang Ferry (An Giang Province)

Source: The Survey Team

**Figure 3.1.2 Ferry Service Operating on Hau River**

### 3.1.2. Inland Water Transport

IWT has been considered a region-specific mode in Vietnam. The region has a dense waterway network used for inland water transport connecting the region and connecting to the port system in Ho Chi Minh City and Cambodia. The IWT network includes approximately 817 km of waterways of special grade, 50 km of waterways of grade I, 139 km of waterways of grade II, 1,807 km of waterways of grade III, and 177 km of waterways of grade IV. The main advantage of IWT transport is that ships can carry more goods per kilometer than road transport (trucks) and are more competitive (cheaper transport costs).

Collecting agricultural products is mainly conducted via canals, from small boats to large boats, and focused on larger vehicles at the focal points due to cultural living along the two banks canals, instead of sticking along the road like in other regions.

In terms of the passenger transport, there are passenger ferries across rivers and canals, IWT is for tourism (serving the region, operating between Ho Chi Minh City and Cambodia), and the sea transport system connects the region with Phu Quoc and Con Dao and Kien Giang (Rach Gia/Ha Tien) with Phu Quoc.

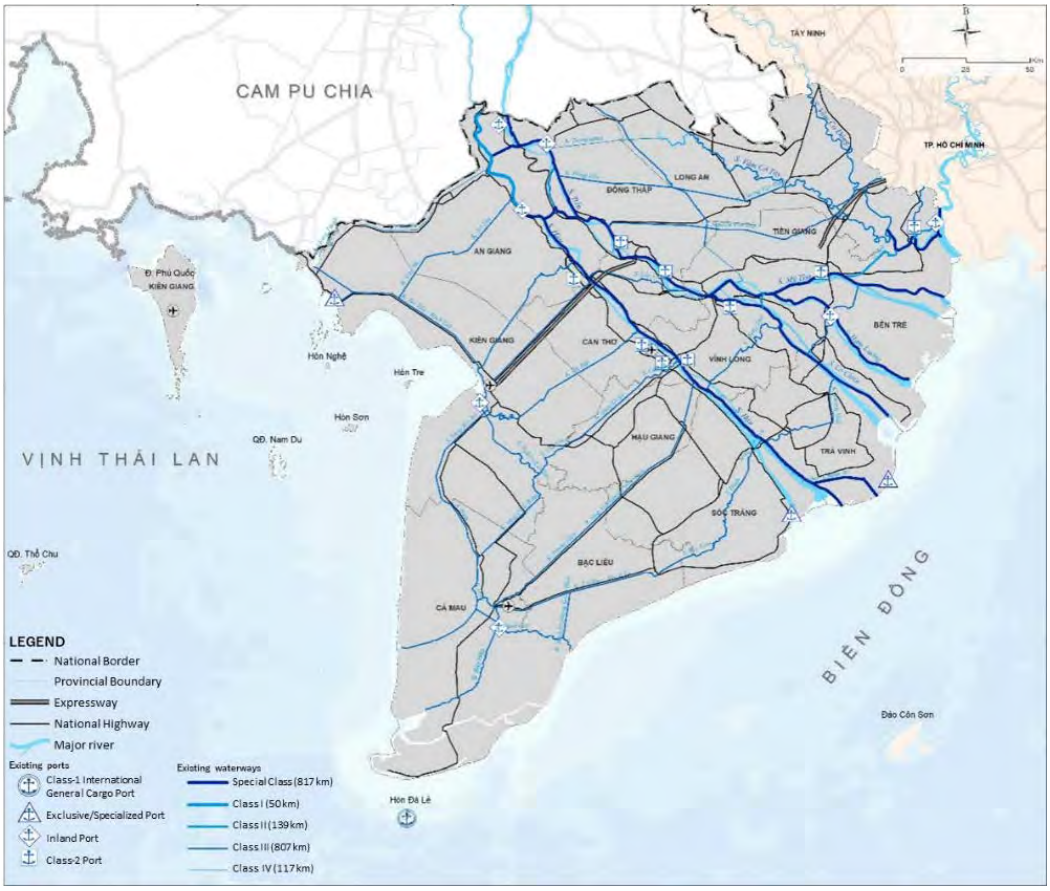
The main problems identified with the IWT are as follows:

- **Low productivity.** Although the waterway network is dense, the transport capacity is very low. About half of the fleet (46.44%) has a capacity of fewer than 50 tons but only transports 9.5% of the total cargo. Currently, large vessels can only travel between HCM City and Can Tho through Hau River, Tien River, and Vam Nao, with a very long waterway of about 260 km. Although there are alternative shorter waterways, they only allow accommodating small vessels with low cargo tonnage due to limitations on depth, width, the curvature radius of the route, as well as restrictions on static height/width. Although there is a proposal to expand the canal, there are concerns regarding sedimentation in the canal, leading to vulnerability to climate change and costly dredging. On the other hand, most IWT ports are small-scale and located in densely populated areas where expansion may be complicated or impossible.
- **Insufficient Demand.** Although the market share of inland waterway transport is high, the main products are bulk cargoes, which have low value and investment efficiency is not high. Production chains of high-value goods for export have not been concentrated in the region. IWT has not participated deeply in the container freight chain in the region. With the establishment of focal centers and higher development of the agricultural sector in terms of quality and added value, the role of IWT will increase.

### 3.1.3. Maritime

Most of the ports in the Mekong Delta only serve domestic and regional coastal transport, mainly from these ports to Cai Mep - Thi Vai port. Currently, only two ports on the An Giang and Can Tho Rivers can allow ships of 2,000–8,000 tons in size for direct export within a close distance of Singapore and the Philippines.

The current cargo volume in the entire region only fills about 10 ships of the size of 100,000 DWT per year, and there is an imbalance between import and export volume. Meanwhile, it is estimated that cargo throughput concentrating in an area of over 1 million TEUs per year should invest in the construction of a deep-sea port.




Source: The Survey Team

**Figure 3.1.3 IWT Transport Network and Ports in Mekong Delta**

### 3.1.4. Air Transport[53]

Currently, there are four major passenger airports and two international airports in Mekong Delta without freight service (specialized cargo aircraft).

- **Phu Quoc International Airport** opened at the end of 2012 and accommodated around 3.4 million passengers (2018). It could accommodate 7 million passengers after completing the construction of phase 2.
- **Can Tho International Airport** started operations in 2011 as an international trading gateway for the Mekong Delta. The capacity is 3–5 million passengers per year, but authorities said that it could only serve about 612,000 passengers by the end of 2017, roughly 20% of its capacity.[54]
- **Rach Gia Airport** is in Kieng Giang Province. Its handling capacity is just 200,000 passengers per year and operates below capacity. Direct flights only for Hanoi and HCM cities are available.
- **Ca Mau Airport** is in the most southern part of Vietnam and serves only for HCM City. It is also operating below capacity.

[53] Airports Corporation of Vietnam (https://www.vietnamairport.vn/)
[54] VN Express International: Vietnam warned it is planning one airport too many, 2017 (https://e.vnexpress.net/news/business/industries/vietnam-warned-it-is-planning-one-airport-too-many-3816096.html)


1) Con Dao Airport, which is located on Con Son Island, belongs to Ba Ria–Vung Tau Province
Source: The Survey Team

**Figure 3.1.4 Airport in Mekong Delta[1)]**

## 3.2. Analysis of Existing Passenger Traffic and Freight

### 3.2.1. Transport Characteristics

As well as other regions in Vietnam, the motorcycle is dominant, and the ridership of public transport services is very low. In 2013, 1.6 million citizens in Can Tho City made 2.6 million trips per day, but 80% were by motorcycles and only 2% by bus transport.[55] Existing buses are mainly used by people in the lower-income group without access to private vehicles or cannot afford other services.

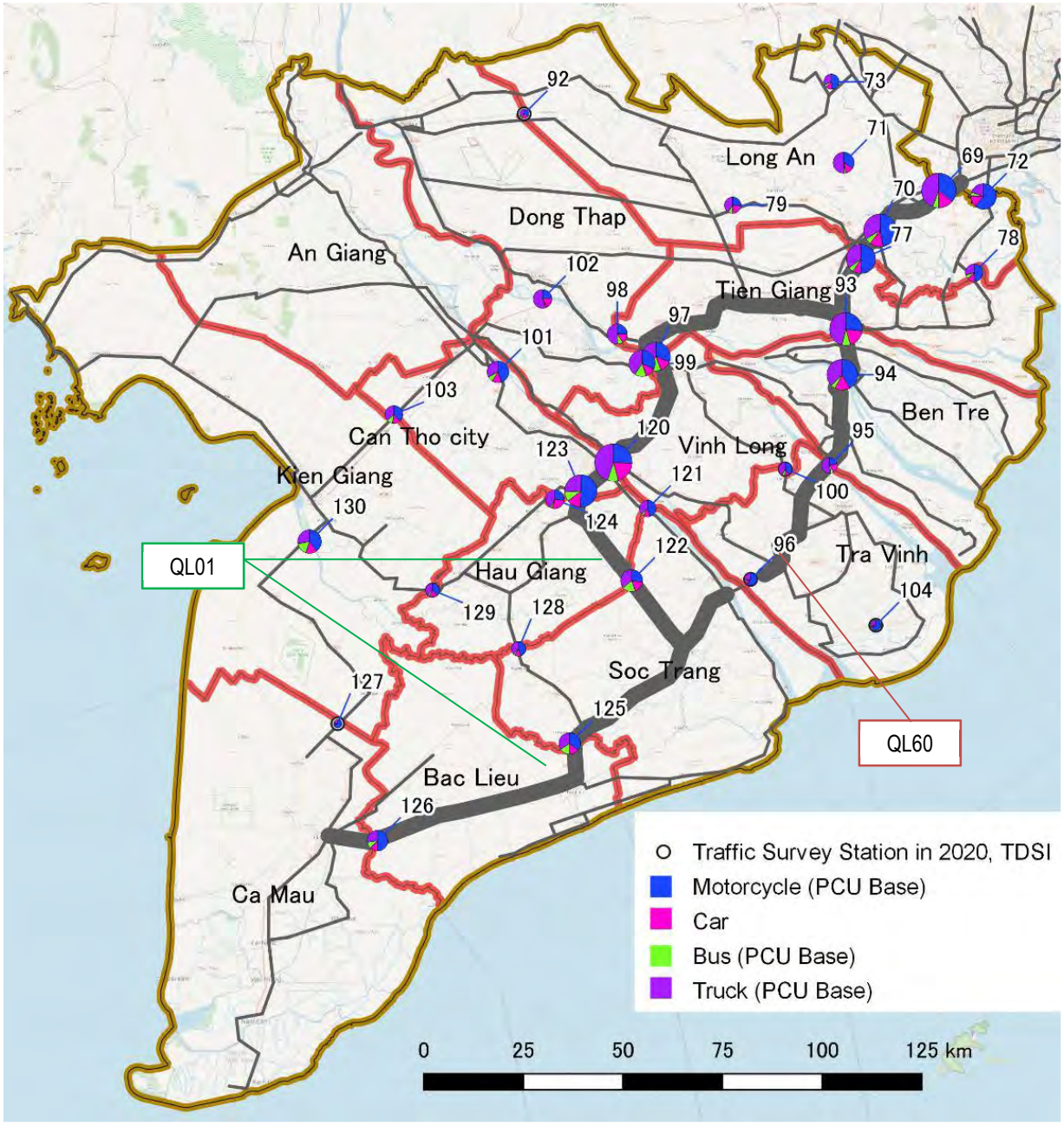
### 3.2.2. Road Traffic Condition

#### 1) Traffic Volume on National Highway

Existing traffic count survey data in 136 stations on the national highway had been collected as part of the "Study for Formulation of National Road Infrastructure Development Master Plan." There are 32 stations located in the Mekong Delta Region. Traffic volume on the stations is shown in Table 3.2.1, and locations of the survey stations and traffic volume (size of the pie chart shows the traffic volume) are visualized in Figure 3.2.1. The main characteristics are as follows:

- High traffic volumes were observed mainly on National Highway 1 (QL1) and National Highway 60 (QL60), the main corridors connecting to Ho Chi Minh City.
- The highest traffic volumes were observed on Can Tho Bridge (120), with 57,200 pcu/ day / 2 directions. In terms of vehicle type, freight vehicles accounted for almost half of the traffic (25,700 pcu), while on the adjacent Cai Rang - Can Tho section (123) the volume by freight traffic is halved to 11,100 pcu. The result implied that many vehicles either arrive and depart within Can Tho city or are dispersed in a north-south direction via National Highway 91 (QL91/QL91B).
- On QL60, traffic volume in Ham Long Bridge (94) is nearly a quarter of the volume in Co Chien Bridge (95), and traffic to / from Ben Tre Province to the south is very small. At the location which Dai Gai New Bridge is planned to be constructed on the border between Tra Vinh and Soc Trang, currently ferry service is operated and the traffic capacity is severely restricted, which may also hinder growth of traffic demand.

[55] Can Tho City urban transport planning to 2020 and orientation to 2030, 2013




Source: Study for Formulation of National Road Infrastructure Development Master Plan

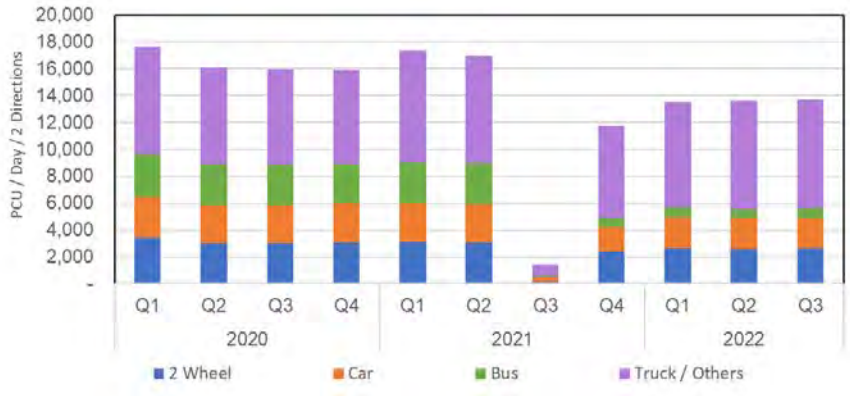
**Figure 3.2.1 Traffic Volume on National Highway in Mekong Delta Region, 2020**

### Table 3.2.1 Traffic Volume on National Highway in Mekong Delta Region

| No. | Name of Stations_EN | Vehicle Count | | | | | | | | | | | Total PCU | | | | | QL-01 | QL-60 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 Wheels | | Cars/ Veh <= 12 seats | Bus | | Truck / Others | | | | | | Bicycle / Motor cycle | Car / Taxi | Bus | Truck / Others | Total | | |
| | | BC | MC, e-bicycles | | Mini bus (<=30 seats) | Large bus (>=30 seats) | <= 2 tons | <= 4 tons | <= 10 ton | <= 18 t or 20 ft container | >18 t or 40 ft container | Others | | | | | | | |
| 69 | QL.1 - Ben Luc - Long An | 165 | 58,523 | 6,913 | 732 | 611 | 799 | 2,027 | 2,141 | 1,484 | 2,028 | 736 | 17,590 | 6,913 | 2,845 | 21,535 | 48,883 | ○ | - |
| 70 | QL.1 - Thu Thua - Long An | 218 | 69,180 | 5,837 | 720 | 518 | 1,334 | 1,661 | 1,244 | 927 | 967 | 524 | 20,798 | 5,837 | 2,591 | 14,843 | 44,068 | ○ | - |
| 71 | QL.N2 - Thu Thua - Long An | 67 | 20,081 | 2,398 | 192 | 50 | 162 | 515 | 2,119 | 761 | 168 | 172 | 6,038 | 2,398 | 471 | 9,230 | 18,136 | - | - |
| 72 | QL.50 - Can Giuoc - Long An | 201 | 54,212 | 4,081 | 349 | 224 | 344 | 874 | 629 | 167 | 146 | 432 | 16,304 | 4,081 | 1,188 | 5,296 | 26,869 | - | - |
| 73 | QL.N1 - Duc Hue - Long An | 158 | 15,154 | 1,337 | 44 | 161 | 170 | 402 | 256 | 307 | 60 | 264 | 4,578 | 1,337 | 482 | 2,996 | 9,392 | - | - |
| 77 | QL.1 - Tan An - Long An | 314 | 57,536 | 3,231 | 407 | 488 | 2,008 | 1,041 | 680 | 517 | 939 | 352 | 17,324 | 3,231 | 1,953 | 12,260 | 34,767 | ○ | - |
| 78 | Cau My Loi - QL.50 | 294 | 20,339 | 1,855 | 104 | 287 | 670 | 617 | 357 | 29 | 11 | 111 | 6,161 | 1,855 | 905 | 3,683 | 12,603 | - | - |
| 79 | QL.N2 - Tan Thanh - Long An | 26 | 9,686 | 2,627 | 353 | 143 | 240 | 610 | 783 | 241 | 65 | 53 | 2,911 | 2,627 | 993 | 4,508 | 11,039 | - | - |
| 92 | QL.N1 - Tan Hong - Dong Thap | 107 | 4,051 | 781 | 112 | 6 | 82 | 332 | 116 | 5 | 13 | 22 | 1,237 | 781 | 217 | 1,192 | 3,426 | ○ | - |
| 93 | Cau Rach Mieu | 94 | 39,570 | 7,969 | 925 | 803 | 1,556 | 3,904 | 1,787 | 704 | 827 | 488 | 11,890 | 7,969 | 3,673 | 20,117 | 43,648 | - | ○ |
| 94 | Cau Ham Luong | 189 | 53,796 | 6,190 | 460 | 440 | 2,397 | 1,426 | 1,127 | 603 | 588 | 655 | 16,177 | 6,190 | 1,928 | 14,390 | 38,685 | - | ○ |
| 95 | Cau Co Chien | 66 | 7,135 | 1,986 | 140 | 172 | 738 | 789 | 395 | 306 | 137 | 42 | 2,154 | 1,986 | 682 | 5,260 | 10,081 | - | ○ |
| 96 | QL.60 - Tieu Can - Tra Vinh | 391 | 12,491 | 510 | 89 | 21 | 235 | 239 | 230 | 75 | 17 | 21 | 3,826 | 510 | 213 | 1,783 | 6,331 | - | ○ |
| 97 | Cau My Thuan | 351 | 34,670 | 4,550 | 1,017 | 1,353 | 765 | 1,250 | 1,887 | 1,127 | 592 | 138 | 10,471 | 4,550 | 5,213 | 13,479 | 33,713 | ○ | - |
| 98 | QL.30 - Cai Be - Tien Giang | 344 | 13,681 | 2,607 | 323 | 361 | 486 | 1,337 | 792 | 598 | 371 | 199 | 4,173 | 2,607 | 1,484 | 8,433 | 16,697 | - | - |
| 99 | QL.80 - Chau Thanh - Dong Thap | 451 | 29,853 | 3,605 | 724 | 1,090 | 485 | 1,002 | 2,028 | 818 | 387 | 236 | 9,046 | 3,605 | 4,028 | 11,486 | 28,165 | - | - |
| 100 | QL.53 - Vung Liem - Vinh Long | 264 | 9,853 | 723 | 111 | 119 | 176 | 582 | 444 | 66 | 74 | 50 | 3,009 | 723 | 497 | 3,063 | 7,292 | - | - |
| 101 | QL.91 - Thot Not - Can Tho | 1,036 | 27,863 | 2,760 | 520 | 243 | 659 | 1,343 | 717 | 126 | 68 | 0 | 8,566 | 2,760 | 1,544 | 6,316 | 19,185 | - | - |
| 102 | Cau Cao Lanh | 80 | 11,021 | 2,760 | 70 | 58 | 987 | 1,365 | 541 | 175 | 507 | 1 | 3,322 | 2,760 | 271 | 8,016 | 14,369 | - | - |
| 103 | QL.80 - Vinh Thanh - Can Tho | 725 | 15,730 | 1,966 | 197 | 389 | 1,191 | 648 | 284 | 56 | 69 | 21 | 4,864 | 1,966 | 1,327 | 4,756 | 12,913 | - | - |
| 104 | QL.53 - Duyen Hai - Tra Vinh | 1,066 | 7,876 | 206 | 20 | 28 | 210 | 201 | 86 | 15 | 5 | 17 | 2,576 | 206 | 106 | 1,107 | 3,995 | - | - |
| 120 | Cau Can Tho | 61 | 48,972 | 11,479 | 1,100 | 1,356 | 1,240 | 3,441 | 3,656 | 1,221 | 1,354 | 52 | 14,704 | 11,479 | 5,370 | 25,669 | 57,221 | ○ | - |
| 121 | QL.91C - Chau Thanh - Hau Giang | 88 | 16,689 | 1,480 | 107 | 120 | 271 | 658 | 356 | 224 | 230 | 17 | 5,024 | 1,480 | 493 | 4,015 | 11,012 | - | - |
| 122 | QL.1 - Ke Sach - Soc Trang | 533 | 17,497 | 3,542 | 789 | 963 | 787 | 1,180 | 648 | 299 | 187 | 231 | 5,356 | 3,542 | 3,828 | 7,094 | 19,819 | ○ | - |
| 123 | QL.1 - Cai Rang - Can Tho | 120 | 71,881 | 5,920 | 846 | 1,012 | 710 | 2,468 | 999 | 492 | 325 | 39 | 21,588 | 5,920 | 4,053 | 11,098 | 42,659 | ○ | - |
| 124 | QL.61C - Phong Dien - Can Tho | 20 | 13,070 | 3,887 | 155 | 76 | 886 | 878 | 661 | 145 | 130 | 7 | 3,925 | 3,887 | 469 | 5,940 | 14,221 | - | - |
| 125 | QL.1 - Vinh Loi - Bac Lieu | 271 | 22,500 | 2,659 | 637 | 739 | 422 | 600 | 1,140 | 438 | 150 | 35 | 6,804 | 2,659 | 2,994 | 6,474 | 18,931 | ○ | - |
| 126 | QL.1 - Tp. Ca Mau - Ca Mau | 648 | 28,176 | 2,230 | 361 | 474 | 419 | 1,242 | 441 | 98 | 25 | 28 | 8,582 | 2,230 | 1,835 | 4,773 | 17,420 | ○ | - |
| 127 | QL.63 - Thoi Binh - Ca Mau | 531 | 6,696 | 158 | 38 | 6 | 60 | 144 | 76 | 11 | 3 | 1 | 2,115 | 158 | 83 | 636 | 2,992 | - | - |
| 128 | QL.61B - Long My - Hau Giang | 279 | 12,799 | 1,255 | 149 | 22 | 362 | 502 | 467 | 139 | 8 | 25 | 3,896 | 1,255 | 323 | 3,292 | 8,766 | - | - |
| 129 | QL.61B - Vi Thanh - Hau Giang | 234 | 9,702 | 1,485 | 132 | 41 | 626 | 435 | 220 | 85 | 13 | 60 | 2,957 | 1,485 | 340 | 2,984 | 7,766 | - | - |
| 130 | Cau Cai Lon | 105 | 29,885 | 3,542 | 789 | 963 | 787 | 1,180 | 648 | 196 | 70 | 61 | 8,987 | 3,542 | 3,828 | 6,315 | 22,671 | - | - |
| Passenger Car Unit Factor | | 0.2 | 0.3 | 1 | 1.8 | 2.5 | 2 | 2 | 2.5 | 2.5 | 3 | 1 | - | | | | | | |

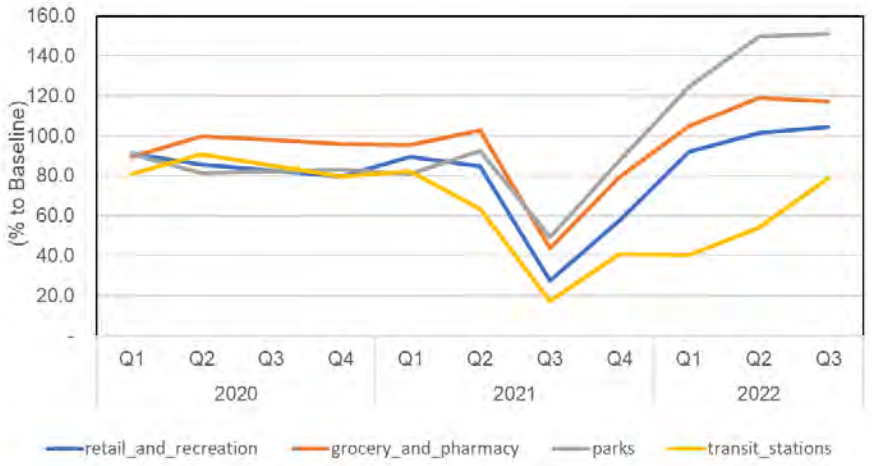
Source: Study for Formulation of National Road Infrastructure Development Master Plan

The data received from the DOT of Hau Giang Province regarding the traffic volume on Route 61C, the project area since 2020 is summarized as shown in Figure 3.2.2. Compared to the community mobility report provided by Google (Figure 3.2.3), the traffic volume is affected by the lockdown due to the spread of COVID-19 infection in the area. Strict social quarantine measures were implemented from early July to the end of September 2021, resulting in a sharp drop in traffic volumes. And, although the movement of people since 2023 has exceeded the pre-corona disaster level (100%), the traffic volume on national road 61C has not returned to the previous level.




Source: Hau Giang DOT

**Figure 3.2.2 Traffic Volume on National Highway 61C since 2019**



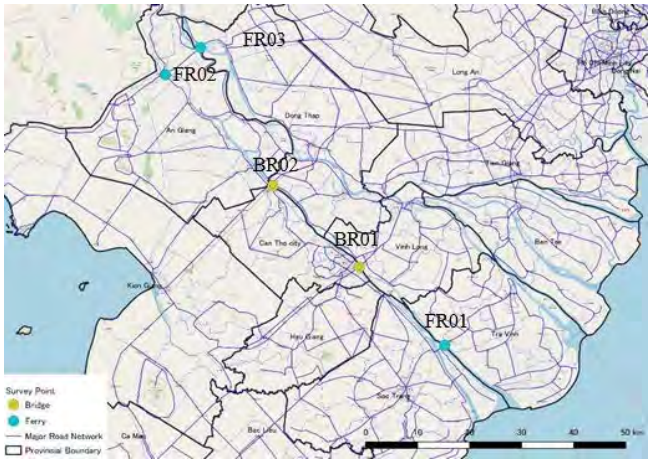

Source: Google Community Mobility Report

**Figure 3.2.3 Mobility by Purpose Since COVID-19, in Hau Giang Province**

### 2) Traffic Volume on Hau River, 2022

#### (a) Outline of the Screenline Survey

A screenline survey is conducted for the passenger and traffic volumes crossing the Mekong River to calibrate the base-year trip demand estimated from the existing traffic model and the socio-economic framework. The following figure shows the location and contents of the screenline survey.




| No | Location | Survey Period | |
|---|---|---|---|
| | | Traffic Count | Occupancy/passenger Count |
| BR 01 | Can Tho Bridge | 24 hours | 16 hours |
| BR 02 | Vam Cong Bridge | | |
| FR 01 | Dai Ngai Ferry | 17 hours | 17 hours |
| FR 02 | Chau Giang Ferry | 24 hours | 24 hours |
| FR 03 | Tan Chau Ferry | | |

Source: Screenline Survey

**Figure 3.2.4 Outlines of the Screenline Survey**

#### (b) Results

Table 3.2.2 and Figure 3.2.5 shows the summarized survey result. The main characteristics of the results are as follows:

- **Bridges (BR01, BR02):** the Can Tho Bridge (BR01) showed more than twice as much traffic as the Vam Cong Bridge (BR02). In terms of PCU, traffic of freight vehicles is more than half of the total traffic flow. Comparing traffic volumes on the Can Tho Bridge (BR01) with existing data (see *Location 120* in 3.3.2-1), traffic volumes (PCU base) are almost the same, but the volume of freight vehicles (especially heavy truck) has increased.
- **Ferries (FR01-FR03):** traffic volumes are much lower than bridges. Among them, Chau Giang Ferries (FR02) carry approximately 7,000 PCU of vehicles and 25,000 passengers daily, in the composition by vehicle type, however, motorcycles account for more than half, even in terms of PCU. Tan Chau ferries (FR03) on the same corridor carry less than 20 % of the traffic of FR02, suggesting that long distance traffic crossing the province is served by bridges and ferry users cover relatively short-distance traffic demand.
- **Passenger Volume by Vehicle Type (available in bridges only):** the contribution of motorbikes and buses is higher, which differs significantly from the characteristics of traffic volume (PCU base). In particular, the high passenger transport efficiency of buses is highlighted.

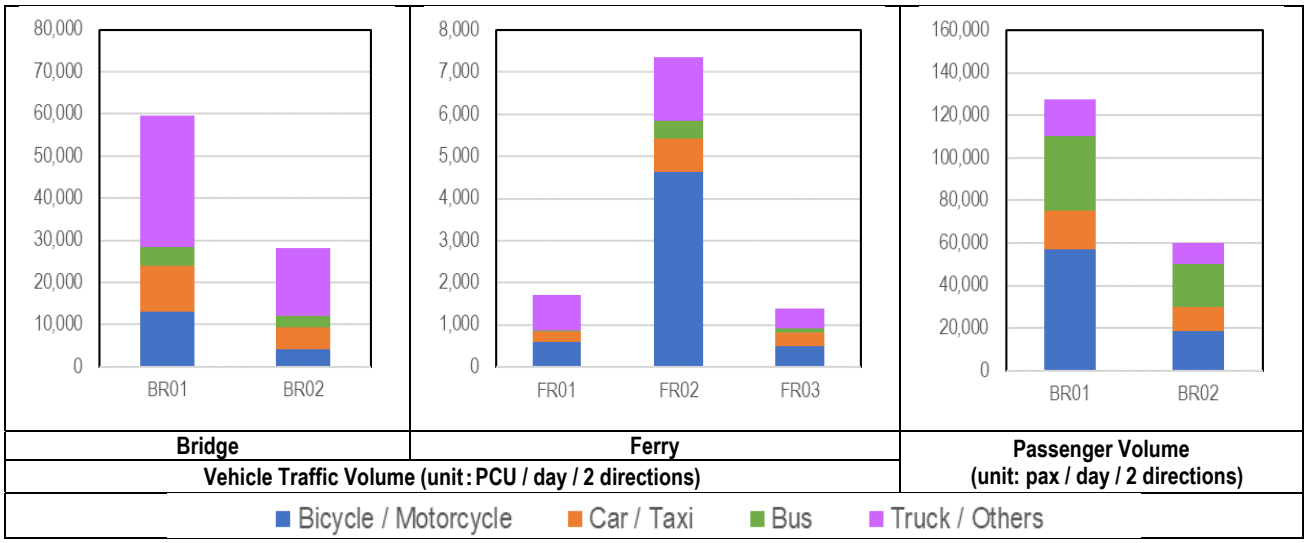
## Table 3.2.2 Traffic Volume on Hau River, 2022 [1)]

| Category | Code | Direction | | 1) Bicycle | 2) Electric bicycle | 3) Motorcycle | 4) Car | 5) Taxi | 6) Minibus | 7) Standard Bus | 8) Small Truck | 9) Big Truck | 10) Container Truck | 11) Others | PCU Base | | | | Total (PCU) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | | | | | | | | | | | | Bicycle / Motorcycle (1-3) | Car / Taxi (4-5) | Bus (6-7) | Truck / Others (8-11) | |
| Vehicle Count | BR01: Can Tho Bridge | Vinh Long | Can Tho | 6 | 5 | 21,846 | 5,601 | 123 | 521 | 583 | 1,635 | 4,213 | 609 | 142 | 6,556 | 5,724 | 2,369 | 15,772 | 30,421 |
| | | Can Tho | Vinh Long | 6 | 0 | 21,545 | 5,150 | 85 | 468 | 530 | 1,005 | 4,739 | 498 | 99 | 6,465 | 5,235 | 2,144 | 15,451 | 29,294 |
| | | **Subtotal** | | **12** | **5** | **43,391** | **10,751** | **208** | **989** | **1,113** | **2,640** | **8,952** | **1,107** | **241** | **13,021** | **10,959** | **4,513** | **31,222** | **59,715** |
| | BR02: Vam Cong Bridge | Dong Thap | Can Tho | 13 | 0 | 6,856 | 2,686 | 58 | 337 | 311 | 1,163 | 2,091 | 195 | 41 | 2,059 | 2,744 | 1,367 | 8,180 | 14,350 |
| | | Can Tho | Dong Thap | 14 | 0 | 6,650 | 2,474 | 47 | 307 | 313 | 1,255 | 1,979 | 161 | 28 | 1,998 | 2,521 | 1,320 | 7,969 | 13,807 |
| | | **Subtotal** | | **27** | **0** | **13,506** | **5,160** | **105** | **644** | **624** | **2,418** | **4,070** | **356** | **69** | **4,057** | **5,265** | **2,687** | **16,148** | **28,157** |
| | FR01: Dai Ngai Ferry | Tra Vinh | Soc Trang | 7 | 5 | 1,024 | 126 | 0 | 8 | 2 | 66 | 117 | 0 | 6 | 310 | 126 | 19 | 431 | 885 |
| | | Soc Trang | Tra Vinh | 5 | 4 | 959 | 105 | 2 | 6 | 4 | 47 | 126 | 0 | 5 | 290 | 107 | 21 | 414 | 831 |
| | | **Subtotal** | | **12** | **9** | **1,983** | **231** | **2** | **14** | **6** | **113** | **243** | **0** | **11** | **599** | **233** | **40** | **845** | **1,716** |
| | FR02: Chau Giang Ferry | Dong Thap | An Giang | 208 | 6 | 7,487 | 396 | 15 | 55 | 5 | 177 | 118 | 0 | 70 | 2,289 | 411 | 109 | 719 | 3,528 |
| | | An Giang | Dong Thap | 199 | 9 | 7,644 | 378 | 16 | 129 | 35 | 182 | 137 | 0 | 86 | 2,335 | 394 | 313 | 793 | 3,835 |
| | | **Subtotal** | | **407** | **15** | **15,131** | **774** | **31** | **184** | **40** | **359** | **255** | **0** | **156** | **4,624** | **805** | **422** | **1,512** | **7,362** |
| | FR03: Tan Chau Ferry | Dong Thap | An Giang | 38 | 3 | 760 | 151 | 0 | 31 | 2 | 27 | 61 | 0 | 18 | 236 | 151 | 59 | 225 | 671 |
| | | An Giang | Dong Thap | 47 | 0 | 804 | 172 | 1 | 20 | 7 | 77 | 26 | 0 | 14 | 251 | 173 | 53 | 233 | 709 |
| | | **Subtotal** | | **85** | **3** | **1,564** | **323** | **1** | **51** | **9** | **104** | **87** | **0** | **32** | **487** | **324** | **112** | **458** | **1,380** |
| | Passenger Car Unit Factor | | | 0.2 | 0.2 | 0.3 | 1.0 | 1.0 | 1.8 | 2.5 | 2.0 | 2.5 | 3.0 | 1.0 | | | | | |

| Category | Code | Direction | | 1) Bicycle | 2) Electric bicycle | 3) Motorcycle | 4) Car | 5) Taxi | 6) Minibus | 7) Standard Bus | 8) Small Truck | 9) Big Truck | 10) Container Truck | 11) Others | Bicycle / Motorcycle (1-3) | Car / Taxi (4-5) | Bus (6-7) | Truck / Others (8-11) | Total Passenger |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | | | | | | | | | | | | | | | | |
| Passenger Count | BR01: Can Tho Bridge | Vinh Long | Can Tho | 6 | 5 | 29,255 | 9,538 | 185 | 3,757 | 15,289 | 2,245 | 5,742 | 678 | 285 | 29,266 | 9,723 | 19,046 | 8,950 | 66,985 |
| | | Can Tho | Vinh Long | 6 | 0 | 27,989 | 8,263 | 110 | 3,315 | 12,421 | 1,198 | 6,458 | 573 | 201 | 27,995 | 8,373 | 15,736 | 8,430 | 60,534 |
| | | **Subtotal** | | **12** | **5** | **57,244** | **17,801** | **295** | **7,072** | **27,710** | **3,443** | **12,200** | **1,251** | **486** | **57,261** | **18,096** | **34,782** | **17,380** | **127,519** |
| | BR02: Vam Cong Bridge | Dong Thap | Can Tho | 13 | 0 | 9,285 | 5,818 | 115 | 2,286 | 7,197 | 1,744 | 2,918 | 232 | 72 | 9,298 | 5,933 | 9,483 | 4,966 | 29,680 |
| | | Can Tho | Dong Thap | 14 | 0 | 9,125 | 5,384 | 100 | 2,805 | 8,199 | 1,892 | 2,720 | 185 | 72 | 9,139 | 5,484 | 11,004 | 4,869 | 30,496 |
| | | **Subtotal** | | **27** | **0** | **18,410** | **11,202** | **215** | **5,091** | **15,396** | **3,636** | **5,638** | **417** | **144** | **18,437** | **11,417** | **20,487** | **9,835** | **60,176** |
| | FR01: Dai Ngai Ferry | Tra Vinh | Soc Trang | Not Available (some passengers board the ferry by walking) [1)] | | | | | | | | | | | | | | | 1,920 |
| | | Soc Trang | Tra Vinh | | | | | | | | | | | | | | | | 1,981 |
| | | **Subtotal** | | | | | | | | | | | | | | | | | **3,901** |
| | FR02: Chau Giang Ferry | Dong Thap | An Giang | | | | | | | | | | | | | | | | 12,016 |
| | | An Giang | Dong Thap | | | | | | | | | | | | | | | | 12,527 |
| | | **Subtotal** | | | | | | | | | | | | | | | | | **24,543** |
| | FR03: Tan Chau Ferry | Dong Thap | An Giang | | | | | | | | | | | | | | | | 2,173 |
| | | An Giang | Dong Thap | | | | | | | | | | | | | | | | 2,134 |
| | | **Subtotal** | | | | | | | | | | | | | | | | | **4,307** |

Source: Screenline Survey

1) Ferry passengers, excluding the vehicle's driver, are requested to board by walking. Only the total number of passengers was recorded.




Source: The Survey Team

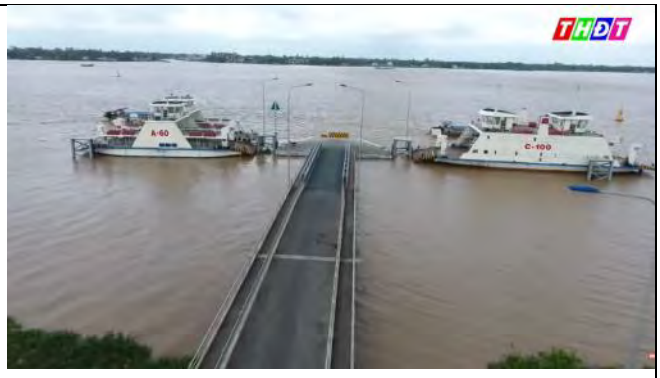
**Figure 3.2.5 Traffic Volume by Vehicle's Classification on Screen Line Survey**

### (c) Traffic Volume on Thoi An – Phong Hoa Ferry Service

After conducting a traffic survey in this part, it was found that the Thoi An - Phong Hoa ferry service operates between Can Tho City and Dong Thap Province (see Figure 3.2.6 and Figure 3.2.7). As a result of interviews with the Department of Transport of Dong Tap Province, the operator, operational data were provided as shown in Table 3.2.3. On a daily basis, the number of users was the same as that of minor ferry terminals such as FR01 and FR03. This data is also used for updating the traffic demand forecasting model.


Source: Open Street Map

**Figure 3.2.6 The Location of Thoi An – Phong Hoa Ferry Service**




Source: Truyền Hình Đồng Tháp

**Figure 3.2.7 Ferry Fleets Operated at Thoi An – Phong Hoa Ferry Service**

**Table 3.2.3 Average Monthly Traffic Volume on Thoi An – Phong Hoa Ferry Service**

| 2- Wheel Vehicles (Motorcycle) | Cars or Buses less than 12 seats | Buses of 12-16 seats and Trucks (3-7t) | Buses (6-30 seats) | Buses (> 30 seats) and Trucks (7-10t) | Trucks (>10 t) |
|---|---|---|---|---|---|
| 63,000 | 12,500 | 2,600 | 450 | 400 | 170 |

Source: Dong Thap DOT

## 3.3. Infrastructure Development Plans

### 3.3.1. Latest Plans for Transport Infrastructure Development

The legal basis for implementing transport infrastructure project is the national, regional, and provincial plans. At the national level, there are five transport sub-sector plans (NSP), including road, railway, IWT, seaport, and airport. According to Decision No. 995/QĐ-TTg dated 9 August 2018, the MOT is responsible for the formulation of five NSPs in the transport sector.

Following the national sector plans, the Mekong Delta Region Plan in the period of 2021–2030 and Vision to 2050 (referred to as Mekong Delta Region Plan 2021–2030) was formulated and approved by Decision No. 287/QĐ-TTg dated 28 February 2022.

Hence, five transport NSPs and Mekong Delta Region Plan shall be fundamental orientations for the development of transport infrastructure in this region.

### 3.3.2. Summary of Road Transport Projects

According to Decision No. 11/2012/QĐ-TTg dated 10 February 2012 on the Approval of Transport Master Plan in Mekong Delta Region to 2020 and Orientation to 2030 (Mekong Transport Master Plan 2020), the direction of the road network plan is to formulate vertical and horizontal transport corridors by developing expressways and national highways. Based on this orientation, the network of vertical and horizontal national highways was well developed in the 2010s; however, the network has a limited capacity because most have only two lanes in accordance with Mekong Master Plan 2020. Additionally, just a few sections of expressways were developed in the Mekong Delta Region in the same period mainly because the Government of Vietnam prioritized constructing expressways connecting to Hanoi and Ho Chi Minh Cities during this period.

Following the Mekong Transport Master Plan 2020, the Road-NSP and Mekong Regional Plan 2021–2030 have retained the orientation for developing vertical and horizontal corridors. In comparison with the Mekong Transport Master Plan 2020, however, there are two different key points. The first point is that the network of expressways has been expanded, and the second is the cross-sections of national highways have been widened. The long list of road projects is compiled into four groups as follows.

(i) **Expressways**. The project aims to formulate vertical and horizontal backbones for the Mekong Delta Region. Generally, these expressways will significantly improve the capacity, connectivity, and accessibility of the road network as well as the competing capability of the MDR.

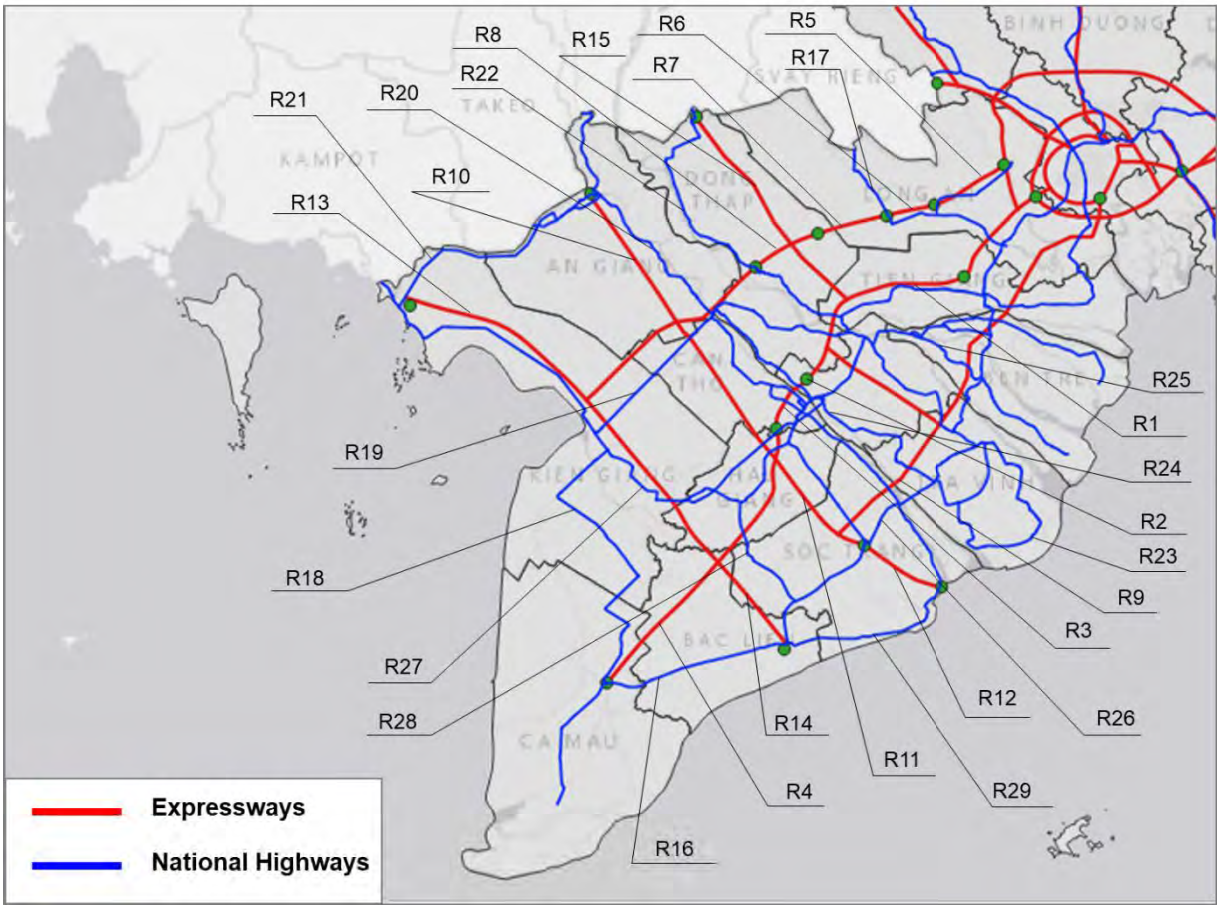
- **Vertical expressways**. The projects will enhance the connectivity and accessibility from Mekong Delta provinces to Ho Chi Minh City and other provinces in the Southeast region by developing three north–south backbone expressways, including the section of the North–South Expressway in the east, section of North–South Expressway in the west, and Ho Chi Minh–Tien Giang–Ben Tre–Tra Vinh–Soc Trang.
- **Horizontal expressways.** The projects will improve the connectivity and accessibility from major cities and industrial areas to the border gates with Cambodia and regional ports through the development of three east–west expressways, including Chau Doc–Can Tho–Soc Trang expressway, Ha Tien (Kien Giang)–Rach Gia–Bac Lieu expressway, and Hong Ngu (Dong

Thap)–Tra Vinh.

(ii) **National highways**. The projects will improve the capacity of the road network in general and the national highway network in particular by upgrading or rehabilitating the existing national highways.

- **Major national highways.** The major national highways will serve as alternative routes of vertical and horizontal expressways; hence, the projects will ensure smooth passenger and cargo traffic within Mekong Delta Region and improve the connectivity and accessibility from major cities and industrial areas to the Southeast (including HCMC), the border gates with Cambodia and regional ports.
- **Minor national highways.** These highway projects will improve the connectivity and capacity of the road network in the MDR. As a result, the accessibility from not only major cities but also minor cities/towns to border gates, regional ports, and the Southeast will be improved.

The list and map of road projects are presented in Figure 3.3.1 and Table 3.3.1.




Source: Study Team

**Figure 3.3.1 Location of Road Projects in the MDR**

### Table 3.3.1 List of Road Projects in Mekong Delta Region

| Project Group | Code & Name of Projects | Cost (Billion VND) | |
|---|---|---|---|
| | | 2021–2030 | 2031–2050 |
| Vertical expressways | R1: North–South expressway in the East (Trung Luong–My Thuan) | 8,816 | |
| | R2: North–South expressway in the East (My Thuan Bridge No.2) | 1,210 | |
| | R3: North–South expressway in the East (My Thuan–Can Tho) | 3,976 | |
| | R4: North–South expressway in the East (Can Tho–Ca Mau) | 34,316 | |
| | R5: North–South expressway in the West (Ngoc Hoi–Chon Thanh–Rach Gia: Duc Hoa–Thanh Hoa) | | 4,350 |
| | R6: North–South expressway in the West (Ngoc Hoi–Chon Thanh–Rach Gia: Thanh Hoa–Tan Thanh section) | | 2,610 |
| | R7: North–South expressway in the West (Ngoc Hoi–Chon Thanh–Rach Gia: Tan Thanh–My An section) | | 3,480 |
| | R8: North–South expressway in the West (Ngoc Hoi–Chon Thanh–Rach Gia: My An–Cao Lanh section) | 4,524 | |
| | R9: Hochiminh–Tien Giang–Ben Tre–Tra Vinh-Soc Trang | | 16,560 |
| Vertical expressways | R10: Chau Doc-Can Tho-Soc Trang expressway (Chau Doc–Can Tho section) | 24,100 | |
| | R11: Chau Doc-Can Tho-Soc Trang expressway (Can Tho–Soc Trang section) | 9,800 | |
| | R12: Chau Doc-Can Tho-Soc Trang expressway (Soc Trang–Tran De section) | 7,477 | |
| | R13: Ha Tien–Rach Gia–Bac Lieu expressway (Ha Tien-Rach Gia section) | 8,500 | |
| | R14: Ha Tien–Rach Gia–Bac Lieu expressway (Rach Gia-Bac Lieu section) | | 19,328 |
| | R15: Hong Ngu–Tra Vinh expressway | | 21,933 |
| Major national highways | R16: National Highway 1 (Nam Can–Phung Hiep section) | 6,178 | |
| | R17: National Highway 62 (section of Tan An (Long An) to the border gate in Moc Hoa (Long An)) | 2,266 | |
| | R18: National Highway 63 (Ca Mau–Kien Giang) | 2,700 | |
| | R19: National Highway 80 (Can Tho–Kien Giang) | tbd | |
| | R20: National Highway 91 | 5,107 | |
| | R21: National Highway N1 | 4,000 | |
| Minor national highways | R22: National Highway 30 (Dinh Ba–Hong Ngu–the border of Cambodia) | 1,618 | |
| | R23: National Highway 53 (Long Ho–Ba Si–Long Toan–Dinh An economic Zone) | 3,942 | |
| | R24: National Highway 54 (Dong Thap–Vinh Long–Tra Vinh) | 4,744 | |
| | R25: National Highway 57 (Dinh Khao bridge–Mo Cay Town (Ben Tre)) | 1,700 | |
| | R26: National Highway 60 (including Dai Ngai and Rach Mieu 2 bridges) | 14,310 | |
| | R27: National Highway 61 | 1,560 | |
| | R28: National Highway 61B (Vinh Tuong–Long My Town–NH1A) | 1,157 | |
| | R29: National Highway 91C/Nam Song Hau road | 3,500 | |

Source: VITRANSS3, Documents of Road-NSP & Mekong Delta Regional Plan 2021-2030

### 3.3.3. Summary of Projects in Other Transport Sub-Sectors

For the other transport subsectors, progressive network development plans are summarized in the following sub-sections.

#### 1) Railway Projects

According to the Mekong Transport Master Plan 2020, there was an orientation for the development of the Ho Chi Minh–My Tho–Can Tho railway line with 170 km in length. However, this railway line was extended to Ca Mau province by Decision No. 1468/QĐ-TTg dated 24 August 2015 on the Adjusted Master Plan on Development of Railway Transport to 2020 and Vision to 2030. In reality, this railway was not constructed in the 2010s due to low traffic demand in the Mekong Delta Region and the priority of road development.

Railway-NSP and Mekong Delta Regional Plan 2021–2030 have been the direction for the development of the Ho Chi Minh–Can Tho railway line in 2031–2050. In summary, there is only one planned railway line in the Mekong Delta Region.

#### 2) Inland Waterway Projects

The Mekong Delta Region is characterized by a dense network of inland waterways. IWT has been the key transport mode for both passengers and freight. However, there have been some obstacles to the growth of IWT transport. For vertical IWT transport corridors, there is a system of larger rivers allowing movement of large-scale vessels that helps promote river-sea or coastal-line transport from Mekong Delta Region to Ho Chi Minh City or Cai Mep–Thi Vai seaports. However, horizontal IWT transport corridors have shorter routes to Ho Chi Minh City but are mostly based on narrow channels with limited capacity. Additionally, the IWT network capacity in the region has been significantly reduced by low-clearance bridges.

According to the Mekong Transport Master Plan 2020, there were directions for developing vertical and horizontal transport corridors by inland waterways. Additionally, the government of Vietnam has th policy to prioritize and promote the development of inland waterways and river-sea transportation according to Decision No 318/QĐ-TTg dated 4 March 2014 on the Approval of Strategy for development of transportation services through 2020, and orientations toward 2030 (referred to as Transport Service Strategy 318). However, following the Mekong Transport Master Plan 2020 and Transport Service Strategy 318, IWT-NSP and Mekong Delta Regional Plan 2021-2030 aimed to further improve the IWT network in terms of capacity, accessibility, and safety. A long list of IWT projects is compiled into the following groups.

- **Waterway Improvements**. The projects will enhance the capacity and accessibility of the waterway network by upgrading core waterway transport corridors, removing bottlenecks, and developing river-sea transport via estuaries.
- **Improvement/Construction of River Ports**. The projects will improve the capacity of river ports in the aspects of accessibility of large-sized vessels, upgrade of loading system, and efficiency in port operation.
- **Development of Inland Container Deport for Inland Waterway (IWT-ICDs)**. The projects will improve the connectivity of IWT transport with other transport modes and industrial centers.
- **Replacement of Low-Clearance Bridges.** The projects will enhance the capacity and connectivity of waterway transport routes.
- **Traffic Safety Improvement**. The project will ensure traffic safety and enhance the

reliability of inland waterway navigation.

### 3) Seaport Projects

The MDR has the advantage of sea-side accessibility with the Gulf of Thailand to the southwest and East Sea to the southeast. In the region, however, most seaports only serve domestic and coastal-line maritime transport. Only those in An Giang and Can Tho can receive large-sized vessels of 2000 to 8000 tons. A key reason is the low export and import demand due to the low industrialization level. Additionally, the seaport systems in Ho Chi Minh City and Cai Mep–Thi Vai have been well-developed; therefore, cargo flows in and out of the region still depend on their seaport systems in the short- and medium-term.

To enhance the competing capability of the region, the Seaport-NSP and Mekong Delta Region Plan 2021–2030 aims to improve further the capacity, sea-side accessibility, and safety of seaport systems in the region as follows:

- **Construction of New Ports and ICDs**. The projects will improve the capacity and connectivity of the seaport system in the region, especially for deep-sea Tran De port.
- **Improvement or Upgrade of Channels to Main Ports**. The projects will improve sea-side accessibility to existing seaports via the improvement of the port access channels.
- **Navigation Facilities/System**. The projects will ensure traffic safety and enhance the reliability of maritime navigation.

### 4) Airport Projects

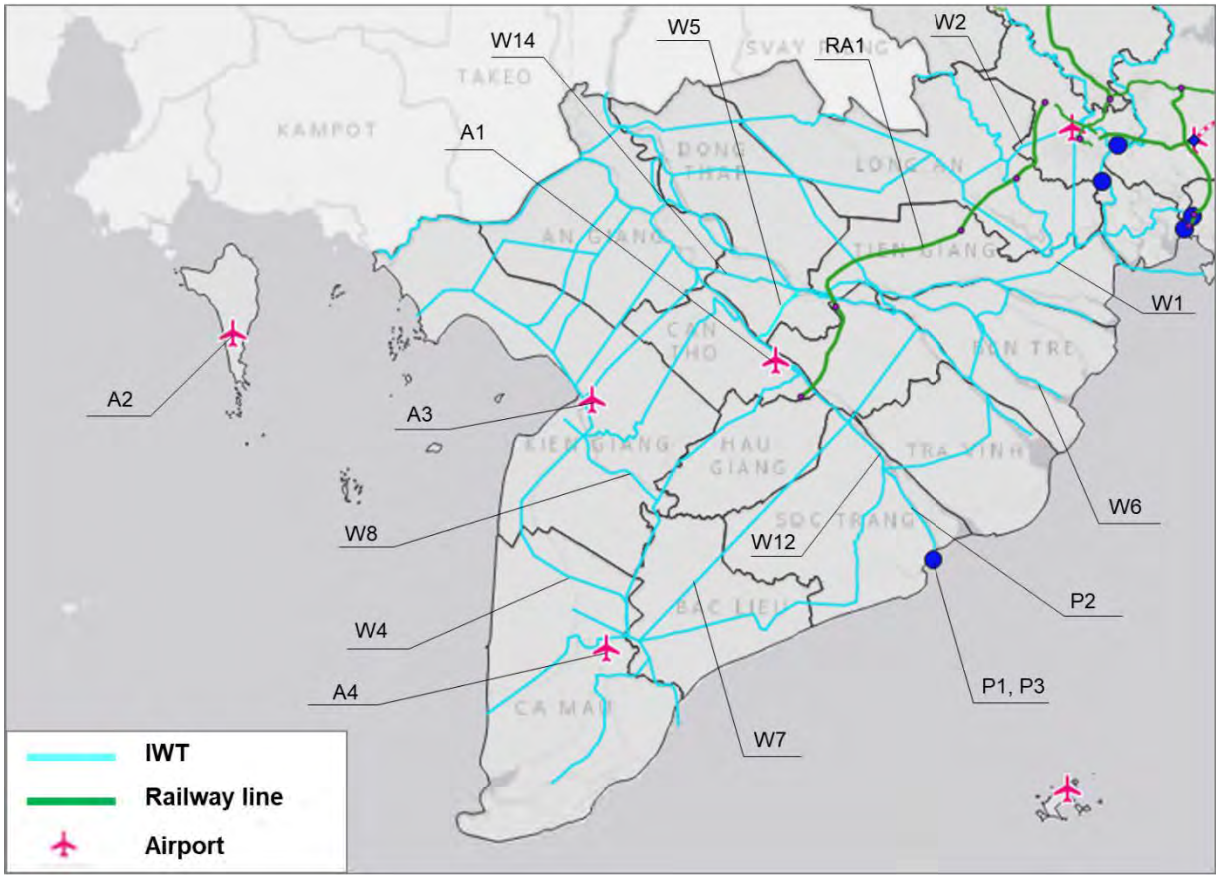
While the slowdown in the global economy and negative impacts of the COVID-19 pandemic significantly reduce air travel demand in the short- and medium-term, the growth in air travel is expected in the region and would continue up to the long term, especially for Can Tho and Phu Quoc international airports. To meet the growth of air travel demand, the Airport-NSP and Mekong Delta Region Plan 2021–2030 aim to enhance the capacity of existing airports in the region by constructing new terminals and additional runways and taxiways and expanding airport aprons. The list and map of other transport sub-sector projects are presented in Table 3.3.2 and Figure 3.3.2.

**Table 3.3.2 List of Projects in Other Transport Subsectors in Mekong Delta Region**

| Project Group | Code & Name of Projects | Cost (Billion VND) | |
|---|---|---|---|
| | | 2021–2030 | 2031–2050 |
| Railway Project | RA1: Hochiminh–Can Tho railway | | 157,254 |
| IWT | W1: Cho Gao Canal | 1,500 | |
| | W2: Cho Dem–Ben Luc waterway transport route | 200 | |
| | W3: Development of logistics and waterway corridors in the south | 5,800 | |
| | W4: Improvement of Rach Gia–Ca Mau route | 1,800 | |
| | W5: Upgrade of Muong Khai–Doc Phu Hien Canal | 2,300 | |
| | W6: Waterway route on Ham Luong River from confluence of Tien River to Ham Luong estuary | 500 | |
| | W7: Upgrade of Sai Gon–Ca Mau route (Can Tho–Ca Mau section) | 1,700 | |
| | W8: Upgrade of Rach Soi–Hau Giang Canal | 1,550 | |
| | W9: Improvement of river ports in the south (Phases I & II) | | 87,500 |
| | W10: Development of IWT-ICD in the south (Phase I) | | 7,868 |
| | W11: Upgrade of low-clearance bridges in the south | | 15,700 |
| | W12: Vessel traffic system on Hau River | 110 | |

| Project Group | Code & Name of Projects | Cost (Billion VND) | |
|---|---|---|---|
| | | 2021–2030 | 2031–2050 |
| | W14: Dregding Sai Gon – Kien Luong route (section from Lo Vap-Sa Dec to Kien Luong) | 1,660 | |
| Seaport | P1: Development of Tran De Port | 32,000 | |
| | P2: Navigation channel to Hau River | 2,225 | |
| | P3: Dredging of navigation channel through Tran De estuary | 151 | |
| | P4: Dredging of navigation channel to Tien River | 300 | |
| Airport | A1: Construction of new terminal and taxiway, expansion of apron in Can Tho International Airport | 7,462 | |
| | A2: Construction of new terminal and runway, expansion of apron in Phu Quoc International Airport | 9,595 | |
| | A3: Extension of runway and expansion of apron in Rach Gia Airport | | 4,454 |
| | A4: Construction of new terminal, expansion of apron and extension of runway in Ca Mau Airport | | 3,117 |

Source: VITRANSS3, Documents of IWT-NSP, Railway-NSP, Seaport-NSP, Aiport-NSP & Mekong Delta Regional Plan 2021-2030




Source: Study Team

**Figure 3.3.2 Location of Projects in Other Transport Subsectors in Mekong Delta Region**

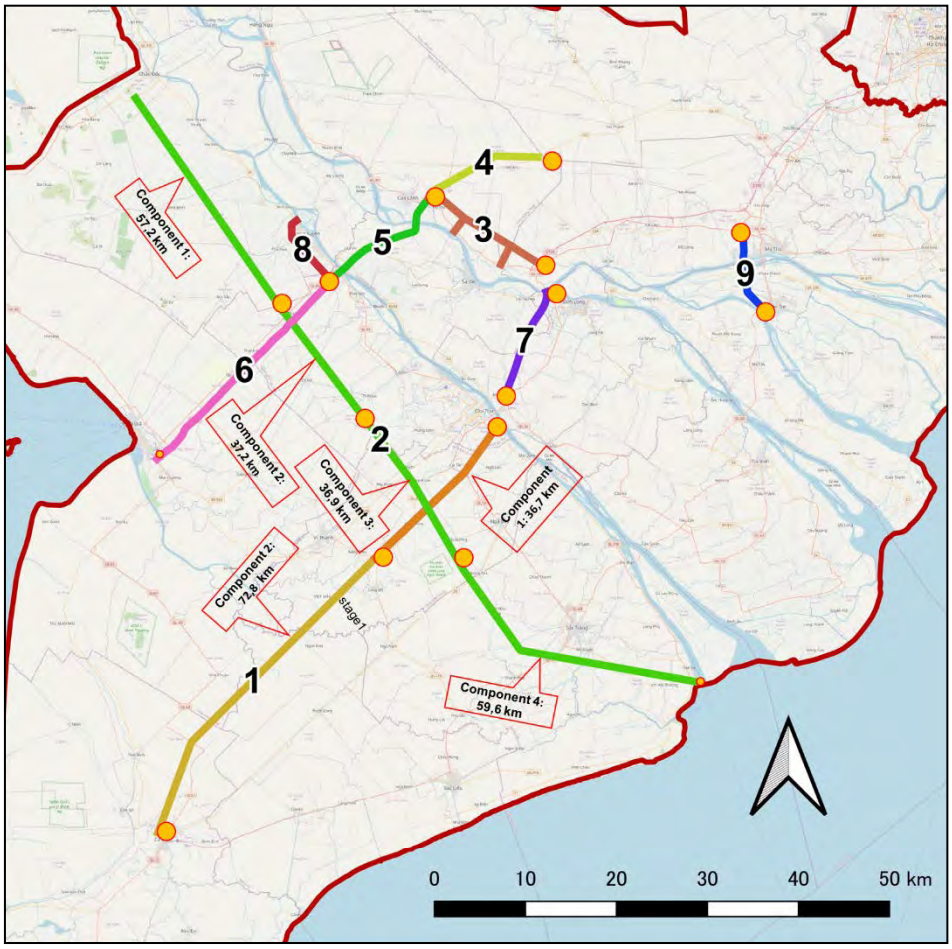
## 3.4. On-going Transport Infrastructure Project (until 2025)[56]

### 3.4.1. Overview[57]

In 2021, the MOT proposed to allocate at least VND57.3 trillion in the next five years as investment in transportation infrastructure in the Mekong Delta. The projects include the upgrade and completion of several highway projects, a complete a sea route project to allow large-capacity ships to enter the Hau River, and the development of logistics and waterways in southern Vietnam.

### 3.4.2. Road and Expressway Project Implemented by PMU My Thuan

In the Mekong Delta, the MOT Project Management Unit (PMU) My Thuan is the implementation body for the 10 road and expressway projects. Among them, seven are under preparation stage (up to 2025) and three are ongoing. Table 3.4.1 summarizes the project status and shows the location by the proposed components.




Source: Worked by the Survey Team, based on Summary Report – Status of projects managed by PMU My Thuan

**Figure 3.4.1 Location of Road and Expressway Projects managed by PMU My Thuan in Mekong Delta**

[56] MOT, PMU My Thuan: Summary Report - Status of projects managed by PMU My Thuan, 30 March 2022

[57] https://www.seetao.com/details/131266.html

**Table 3.4.1 Road and Expressway Projects managed by PMU My Thuan in Mekong Delta**

| | No. | Name of Projects | Total length (km) | Width | Investment (billion VND) | Remarks |
|---|---|---|---|---|---|---|
| Under Preparation Stage | 1 | Bac – Nam Expressway Project under 2021–2025 (project components: Can Tho– Hau Giang and Hau Giang–Ca Mau). | 109.5 | *Stage 1:* 4 expressway-lanes, 17 m | 27,254 | Already signed the consultant contracts for the preparation of F/S. |
| | 2 | Chau Doc–Can Tho–Soc Trang Expressway Project | 188.2 | *Finalization stage:* 6-expressway-lanes, 32.5 m<br>*Stage 1:* 4-lane, 17 m | 44,691 | The project has been appraised by the State Appraisal Council. The MOT submitted to the Government a Pre-FS report on 18/3/2022. |
| | 3 | Cao Lanh–An Huu Expressway Project | 27.43 | *Finalization stage:* 4-expressway-lanes 24.75.<br>*Stage 1:* 4-lane, 17 m | 6,029 | MOT submitted Letter No. 1461/TTr-BGTVT dated 16/2/2022 to the Prime Minister for approval of the Pre-FS report. The MPI issued Letter No. 1345/BKHĐT-GSTDĐT dated 04/3/2022 to the relevant ministries and province for appraisal comments on the project investment policy decision document. |
| | 4 | My An–Cao Lanh Expressway | 26.16 | *Finalization stage:* 6-lanes expressway standard<br>*Stage 1:* 4-lane, 17 m | 3,677.2 | The Prime Minister approved the project with an investment policy through Decision No. 2203/QD-TTg dated 27/12/2021. Currently, PMU My Thuan is organizing the selection of the consultant and has already signed the consultant contract for a survey, with the preparation of F/S. |
| | 5 | Improvement of Cao Lanh–Lo Te Road Project | 28.84 | N/A | 950 | MOT approved the investment policy through Decision No. 140/QD-BGTVT dated 24/01/2022. PMU My Thuan approved the selection of consultant plan, term of reference, and cost estimate of consultant packages and organized the selection of consultants for the project. |
| | 6 | Improvement of Lo Te–Rach Soi Road Project | 51.5 | N/A | 750 | MOT approved investment policy at Decision No.153/QD-BGTVT dated 25/01/2022. Currently, PMU My Thuan approved the selection of consultant plan, terms of reference, and cost estimate of consultant packages and organized the selection of consultants for the project. |
| Under Construction | 7 | My Thuan–Can Tho Expressway Project | 22.97 | Stage 1: 4-lanes, Bn = 17.0 m | 4,826 | The project is divided into three civil works packages that commenced in January 2021 and will be completed in 2022. The entire phase 1 will be complete in 2023. |
| | 8 | Connecting Road to NH.91 and Long Xuyen City Bypass Project | App. 18.1 | 02 motor vehicle lanes, Bn = 12 m | 2,106 | The project is divided into three civil works packages, commenced in January 2022 and for completion in December 2023. |
| | 9 | Construction of Rạch Mieu 2 Bridge connecting Tien Giang and Ben Tre provinces Project. | App. 15.5 | BxH = 110 × 37.5 m and 220 x 30 m | 5,175 | The project is divided into six civil works packages, commenced in March 2022 and for completion in 2025. |

Source: Summary Report – Status of projects managed by PMU My Thuan

Besides the projects to be undertaken by PMU My Thuan, the following projects are worth noting for regional network development:

- the 7 km Second My Thuan Bridge by PMU 7 worth more than VNĐ5.5 trillion on North-South Expressway over the Tien River between Tien Giang and Vinh Long provinces
- the 15.2km Đại Ngãi Bridge by PMU 85 worth more than VNĐ8 trillion on National Highway No. 60 over the Hậu River between Trà Vinh and Sóc Trăng provinces

### 3.4.3. Railway

In August 2013, the MOT signed a decision[58] approving the planning of the Ho Chi Minh City–Can Tho railway route, with a total length of 173.7 km, through HCMC and the Mekong Delta's Long An, Tien Giang and Vinh Long. Double tracking and standard gauge (1,435 mm) are applied, and the design speed for the section between Ho Chi Minh City and Can Tho is about 190 kph for a passenger train and 120 kph for a freight train. The travel time between the two

[58] Decision 1556/QD-BGTVT

cities will be 75–80 minutes, from the current 3–4 hours by road.

In May 2022, Can Tho Authorities suggest the construction project should start by 2030.[59]

Source: Can Tho City

**Figure 3.4.2 Draft Alignment of the Ho Chi Minh City–Can Tho Railway Project**

### 3.4.4. Inland Water Transport and Seaport

According to Resolution No. 36-NQ/TW, the "Strategy for Sustainable Development of Vietnam Ocean Economy by 2030, Vision to 2050," dated 22 October 2018, stated that the central point of a maritime economy is the development and improvement of seaports and maritime transport services. By 2030, seaports in the region are expected to meet the demand of throughput of cargo from 64 to 80 million tons (container cargo from 0.6 to 0.8 million TEU); passengers from 6.1 to 6.2 million of passenger arrivals and departures; by 2050, meet the demand of throughput of cargo at an average growth rate of about 5.5 to 6.1%; of passengers at an average growth rate from 1.1 to 1.25%.

**Table 3.4.2 Prioritized Projects for IWT in Mekong Delta Region**

| No | Name of Projects | Scope | Implementation Schedule | Total investment (Billion VND) |
|---|---|---|---|---|
| 1 | Expanding the Hau River channel | Embankment protection of the bank of Quan Chanh Bo canal, with a total length of over 18 km; build 5 km of road along the south bank of Tat canal. | 2021–2023 | 2,596 |
| 2 | Improving the clearance of road bridges crossing national inland waterways | Build 9 new bridges including: Mo Cay crossing the Mo Cay canal; O Mon and Thoi Lai cross O Mon canal; Dong Thuan, Dong Binh via Thi Doi– O Mon canal; Vam Xang–Thi Doi cross Thot Not canal; Sa Dec (Nang Hai) through Lap Vo - Sa Dec canal; Hong Ngu crosses Hong Ngu– Vinh Hung canal and Moc Hoa bridge across Vam Co Tay River. | 2022–2025 | 1,944 |
| 3 | Developing waterway transport in the southern | Renovate and upgrade the 197 km of East–West corridor through Hau River, Tra On River, Mang Thit canal, Co Chien river, Cho Lach canal, Tien river, Ky Hon canal, Rach | 2024–2026 | 4,000 |

[59] VN Express International: PM order speed-up launch of HCMC – Mekong Delta railway (https://e.vnexpress.net/news/news/pm-orders-sped-up-launch-of-hcmc-mekong-delta-railway-4466414.html)

| | | | | |
|---|---|---|---|---|
| | region using World Bank loans | canal. La, Vam Co River, Nuoc Man Canal, Rach Cat River, Soai Rap River, Long Tau River, Dong Tranh River, Tac Cua/Tac Bai River, Go Gia River, and Thi Vai River. | | |

Source: Dau Tu Online

### 3.4.5. Air Transport

According to Decision No. 236/QĐ-TTg, "Approval of Adjusted Plan for Development of Air Transport by 2020 and Orientation Towards 2030," dated 23rd February 2018, there will be 15 domestic airports and 13 international airports by 2030. While the slowdown in the global economy and negative impacts of the COVID-19 pandemic significantly reduce air travel demand in short and medium terms, high growth in air travel in Vietnam is expected and would continue up to the long term. Although new construction project is not proposed in the Mekong Delta, project to upgrade and expand the existing airports are proposed. Phu Quoc International Airport is expected to play the role of an airport serving international and domestic visitors. Can Tho International Airport is the hub center for the development of airline logistics in the region. Rach Gia and Ca Mau Airports, in addition to being domestic airports, also act as flight training and coaching centers.

## 3.5. MPI Initiative

Since the 2010s, the government of Vietnam has heeded the development of the Mekong Delta Region. On 17 November 2017, the government promulgated Resolution No. 120/NQ-CP on "Sustainable and Climate-Adaptive Development of Mekong Delta Region." According to this resolution, a specific task of the Ministry of Planning and Investment (MPI) is to formulate mechanisms of resource mobilization and encourage investments in inter-regional transport infrastructures from different sources (including ODA loans).

On 13 April 2019, the government of Vietnam promulgated Decision No. 417/QĐ-TTg on the comprehensive action program on the implementation of Resolution No. 120/NQ-CP. According to this decision, there are six groups of main tasks and specific actions, including infrastructure development and investment (i.e., the 5th task group). For the 5th task group, a specific action of the MPI is to chair and coordinate with city or provincial people's committees for the compilation of an infrastructure project list for 2021–2030. Those infrastructures will promote inter-regional development in the Mekong Delta Region. To further push the implementation of Resolution No. 120/NQ-CP, the Prime Minister of Vietnam promulgated Directive No .23/CT-TTg on 5 September 2019. According to the Directive, MPI shall study and propose USD2 billion for the finalization of approved and appraised investment projects and programs from 2021 to 2025 under Decision No. 417/QĐ-TTg and Integrated Master Plan of Mekong Delta Region in the period of 2021–2030 and Vision to 2050 (referred to as Mekong Integrated Master Plan 2021–2030). It is noted that the Mekong Integrated Master Plan 2021-2030 was approved by Decision No. 287/QĐ-TTg on 28 February 2022. This is the legal basis of the MPI and Mekong Delta provinces for the compilation of a project list.

The MPI requested the Mekong Delta provinces and cities for project proposals. Most provinces proposed inter-regional transport infrastructure projects. On the other hand, MPI shared the list of project proposals with six international donors and asked about their interests. The list of project proposals and expected funding sources is presented in Table 3.5.1

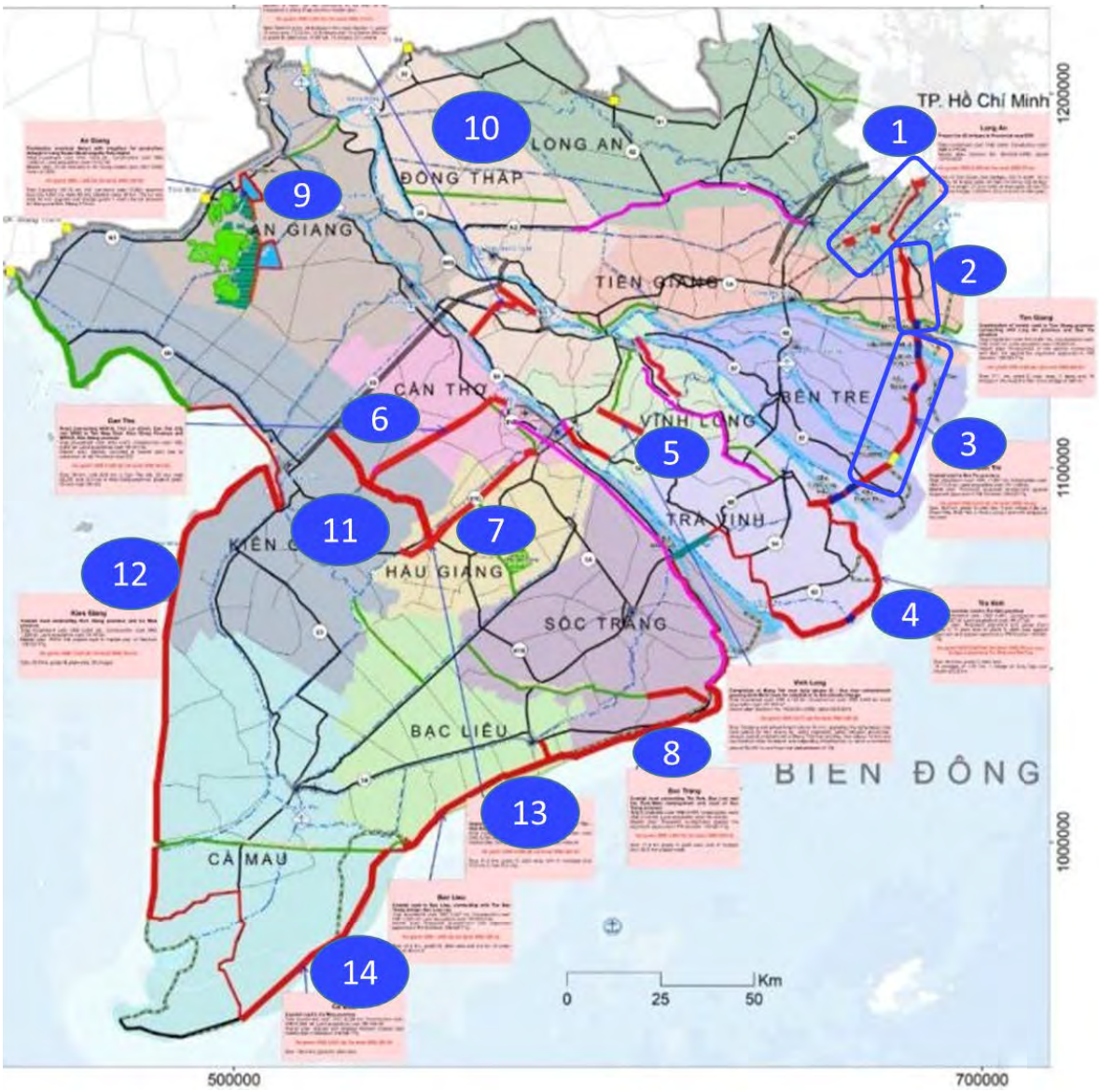
In the table, 16 projects are expected to be financed by: WB (2), ADB (6), JICA (2), KEXIM (4), AFD (1) and KFW (1). WB-financed projects would be under MOT and MARD. Each of the 13 provinces is expected to manage one project, except Kien Giang (1 "ADB" project + 1 "KEXIM" project).

The official signing ceremony of the MOC between MPI and six international donors was held on 21st June 2022.

**Table 3.5.1 List of Project Proposals and Expected Funding**

| No. | Name of Project Proposals | Leading Agency | Expected Donors | No. in Figure 3.5.1 |
|---|---|---|---|---|
| 1 | Upgrade and improvement of 03 national highways (No. 53, 62 and 91B) in Mekong Delta Region | MOT | WB | - |
| 2 | 3 Inland Waterway Projects in Mekong Delta Region | MARD | WB | - |
| 3 | The project of coastal road passing through Tien Giang province, connecting with Long An and Ben Tre provinces (phase 1) | Tien Giang PC | ADB | 2 |
| 4 | Building a coastal corridor route in Tra Vinh province | Tra Vinh PC | ADB | 4 |
| 5 | Coastal road connecting Tra Vinh and Bac Lieu to the East-West economic development road axle of Soc Trang province (phase 2). | Soc Trang PC | ADB | 8 |
| 6 | Road transport infrastructure in the south of Tien River, Dong Thap province) | Dong Thap PC | ADB | 10 |
| 7 | Upgrading and expansion of Provincial Road DT.963 in the Section of National Road No. 80 - Vi Thanh, passing through Tan Hiep district and Giong Rieng district and connecting to Thoi Lai district, Can Tho City | Kien Giang PC | ADB | 11 |
| 8 | Coastal road that passes through Bac Lieu province and connects to Ton Duc Thang bridge, Bac Lieu city | Bac Lieu PC | ADB | 13 |
| 9 | Sustainable and climate-adaptive development of Can Tho city | Can Tho PC | JICA | 6 |
| 10 | Upgrading and expansion of the road connecting Can Tho - Hau Giang (National Road No. 61C) | Hau Giang PC | JICA | 7 |
| 11 | Completion of Mang Thit River Dyke (Phase 2) - Hau River Embankment Section in Binh Minh Town, Vinh Long Province for Resilience to the Climate Change) | Vinh Long PC | AFD | - |
| 12 | Investment in the coastal road connecting Kien Giang province and Ca Mau province | Kien Giang PC | KfW | 12 |
| 13 | 03 bridges on ĐT.827E (bridge over Can Giuoc river; Vam Co Dong river; Vam Co Tay river) | Long An PC | KEXIM | 1 |
| 14 | Construction of Coastal Road Connecting Ben Tre province to Tien Giang anh Tra Vinh Provinces | Ben Tre PC | KEXIM | 3 |
| 15 | Development of a freshwater reservoir system linked with irrigation infrastructure to support production linkages in Long Xuyen quadrangular sub-region | An Giang PC | KEXIM | - |
| 16 | Coastal road project passing through Ca Mau province | Ca Mau PC | KEXIM | 14 |

Source: Document No. 2855/BKHĐT-KTĐN dated 29th April 2022




1) Location of Project No. 6 Road transport infrastructure in the south of Tien River, Dong Thap province) is unclear
Source: Worked by the Survey Team based on Document No. 2855/BKHĐT-KTĐN dated 29th April 2022

**Figure 3.5.1 Location of the Projects**

# 4. Progressive Transport Network Development Plan for Mekong Delta

## 4.1. Review and Assessment of Development Potentials

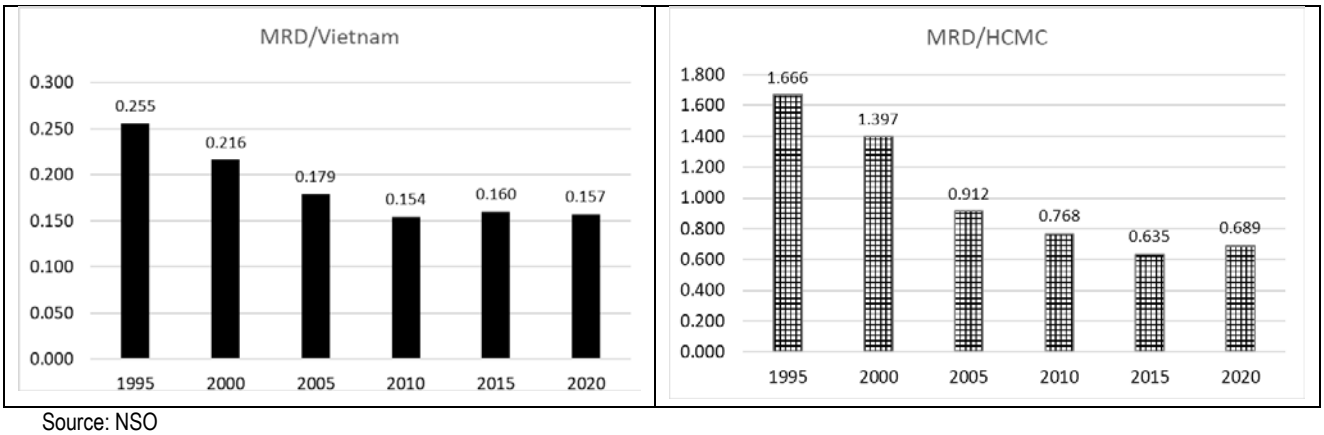
### 4.1.1. Regional Economic Development

The MDR has historically decreased its economic share in the country in terms of GDP, from 25.5% in 1995 to 15.7% in 2020. Particularly it is obvious in the relationship between the MDR and HCMC. The MDR's GRDP was about 1.7 times higher than that of HCMC in 1995 while the MRD's share barely maintains at around 70% of the HCMC's in the last decade. (Refer to Figure 4.1.1)

One reason why the economy of MDR lagged in national development is attributable to slow investment in both transport infrastructure and manufacturing industry. As a result, the agriculture, forestry, and fishery sectors in the GRDP structure are still large (32% in 2020) compared with the national average (14%) while 1.1 million people have migrated out of the MDR in the last decade.

Until 2022, expressway routes from HCMC have stretched few provinces of Long An, Tien Giang and Dong Thap or merely 170 km is operational. So far, only Long An Province enjoys attracting spill-over effect of industry investments due to the proximity to HCMC. According to the MPI's data on industrial zones in 2018, there are 24 approved industrial zones or 5,683 ha in total in Long An Province (refer to Table 4.1.1).

Although economic development is far from a full-fledged level, the Government shows a strong will to promote development over the region by various policy decisions and policy interventions in private investments. Economic zone is one of the government policy interventions. In the MRD region, three economic zones are allocated: EZ Phu Quoc Island (58,923 ha in Kien Giang), EZ Dinh An (39,020 ha, Tra Vinh) and EZ Nam Can (11,000 ha, Ca Mau). Their zones are huge and thus they intend self-contained economic development rather than manufacturing sector only. A long-term and comprehensive development approach must be taken. In addition to general EZs, the government decided the key border-gate economic zones in 2020. Some border areas in the region are designated under this category such as Ha Tien, Dong Thap and Long An (refer to Figure 4.1.2).



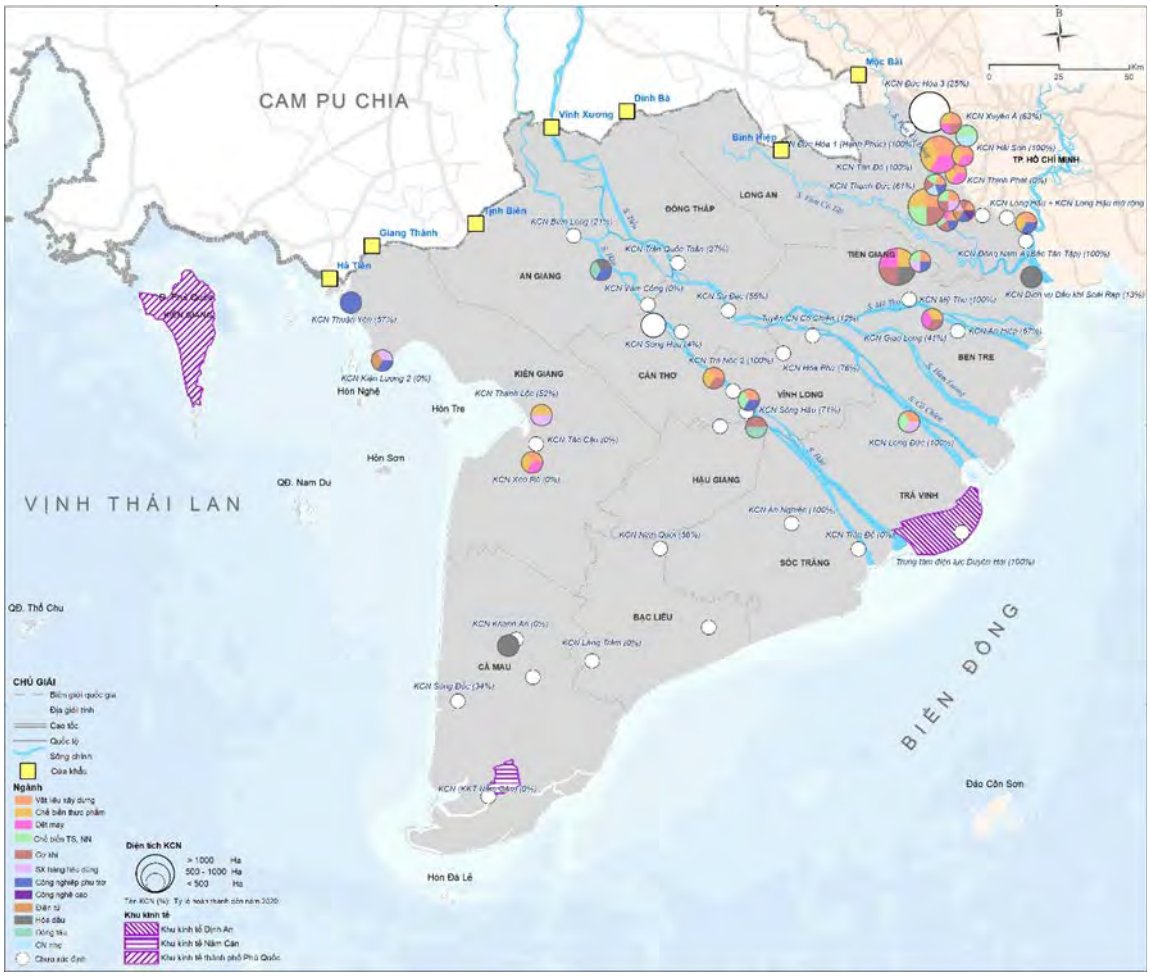

Source: NSO

**Figure 4.1.1 Historical Proportions of MDR's GRDP to Vietnam and HCMC**

**Table 4.1.1 Approved Industrial Zones**

| | No. | Land (ha) | Occupancy (%) |
|---|---|---|---|
| Long An | 24 | 5,683 | 39.5 |
| Tien Giang | 3 | 586 | 86.4 |
| Ben Tre | 2 | 172 | 100.0 |
| Dong Thap | 3 | 189 | 98.6 |
| Vinh Long | 2 | 284 | 80.8 |
| Tra Vinh | 1 | 77 | 94.2 |
| An Giang | 2 | 121 | 90.1 |
| Can Tho | 6 | 1,353 | 64.4 |
| Hau Giang | 2 | 406 | 89.5 |
| Soc Trang | 1 | 189 | 87.3 |
| Kien Giang | 2 | 195 | 43.0 |
| Bac Lieu | 1 | 49 | 69.2 |
| Ca Mau | 2 | 341 | 59.6 |
| MDR Total | 50 | 8,953 | - |

Source: MPI, Can Tho City, both in 2018




Source: MRDIP

**Figure 4.1.2 Distribution of Economic Zones and Industrial Zones**

### 4.1.2. Transport Development Conditions in Can Tho City

Facing with the Hau River and being located at the center of the Mekong Delta, Can Tho City has an advantage to collect agricultural and aquatic products by truck and IWT and process them in the city for domestic consumption and export. For further development as a regional hub of the MDR, however, Can Tho must overcome some issues as follows:

- Fast and line-haul transport with the Southeast Region including HCMC;
- Competitive gateway infrastructure development at sea and air; and
- Good connectivity with other provincial capitals in the region.

#### 1) Fast and line-haul transport with the Southeast Region including HCMC

There is still no expressway and high-speed train operating between Can Tho and HCMC as of 2022. Can Tho Bridge which was open on NH No.1 in 2010 was deemed an epoch-making event that has changed local economy and society to a great deal. This section refers some affected results of the bridge construction.

Can Tho Bridge is the first bridge across the Hau River. Since the bridge largely shortened the previous ferry crossing time (30 minutes) and waiting time (90 minutes on the average), the bridge project has greatly benefited local economy and society. Vam Cong Bridge or the second bridge over the Hau River was opened in 2019. It is located on NH2 and 64 km upstream of the Hau river from the centre of Can Tho city but still in the city. The second bridge contributes to diversification of vehicular traffic or to avoid excessive traffic on Can Tho Bridge.

The table below indicates projected and actual vehicular traffic using Can Tho Bridge. In the case of traffic volume comparison in 2012, the actual traffic was bigger than the projected one in terms of vehicle but smaller in terms of PCU because actual motorbike users were much bigger than expected. It implies that Can Tho Bridge is essential for commuting and social activities in addition to manufacturing and other economic activities.

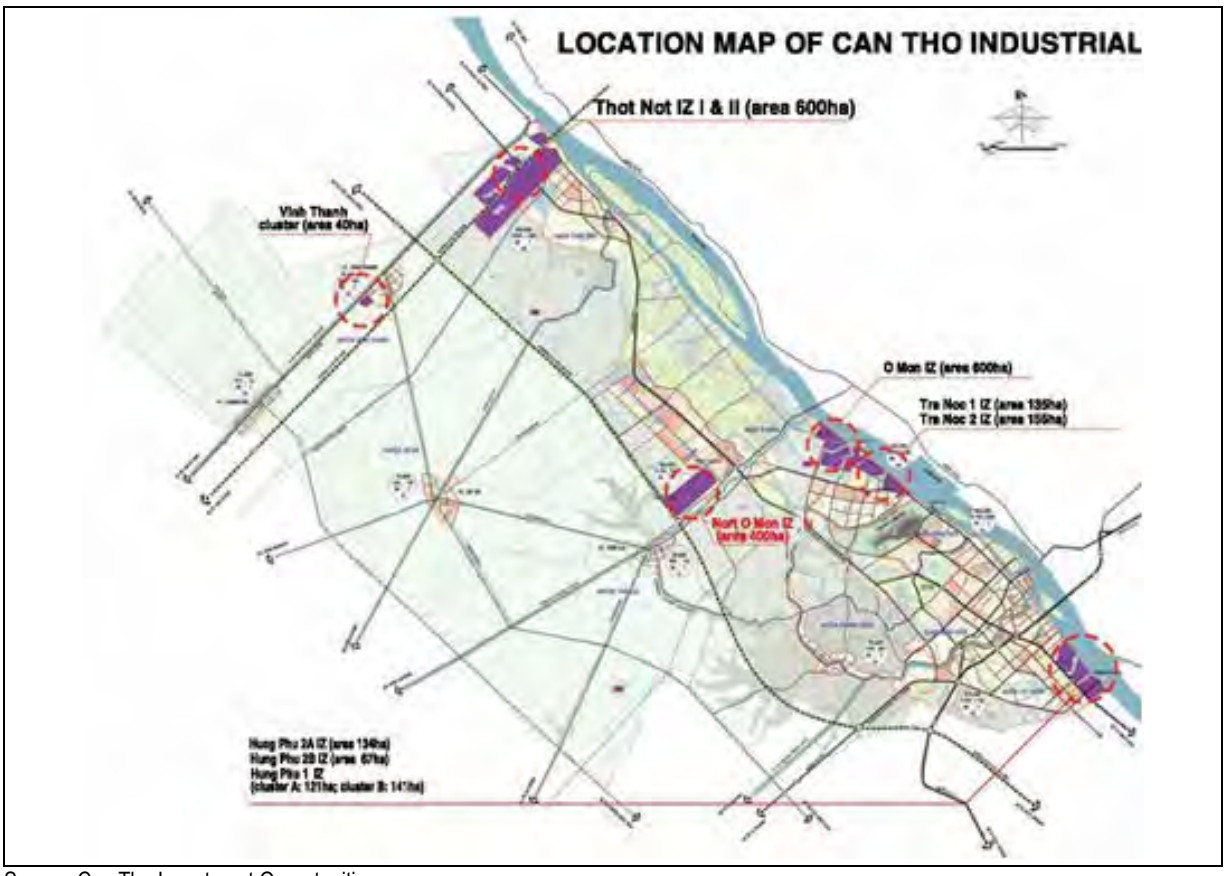
When opening an expressway between Can Tho and HCMC, more investment in industry and wider social activities and longer commuting in community are expected.

**Table 4.1.2 Vehicular Traffic of Can Tho Bridge**

| | Base Year Traffic | Projected Traffic | Actual Traffic | |
|---|---|---|---|---|
| **Year** | **2008** | **2012** | **2012** | **2019** |
| Daily Traffic (Vehicle) | 27,110 | 62,102 | 71,808 | 57,917 |
| Daily Traffic (PCU*) | 20,797 | 52,393 | 41,288 | 47,873 |

Note: * Passenger Car Unit: All vehicle types are converted into PCUs
Source: JICA, Ex-post Evaluation Report of the Can Tho Bridge Construction Project (2019)

One distinct phenomenon which Can Tho City experienced after 2010 or the opening of Can Tho Bridge is mushrooming industrial zones. According to Can Tho City, there are nine industrial zones or 2,353 ha in total. Among them, six are operational with various occupancy rates ranging from 30% to 100%. The remaining zones (O Mon IZ and North O Mon IZ, 1,000 ha in total) are in the process of detail planning and other preparatory works.




Source: Can Tho Investment Opportunities

**Figure 4.1.3 Location of Industrial Zones in Can Tho City**

### (d) Competitive gateway infrastructure development at sea and air

Within the city territory, three seaports are operational. Although located along the Hau River, they have a seaport status which is defined to accommodate seagoing ships under the administration of VINAMARINE. The ports are summarized from the upstream:

- Tra Noc Port: receiving ships of 5,000–10,000 dwt, cargo handling capacity of 1.0–1.5 million tons per year.
- Hoan Dieu Port: receiving ships of up to 10,000 dwt, cargo handling capacity of 2.0–2.5 million tons per year.
- Cai Cui Port: receiving ships of up to 20,000 dwt, cargo handling capacity of 3.5–4.0 million tons per year.

In fact, such maximum sized ships can enter the ports only during high tide and rainy season.

There is no deep-water port available in the region. Even the group of Cai Mep – Thi Vai ports connect with international markets directly, they are far from Can Tho City, around 250 km by road. IWT service is also available through three (3) routes: (i) HCMC – An Giang - Kien Giang route, (ii) HCMC – Can Tho – Ca Mau route, and (iii) Hau River – coastal route. Their services are economical but time consuming. In addition, there are strict ship size constraint along the inland waterway routes and strict seaworthiness requirement along the coastal routes.

Can Tho International Airport has a runway of 3,000 m x 45 m, and a passenger terminal of 20,750 $m^2$. which is designed for 3 million passengers per year. In 2019, 900 thousand passengers used the airport.

The airport has direct connection with major Vietnamese cities and Bangkok (Thailand) and Kuala Lumpur (Malaysia). There is no dedicated cargo terminal with cold-chain services although meat and aquatic products seriously need those services so as to export such consignments in good quality.


Source: Can Tho Investment Opportunities

**Figure 4.1.4 Airways from Can Tho International Airport**

### (e) Good connectivity with other provincial capitals in the region

For Can Tho City to serve as a regional hub, the city must keep good connectivity with other provincial capitals in the MDR, particularly the provinces located at the southwest part of the Hau River. However current connection roads are mostly poorly paved and narrow such as Can Tho – Vin Thanh (Hau Giang) by NH61C, Can Tho – Bac Lieu by NH61B, Can Tho – Ca Mau by NH Phung Hiep, and Can Tho – Rach Gia (Kien Giang) by NH 80.

The proposed expressways will not directly access to those provincial capitals except Rach Gia by the Western North – South Expressway (Duc Hoa – Rach Soi in the MDR), the connecting roads must be wide and maintained in good condition.

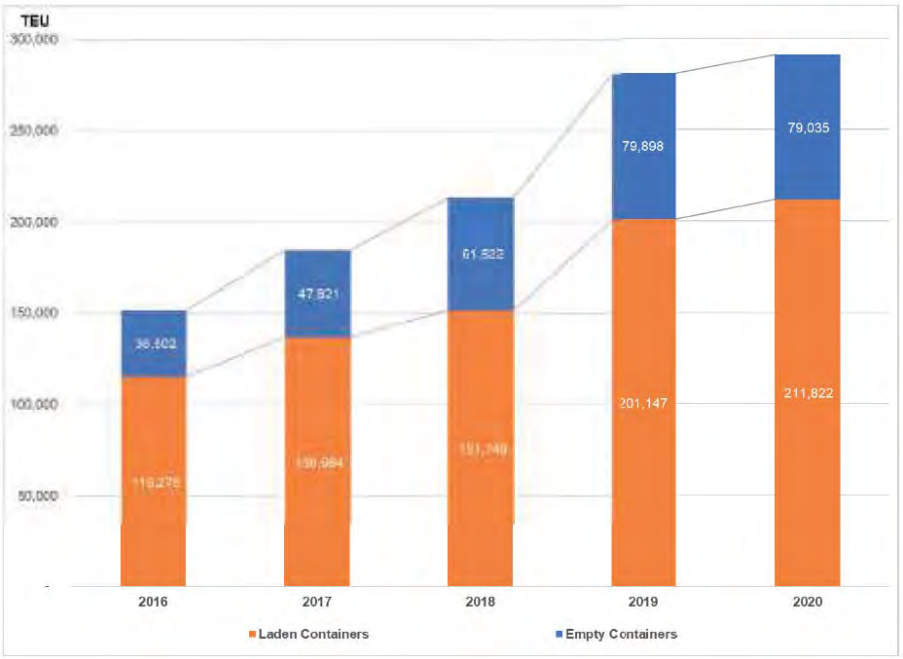
### 4.1.3. Cross-border Transport Opportunities with Cambodia

The MDR has various economic ties with Cambodia in its long history. River-borne shipping and road transport are typical cross-border transport means.

#### 1) Cross-border River-borne Shipping

The Mekong River and its tributaries provide shipping opportunities. The transit routes, such as the routes along the Tien River and the Hau River, are destined for maritime traffic and can be used by all sea-going vessels under foreign flags. The Regulated Waterways such as the routes along the Vam Nao River, Tonle Sap Lake, and selected canals can be used by both Cambodian and Vietnamese vessels.

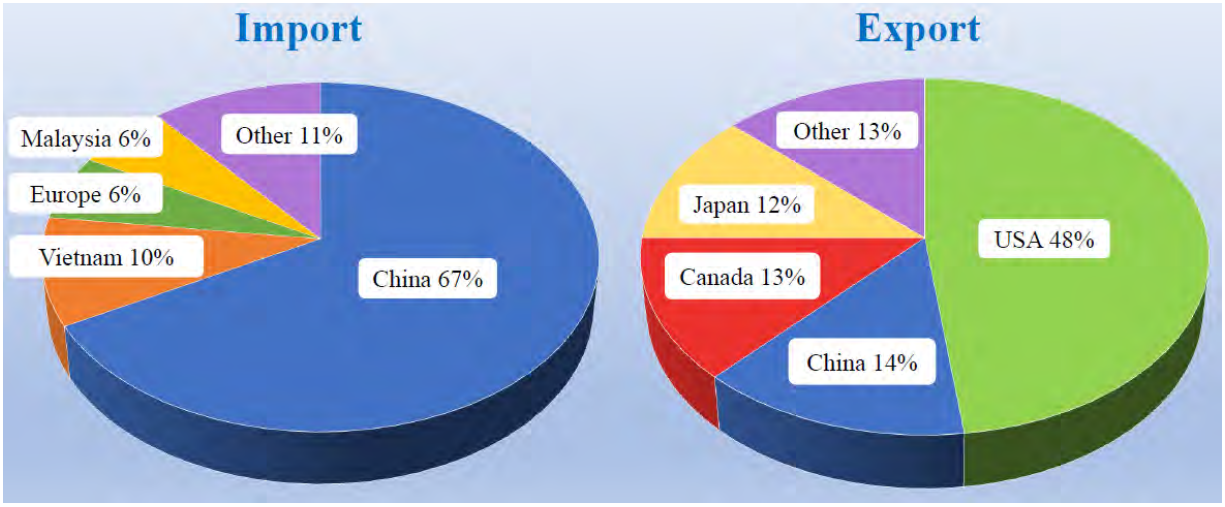
Phenom Penh Autonomous Port (PPAP) or the second largest port in Cambodia is the biggest beneficiary of such an international route arrangement. The port managed 290,857 TEU of container boxes in 2020 with an upward trend in recent years. In 2021, PPAP opened a new container terminal and its capacity was expanded to 500,000 TEU in 2022 (refer to Figure 4.1.6).




Source: PPAP

**Figure 4.1.5 Trend in PPAP Container Cargo Throughput**

On contrary to increasing trading volume at PPAP, the bilateral trade between Vietnam and Cambodia is at a moderate situation, e.g., 10% of import. It is largely explained by the similar economic structures since both the economies have many similarities in goods in trade, exporting garment and agricultural products and importing construction materials and household goods, resulting in few trading needs (refer to Figure 4.1.7).




Source: PPAP

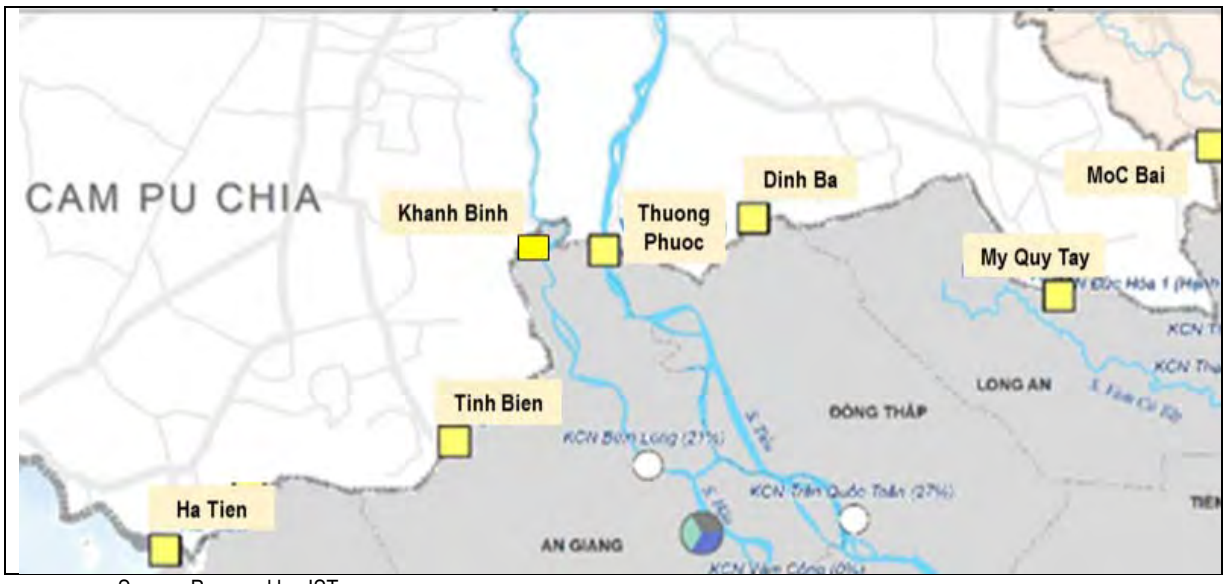
**Figure 4.1.6 Trading Countries of PPAP in 2018**

### 2) Cross-border Posts

Having a long cross-border between Vietnam and Cambodia, numerous cross-border posts are operational. However, some serve for only local people by using border pass rather than passport control. This section introduces formal cross-border posts at which MOT maintains traffic data. The biggest cross-border post is located at Moc Bai at the end of NH 22 in Tay Ninh Province or the nearest post of HCMC. The section introduces major cross-border posts within the MDR in addition to Moc Bai. The traffic records of 2019 indicated normal situations before the COVID-19.

Remarkable local features mentioned below:

- Moc Bai: Active cross-border movement was observed. There is a bilateral agreement of mutual recognition of the registered trucks, some hundreds per country. It should be noted that those trucks were not counted in the statistics.
- My Quy Tay (Long An Province): At the Cambodian side, casino hotels, recreational facilities and spacious houses were built to serve Vietnamese visitors.
- Thuong Phuoc (Dong Thap Province) and Khanh Binh (An Giang Province) provides international shipping transfer to Cambodia. Foreigners prefer to use Khanh Binh.
- Tien Bien (An Giang Province) is located at the end of NH 91. This is a historical cross-border post for the Khmer descendants living in Soc Trang and Tra Vinh provinces. Recently, the town lays stress on cross-border tourism including shopping.
- Although being underdeveloped, Ha Tien (Kien Giang Province) has a good potential of cross-border tourism among foreigners.




Source: Prepared by JST

**Figure 4.1.7 Cross-border Posts with Cambodia**

**Table 4.1.3 Traffic Records of Cross-border Posts, 2019**

| | Passengers | | | | Vehicles | | |
|---|---|---|---|---|---|---|---|
| Border Post (Province) | Vietnamese | Cambodian | Others | Total | Bus | Container Truck | Other Truck |
| Moc Bai (Tay Ninh) | 521,709 | 139,219 | 127,377 | 788,305 | 1,091 | 0 | 2 |
| My Quy Tay (Long An) | 365,502 | 258 | 0 | 365,760 | 0 | 0 | 0 |
| Dinh Ba (Dong Thap) | 12,426 | 4,731 | 465 | 17,622 | 88 | 0 | 0 |
| Thuong Phuoc (Dong Thap) | 8,681 | 925 | 2,829 | 12,435 | 0 | 0 | 0 |
| Khanh Binh (An Giang) | 26,538 | 6,244 | 1 | 32,783 | 0 | 0 | 0 |
| Tinh Bien (An Giang) | 15,454 | 8,572 | 2,194 | 26,220 | 81 | 0 | 0 |
| Ha Tien (Kieng Giang) | 13,096 | 6,399 | 13,697 | 33,192 | 4 | 1 | 0 |

Note: Entry traffic per year

Source: MOT of Vietnam

## 4.2. Transport System Development for Greater Can Tho

### 4.2.1. MDR Development Corridors

The Government Decision No. 287/QD-TTg regarding the Mekong River Region Development Plan for the Period 2021-2030 with Vision toward 2050 in February 2022 designates four (4) regional development corridors:

**1) Urban – industrial economic corridor from Can Tho to Long An**

This corridor will accelerate urbanization and industrialization along the Western North - South Expressway: My An (Dong Thap) - Duc Hoa (Long An) section, and the Eastern North-South Expressway: the Can Tho - Ben Luc section (Long An) and the area along the Ho Chi Minh City - Can Tho inland waterways in order to strengthen linkages for socio-economic development between the Mekong Delta Region and the Southeast Region including Ho Chi Minh City.

**2) Tien river – Hau river corridor**

This river corridor will promote riverine development as a corridor of economy, cultural space, biodiversity, river landscape space zone with unique icons and characteristics in the MDR; Along the corridor, productive agriculture, attractive ecotourism, and tangible and intangible cultural heritages deserve priority. In the long-term, this corridor will become a strategic urban area as counterbalance for Ho Chi Minh City area, with great potentials for international connection and trade using both inland waterways and maritime transport.

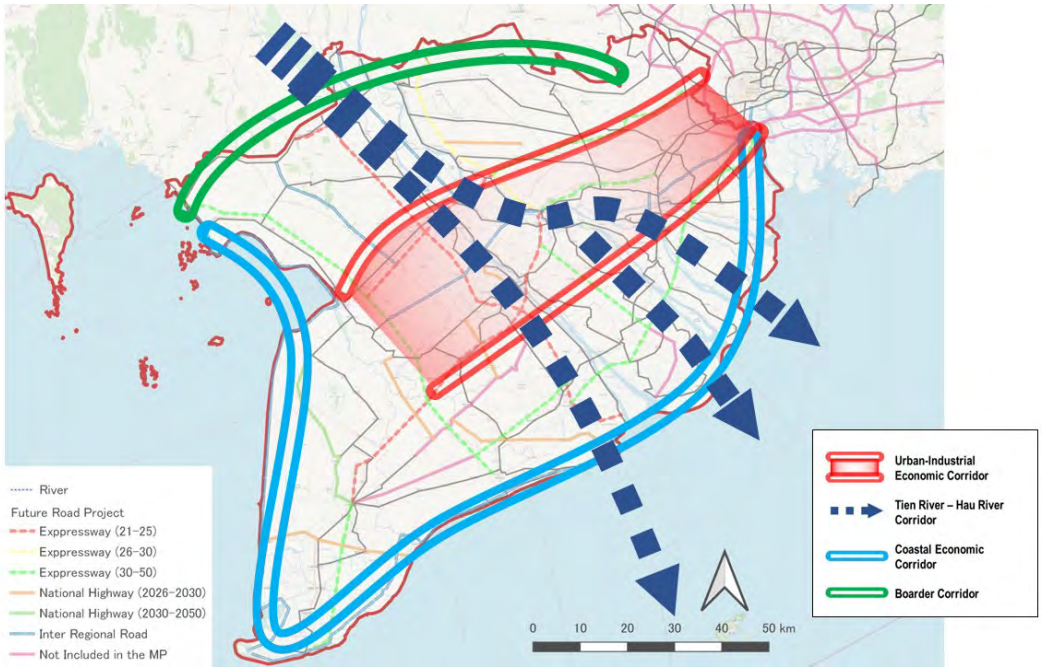
**3) Coastal economic corridor from Long An, Ca Mau to Kien Giang**

This corridor will focus on developing renewable energy, clusters of fisheries, marine fisheries, tourism and urban areas across the coastal provinces from Long An, Tien Giang, Ben Tre, Tra Vinh, Soc Trang, Bac Lieu, Ca Mau to Kien Giang.

**4) Border corridor from Long An to Kien Giang**

This corridor will develop border gate economy in association with ensuring national defense and security from Long An, Dong Thap, An Giang and Kien Giang.

Can Tho City is strategically located on the corridors of (1) and (2).




Source: Illustrated by the Study Team based on the Decision No. 287/QD-TTg in 2022

**Figure 4.2.1 MDR Development Corridors**

### 4.2.2. Future Transport Development System for Greater Can Tho

#### 1) Concept of Greater Can Tho

The Decision No. 287 gives the following development direction to Can Tho City:

"*Can Tho as a modern, civilized and ecological city imbued with the cultural identity of rivers and streams in the MDR; as a center of the region in regards of services, trade, tourism, logistics, processing industry, high-tech agriculture, education and training, specialized health care, science and technology, culture and sports; as the core urban area of the Mekong Delta; as the international gateway of the MDR; Strengthen the transport infrastructure to enhance traffic accessibility between Can Tho city and other provinces in the MDR in order to ensure access to high-quality services with regional and international standards.*"

To make it happen, a desirable future transport system should be deliberated regardless of the city's administrative boundary. In other words, a perspective of Greater Can Tho must come in. Why is such a metropolitan concept necessary? For instance, Can Tho Bridge as well as Vam Cong Bridge have sharply increased river crossing traffic compared with the previous ferry services. The bridges allow local people to expand their economic and social activity areas across the administrative boundary lined along the Hau River.

As for logistics, the Decision No. 287 directs Can Tho City to have the international gateway of the MDR. As a matter of fact, there is no potential site of a deep seaport within the city to accommodate over Panamax container ships and bulk ships over 100,000 dwt suitable for international trunkline shipping service. Such a potential site should be found and developed at the estuary of the Hau River.

There is no master plan document to delineate the Greater Can Tho transport system. The Study tries to discuss some essential elements of the future system even beyond the boundary of Can Tho City.

### 2) Road Network

Three expressways will serve in and around Can Tho City until 2030. They are all ongoing projects in the MDR as follows:

- The Eastern North – South Expressway (HCMC – Can Tho – Ca Mau in the MDR, 245 km with a new Hau River crossing bridge)
- The Western North – South Expressway (Duc Hoa – Rach Soi in the MDR, 180 km using Vam Cong Bridge over the Hau River)
- Chau Doc – Can Tho – Soc Trang Expressway (191 km)

All the expressway projects will strengthen the regional hub function of Can Tho City. Since a harmonized road network of access control expressways and ordinary highways is important, the city's transport development plan[60] will upgrade NH1A, NH80, NH61C, NH Lo Te – Rach Soi, and NH91.

Today, Can Tho City Administration is keen on an additional inter-provincial corridor: Sa Dec (Dong Thap) – O Mon (Can Tho with a new Hau River bridge) – Giong Rieng (Kien Giang), about 77 km long. The alignment is strategically located between the eastern and western north-south expressways in parallel and cross and meet three (3) more expressways which run on the direction of Cambodian and the East Sea. It is essential to strengthen highway network, promote industrial development and improve airport accessibility. (Refer to Figure 4.2.2)

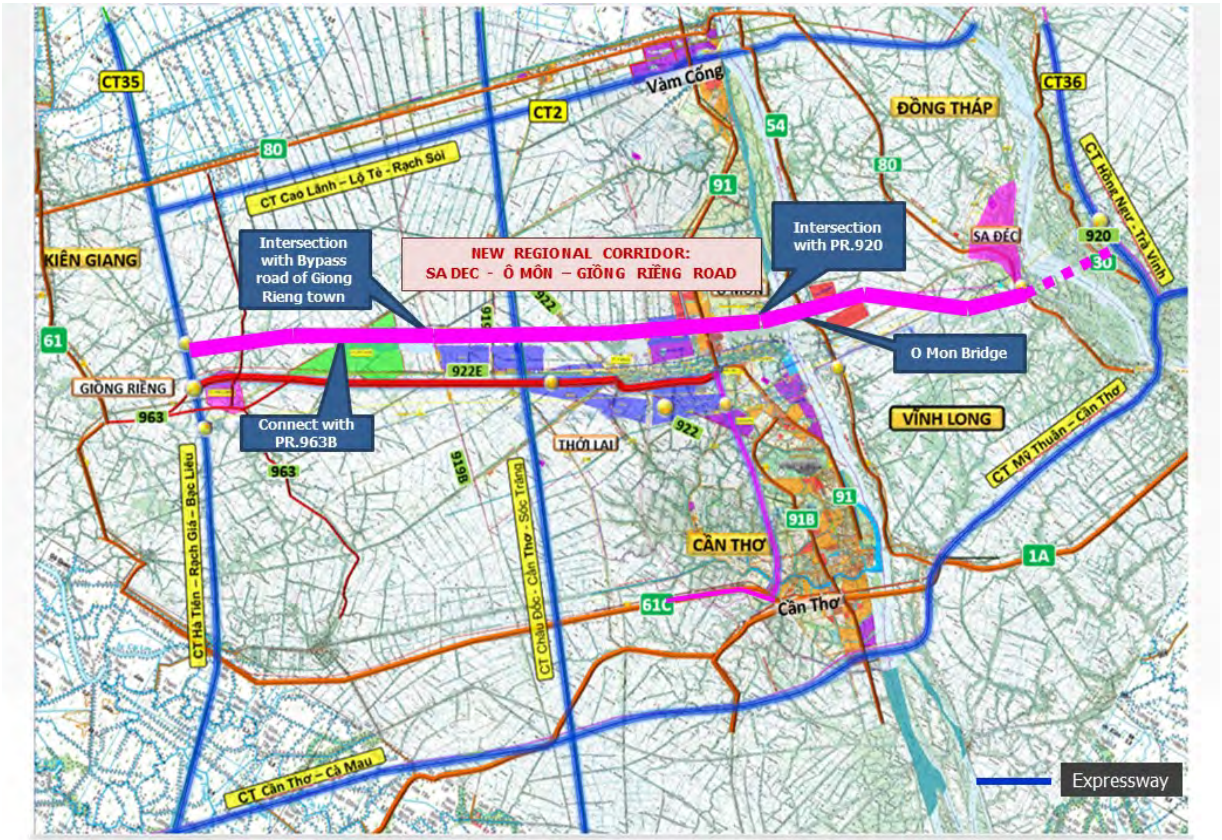
According to the Study Team's consultation meeting in March 2022, another important project by the city administration was raised. It is the Ring Road Project of 19 km, which connects NH91 and NH61C by an alternative route to ease traffic congestion on the city's industry and logistics corridor of NH91. The project is expected to start in 2022 by the state budget.

Flood protection is another big challenge by the city administration. Frequent floods always suspend road traffic flows and degrade road pavement and its substructure. To address such urban flood issues, the city administration plans to improve drainage system along urban roads. For instance, a new drainage system will be installed along 30 urban roads in Ninh Kieu District by 2024, where many government offices stand near the Hau River. In the case of inter-city roads, road elevation work is also effective to prevent widespread floods.

The Study Team observes that both the central and local governments are currently tackling a tremendous backlog of road infrastructure. The central government's approach is to extend expressways throughout the MDR. With the three new expressways mentioned above, however, Can Tho City does not have a clear picture to develop its road network consisting of expressways and ordinary roads.

With the above projects, Can Tho City will connect with the provinces of Dong Thap and Vinh Long by four (4) long-span bridges across the Hau River from the current two (2) bridges: Can Tho Bridge and Vam Cong Bridge. People and economies of Dong Thap and Vinh Long provinces will have more closely relation with Can Tho. However, there is no integrated road development plan is available to serve for the one city and the two provinces or 4 million populaces living there.

[60] Decision No.3522/QD-UBND in 2015 on the Revised Transport Development Plan for Can Tho by 2030




Source: Modified the Study Team based on the Presentation Slide of Can Tho City, in April 2022

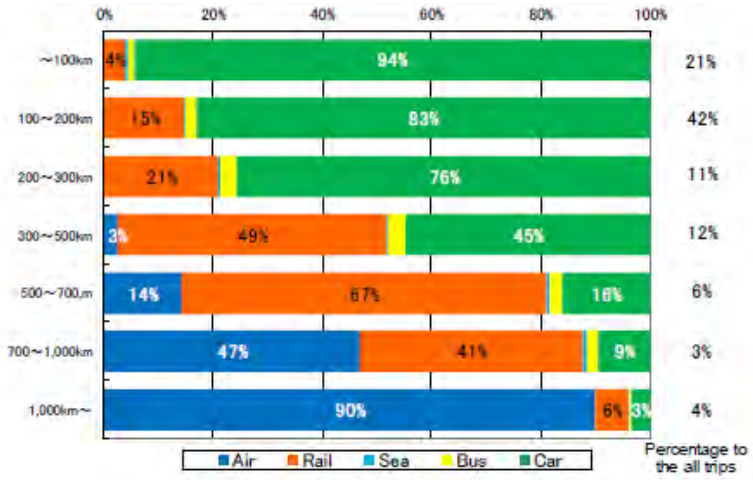
**Figure 4.2.2 New Inter-provincial Corridor**

### 3) Railway Link

The Study Team recognizes that the Mekong railway is a local aspiration, serving for both passenger and freight between HCMC and Can Tho. Since passenger and freight are quite different service segments in railway operation and business, the following comments are noted:

Passenger service: The Mekong railway will have to find its passenger market between the two competitive markets of aviation and expressway car/bus. According to the current rail development plan, the Mekong rail has a single route of 173 km with its designed speed of 190 km/hr in passenger service. When passengers select their transport modes, they must compare various aspects among available transport modes such as fare, travel time, service frequency, travel comfortability, access to transport mode, safety, security, and so on.

In Japan, inter-city rail service holds a merely share of 15% and the rest is served by car and bus in the distance range from 100 km to 200 km. It implies to the Mekong Railway which should provide attractive passenger service particularly compared to the cars and buses using the Eastern North-South Expressway (HCMC – Can Tho).




Source: Year 2015 Inter-regional Travel Survey, MLIT Japan

**Figure 4.2.3 Passenger Modal Share by Distance**

Freight service: It is more difficult to final a new market through the competition with trucks and IWT fleet since freight rail requires the consigners and the consignees to prepare first and last one-mile trucks by themselves. Truck is therefore advantageous to provide fast service without inter-modal transfer, particularly when transporting small and valuable cargo. IWT offers similar services like freight rail such as economic and sizeable transport service. But IWT is more flexible to use many inland waterways to deliver contracted cargo to the consignees. When IWT plays a secondary transport to ocean-going shipping, an IWT ship can anchor and transfer its cargo to a mother vessel by ship gear within port.

For the Mekong Railway to survive in such a logistics market, two measures are deemed necessary: (i) terminal stations allowing feeder trucks, and (ii) interconnected freight rail service with the proposed Bien Hoa – Vung Tau railway particularly to make direct access to the Cai Mep – Thi Vai seaport group.

### 4) IWT

IWT has historically taken a very important role in the MDR's freight service, accounting for about 70% in the market. Can Tho is endowed with the Hau River and its numerous tributaries which are suitable for various IWT services.

Can Tho City has some important river ports such as Can Tho Riverport, O Mon Port and Thot Not Port so as to collect and distribute various cargoes as a regional economic hub. Can Tho City intends to strengthen local IWT function by means of four (4) new riverports, including Cai Rang, Vinh Thanh, Co Do and Phong Dien.[61] The local IWT will have to secure safe 24/7 navigation which requires good maintenance of riverbank, lighted buoys showing navigable routes at night time, bridges with enough clearance, etc.

IWT is a conventional means to transport various cargoes in bulk between Can Tho and HCMC through the main inland waterway routes such as the HCMC – Can Tho – Ca Mau route (transporting capacity: about 100 million tons/year) and the HCMC – An Giang – Kien Giang route (transporting capacity: about 55 million tons/year). It is apparent that congested IWT fleet flows cause increased accidents and canal bank erosions. The government therefore reinforces these main routes, but investment effectiveness becomes low. To

[61] The Transport Development Plan for Can Tho City by 2030 (Decision No. 3522/QD-UBND, 2015)

increase IWT traffic capacity, canal widening is essential, but its land acquisition is time consuming. To reduce IWT fleet or enlarge fleet size, higher bridge clearance must be required but it is extremely difficult because of tedious coordination with the road sector.

Under such situations, sea-cum-river ships which enables river and coastal navigation have been increasing in association with the VIWA's deregulation policy in IWT fleet investment in 2014. From 2015 to 2018, the number of IWT ships over 1,500 dwt which are recognized as sea-cum-river ships has sharply increased from 737 to 1,334 ships, and the cargo volume transported by them increased seven (7) times more or nearly 35 million tons in 2018 accordingly. Therefore, it is suggested that the local port system including riverports and seaports along the Hau River be adjusted to accommodate such sea-cum-river ships.

### 5) Airport

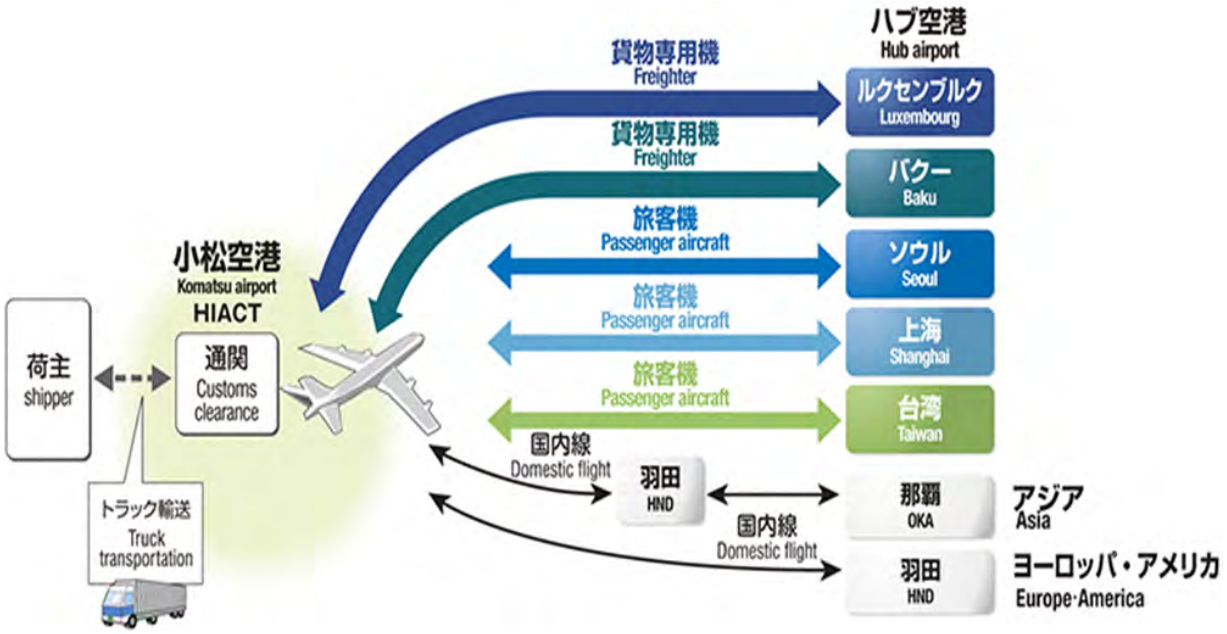
Can Tho International Airport has a plan to expand passenger handling capacity from 3 million at present to 7 million in the future. But there is no cargo terminal plan although seafood is one of major export commodities in the MDR. It is also noted that there is no Vietnamese air freighter. Dedicated air freighters serving in the lucrative air freight market are currently arranged by all foreign airlines in Vietnam.

One good example to foster air cargo service is Komatsu Airport, Ishikawa Prefecture, Japan. It is a medium-sized regional airport, e.g., 1.8 million passengers in 2018, but the airport has an exclusive international cargo terminal of 4,000 $m^2$ with cold chain services to export local seafood to global hub airports directly such as Luxemburg, Baku (Azerbaijan), Shanghai, Seoul, Taipei.

It is therefore important to include air cargo terminal with cold chain service when designing airport capacity expansion of Can Tho International Airport.


Source: Komatsu Airport Guidebook (upper left)

**Figure 4.2.4 View of Komatsu Airport with Its Cargo Complex**



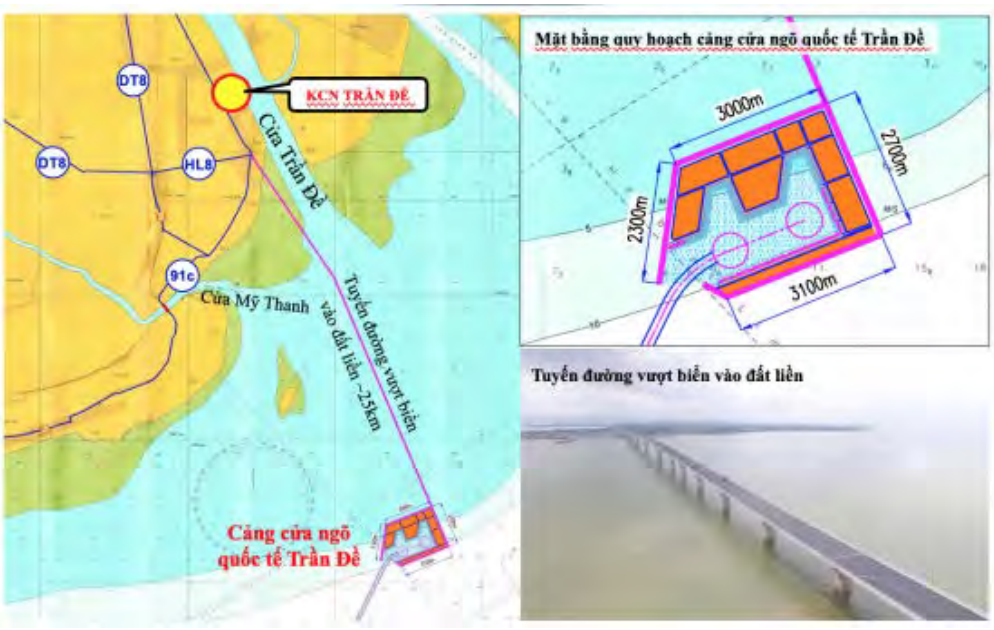

Source: Komatsu Airport Guidebook

**Figure 4.2.5 Air Cargo Network of Komatsu Airport**

### 6) Seaport

Today it is well known among the port users and stakeholders in Vietnam that one potential area to construct a deep seaport is Tran De, Soc Trang Province. It is located at 88 km downstream of the Hau River from Can Tho city center. Port accessibility is excellent because it is convenient for many IWT ships plying on the Hau River and its tributaries and the new Chau Doc – Can Tho – Soc Trang expressway will end at Tran De.

A Tran De Port development concept is uploaded at the website of Tran De Industrial Park. The concept shows a reclamation cargo terminal with a very long connecting road of 25km. Definitely, the concept using a long connecting road is not attractive to the port users such as shippers, forwarders, and container trailer operators. Furthermore, reliable port operation cannot be secured during stormy weather and rough sea. A cargo terminal should be designed as near as possible from the coastline. The combination of breakwater and initial dredging enables such terminal construction and operation. One example is Patimban Port developed by JICA for the gateway of the Greater Jakarta, Indonesia. The port which was partly open in 2021 has two short connecting roads (around 8km each) to serve for containers, automobiles, and some bulk cargoes.




Source: Tran De Industrial Park

**Figure 4.2.6 Tran De Port Development Concept**

Source: JICA

**Figure 4.2.7 Port Development Image of Patimban, Indonesia**

### 7) Integrated Blueprint

This section summarizes the above-mentioned planning considerations relating to the Greater Can Tho transport system (refer to Figure 4.2.8). The future system will be developed by the following leading infrastructure:

- The Hau River will continue to take an important role in Greater Can Tho. In the future, however, the river will not separate economic and social activities anymore. The opposite side or parts of Dong Thap and Vinh Long provinces will be functionally integrated with Can Tho City by four (4) road bridges (Can Tho Bridge, Vam Cong Bridge, Second Can Tho Bridge and O Mon Bridge within a riverside stretch of 80 km) and possibly plus one railway bridge.
- The Hau River will still provide essential places for regional logistics including three (3) seaports under VINAMARINE and seven riverports under VIWA in Can Tho City and more ports at the opposite side. Tran De Port will be newly constructed at the river estuary as a regional gateway port.

- Urbanization and industrialization will be guided by expressways and major general roads. By 2030, three (3) expressways will be constructed and run through the Greater Can Tho: (i) the Eastern North – South Expressway, the Western North – South Expressway, and Chau Doc – Can Tho – Soc Trang Expressway. A new inter-provincial corridor on Sa Dec (Dong Thap) – O Mon (Can Tho) - Giong Rieng (Kien Giang) will be strategic to promote urbanization and industrialization between the two (2) north-south expressways.
- Greater Can Tho is proposed to include Can Tho City, Hau Giang Province, parts of Kien Gaing, Dong Thap and Vinh Long provinces. Since Can Tho City was separated from Hau Giang Province in 2004, the entire Hau Giang province is included in the metropolis concept. The proposed metropolis has around 5 million population on a flat land of 5,000 $km^2$. Within the metropolis concept, several general roads connect important urban centers including NH61C to connect Can Tho City Center with Vi Thanh, the provincial capital of Hau Giang.
- Greater Can Tho will have multimodal and high-capacity transport modes with HCMC and the rest of the Southeast Region, including north-south expressways, inland waterways, coastal shipping and a new rail link and aviation.
- As a regional hub, Greater Can Tho will have strong road and IWT connections with the neighboring provinces such as An Giang, Ca Mau and Soc Trang.
- Direct connection with Cambodia will be strengthened by shipping using international river routes such as the Mekong River and the Hau River, and road transport border gates.
- Can Tho International Airport will have more regular routes with domestic and foreign airports as a regional gateway. Air cargo terminal will be developed with cold chain service to attract dedicated cargo flights in addition to passenger flights.


Source: The Study Team

**Figure 4.2.8 Concept of Greater Can Tho**

# 5. Traffic Demand Forecast

## 5.1. Regional Socio-Economic Framework

### 5.1.1. Outlines

The socio-economic framework is an essential explanatory variable of the future travel demand of the Study Area. Based on the VITRANSS-3 study model, the following indicators were collected:

- Population (in the urban and rural areas)
- Gross regional domestic product (GRDP) (by three sectors)

Base year (2020) socio-economic framework is collected from the statistical yearbooks, and the target year (2030, 2050) socio-economic framework was estimated from the projection by GSO population census results in 2019 and the local socio-economic development plans.

### 5.1.2. Outlines of the Current Regional Socio-economic Framework

#### 1) Population

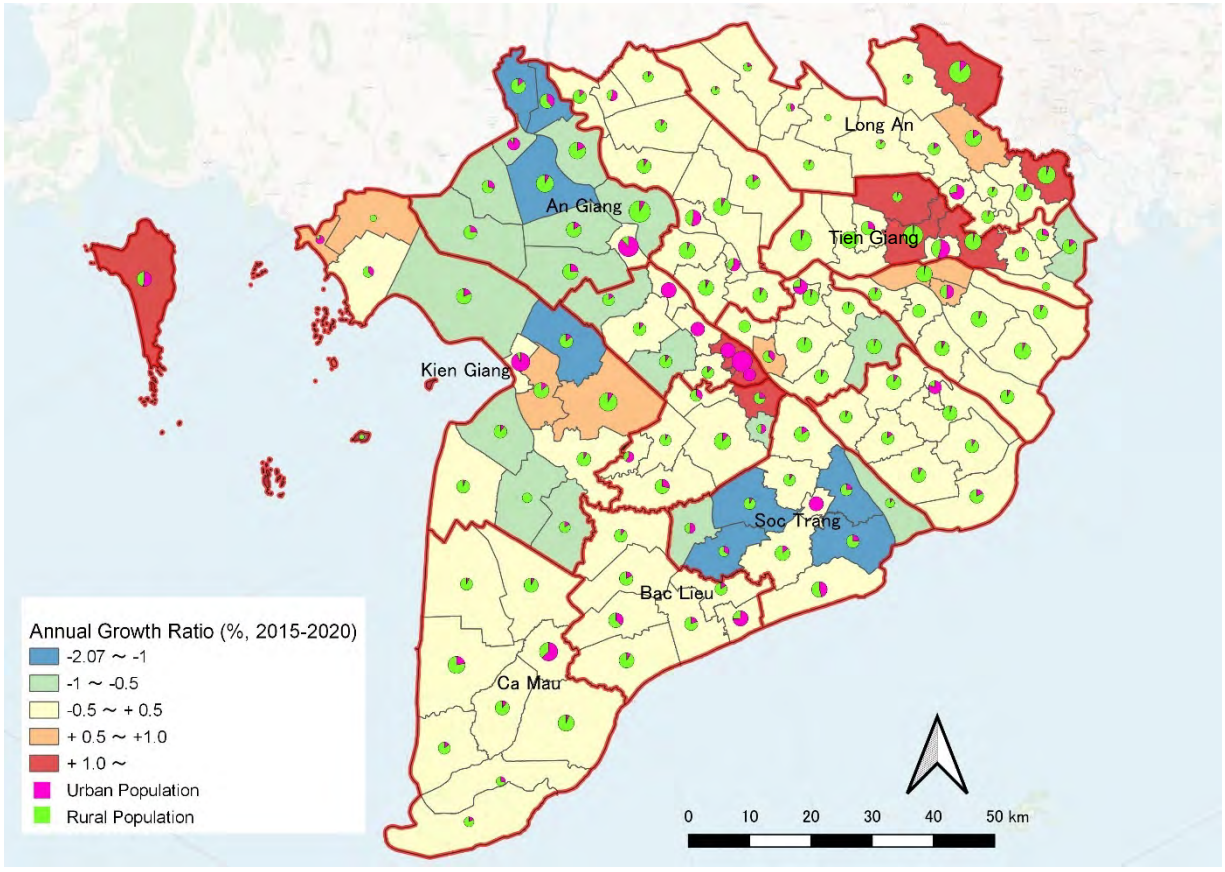
In the statistical yearbooks published by each city and province, the urban and rural populations by district are recorded. Table 5.1.1 summarizes the urban and rural populations of the Mekong Delta in 2015 and 2020. While the total regional population has not changed in the five years, the population growth in the urban areas can be seen.

**Table 5.1.1 Urban & Rural Population in Mekong Delta, 2015 and 2020 [1)]**

| Province | 2015 | | | 2020 | | | Annual Growth Ratio 2015–2020 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Urban | Rural | Total | Urban | Rural | Total | Urban | Rural | Total |
| Long An | 271 | 1,374 | 1,645 | 273 | 1,423 | 1,695 | 0.09% | 0.70% | 0.60% |
| Dong Thap | 293 | 1,333 | 1,626 | 305 | 1,294 | 1,599 | 0.81% | -0.59% | -0.33% |
| An Giang | 620 | 1,381 | 2,001 | 603 | 1,305 | 1,907 | -0.58% | -1.12% | -0.95% |
| Tien Giang | 267 | 1,462 | 1,729 | 248 | 1,518 | 1,766 | -1.47% | 0.76% | 0.43% |
| Vinh Long | 169 | 854 | 1,023 | 170 | 853 | 1,023 | 0.12% | -0.04% | -0.01% |
| Ben Tre | 126 | 1,150 | 1,276 | 126 | 1,163 | 1,289 | 0.05% | 0.23% | 0.21% |
| Kien Giang | 473 | 1,232 | 1,705 | 489 | 1,235 | 1,724 | 0.64% | 0.05% | 0.21% |
| Can Tho | 824 | 384 | 1,209 | 861 | 375 | 1,236 | 0.89% | -0.51% | 0.45% |
| Hau Giang | 175 | 565 | 740 | 198 | 534 | 732 | 2.47% | -1.11% | -0.21% |
| Tra Vinh | 168 | 839 | 1,008 | 174 | 835 | 1,009 | 0.67% | -0.09% | 0.03% |
| Soc Trang | 376 | 860 | 1,236 | 389 | 811 | 1,200 | 0.67% | -1.18% | -0.60% |
| Bac Lieu | 244 | 649 | 893 | 252 | 656 | 908 | 0.67% | 0.22% | 0.34% |
| Ca Mau | 266 | 934 | 1,200 | 272 | 923 | 1,194 | 0.43% | -0.24% | -0.09% |
| **Total** | **4,273** | **13,017** | **17,290** | **4,358** | **12,924** | **17,282** | **0.40%** | **-0.14%** | **-0.01%** |
| **(Urbanization Rate)** | **(24.7 %)** | | | **(25.2 %)** | | | | | |

Source: Statistical Yearbooks of each City/Province in 2015, 2020

Figure 5.1.1 visualizes the rural and urban population distribution by township in base year (2020). The Can Tho City rural population is higher than urban population in most districts. Long An Province and Tien Giang Province, which are next to Ho Chi Minh City, show higher population growth.




Source: Statistical Yearbooks of each City/Province in 2015, 2020

**Figure 5.1.1 Urban and Rural Population Distribution by District in 2020**

### 2) GRDP

Other than population, the statistical yearbooks published by each city/province also recorded the GRDP of various sectors. Table 5.1.2 summarizes the GRDP of the Mekong Delta in 2020. Except for Long An (16%), Can Tho (10%), and Hau Giang (26%), the share of the primary sector is more than 30% in all provinces.

**Table 5.1.2 Gross Domestic Product by Industrial Sector in Mekong Delta, 2015 and 2020**

| Province | 2015 | | | | 2020 | | | |
|---|---|---|---|---|---|---|---|---|
| | Total (billion VND) | % of Primary | % of Secondary | % of Tertiary | Total (billion VND) | % of Primary | % of Secondary | % of Tertiary |
| Long An | 52,210 | 23% | 40% | 37% | 80,575 | 16% | 50% | 34% |
| Dong Thap | 41,887 | 39% | 22% | 40% | 54,682 | 36% | 19% | 45% |
| An Giang | 42,885 | 42% | 13% | 45% | 54,113 | 36% | 14% | 51% |
| Tien Giang | 44,948 | 43% | 23% | 34% | 59,272 | 39% | 26% | 35% |
| Vinh Long | 26,669 | 38% | 17% | 46% | 34,554 | 33% | 19% | 48% |
| Ben Tre | 25,171 | 41% | 17% | 42% | 32,408 | 37% | 18% | 44% |
| Kien Giang | 50,648 | 40% | 18% | 42% | 68,957 | 33% | 20% | 47% |
| Can Tho | 41,117 | 13% | 31% | 56% | 52,230 | 10% | 33% | 57% |
| Hau Giang | 18,747 | 30% | 20% | 50% | 23,533 | 26% | 23% | 51% |
| Tra Vinh | 27,792 | 37% | 25% | 38% | 38,788 | 32% | 33% | 36% |
| Soc Trang | 28,073 | 50% | 14% | 37% | 35,035 | 46% | 13% | 41% |
| Bac Lieu | 22,056 | 48% | 15% | 37% | 29,201 | 43% | 19% | 39% |
| Ca Mau | 38,686 | 32% | 36% | 32% | 41,318 | 34% | 30% | 36% |
| **Total** | **460,887** | **36%** | **24%** | **41%** | **604,667** | **31%** | **26%** | **43%** |

Source: Statistical Yearbooks of each City/Province in 2020

### 5.1.3. Projection of the Future Socio-Economic Framework

#### 1) Outline of the Scenarios

As the projected future population, GSO published the "Viet Nam Population Projection for the Period 2019–2069," which used estimates according to the population census results, in 2020. In the report, the population by city/province was estimated in 2024, 2029, 2034, 2039, and 2045. According to the results in Mekong Delta (Table 5.1.3), the projection showed insignificant population change in the region. There is no classification between urban and rural populations.

**Table 5.1.3 Projected Population in Mekong Delta by GSO Census**

| Province | Population Projection by Census 2019 (000) | | | | | |
|---|---|---|---|---|---|---|
| | 2019 | 2024 | 2029 | 2034 | 2039 | 2045 |
| Long An | 1,689 | 1,786 | 1,856 | 1,902 | 1,944 | 1,977 |
| Dong Thap | 1,600 | 1,572 | 1,567 | 1,572 | 1,580 | 1,573 |
| An Giang | 1,908 | 1,839 | 1,814 | 1,818 | 1,827 | 1,822 |
| Tien Giang | 1,764 | 1,799 | 1,824 | 1,837 | 1,850 | 1,852 |
| Vinh Long | 1,023 | 1,019 | 1,016 | 1,015 | 1,015 | 1,008 |
| Ben Tre | 1,288 | 1,286 | 1,283 | 1,278 | 1,272 | 1,255 |
| Kien Giang | 1,723 | 1,745 | 1,772 | 1,798 | 1,821 | 1,834 |
| Can Tho | 1,235 | 1,309 | 1,367 | 1,400 | 1,429 | 1,449 |
| Hau Giang | 733 | 719 | 718 | 721 | 725 | 724 |
| Tra Vinh | 1,009 | 1,011 | 1,016 | 1,021 | 1,029 | 1,033 |
| Soc Trang | 1,200 | 1,174 | 1,161 | 1,160 | 1,165 | 1,161 |
| Bac Lieu | 907 | 930 | 942 | 953 | 962 | 965 |
| Ca Mau | 1,194 | 1,177 | 1,179 | 1,191 | 1,206 | 1,213 |
| **Total** | **17,273** | **17,366** | **17,515** | **17,666** | **17,825** | **17,866** |

Source: Viet Nam Population Projection for the Period 2019 – 2069

In this Study, the following two scenarios are assumed:

**Trend Scenario.** Urbanization and industrial modernization will be stagnated as the recent trend.

**Urbanization Scenario.** The urbanization will progress as other regions (Hanoi, Ho Chi Minh, and Danang), and the industrial structure will also be modernized according to the local socio-economic masterplans.

Both scenarios have the same population by city or province but shares of urban or rural populations are different according to the urbanization rate. The industrial structure also will be assumed independently.

### 2) Urban and Rural Population

**Trend scenario** projected that the share of the urban and rural population by city or province would not drastically change, referring to the recent trend between 2015 and 2020. The urbanized population, which is 4.36 million as of 2020, is assumed to be 4.61 million in 2030 and 5.16 million in 2050.

**Table 5.1.4 Trend Scenario: Projected Future Population in Mekong Delta (2030, 2050)**

| City / Province | 2030 | | | | | | 2050 | | | | | | Reference: Estimated Values in 2030, by Mekong Delta Plan for 2021-2030, Vision by 2050 (WB) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Population (000) | | | Population (000) | | | Population (000) | | | Annual Growth Ratio 2030–2050 | | | | | |
| | Urban | Urban | Urban | Urban | Urban | Urban | Urban | Rural | Total | Urban | Rural | Total | Urban | Rural | Total |
| Long An | 284 | 1,581 | 1,865 | 0.41% | 1.06% | 0.96% | 289 | 1,710 | 1,999 | 0.09% | 0.39% | 0.35% | 297 | 1,718 | 2,015 |
| Dong Thap | 308 | 1,260 | 1,568 | 0.10% | -0.27% | -0.19% | 325 | 1,241 | 1,566 | 0.27% | -0.08% | -0.01% | 315 | 1,214 | 1,529 |
| An Giang | 595 | 1,220 | 1,815 | -0.12% | -0.67% | -0.50% | 651 | 1,166 | 1,817 | 0.45% | -0.22% | 0.01% | 597 | 1,082 | 1,679 |
| Tien Giang | 210 | 1,616 | 1,827 | -1.63% | 0.63% | 0.34% | 145 | 1,708 | 1,853 | -1.84% | 0.28% | 0.07% | 269 | 1,602 | 1,871 |
| Vinh Long | 171 | 845 | 1,016 | 0.06% | -0.09% | -0.07% | 175 | 826 | 1,001 | 0.13% | -0.12% | -0.07% | 129 | 892 | 1,021 |
| Ben Tre | 124 | 1,158 | 1,282 | -0.17% | -0.04% | -0.06% | 122 | 1,116 | 1,238 | -0.09% | -0.18% | -0.17% | 198 | 1,127 | 1,325 |
| Kien Giang | 531 | 1,246 | 1,777 | 0.83% | 0.09% | 0.31% | 647 | 1,196 | 1,843 | 0.99% | -0.20% | 0.18% | 185 | 1,577 | 1,762 |
| Can Tho | 998 | 375 | 1,374 | 1.49% | 0.02% | 1.06% | 1,135 | 327 | 1,462 | 0.65% | -0.69% | 0.31% | 527 | 762 | 1,289 |
| Hau Giang | 239 | 480 | 719 | 1.90% | -1.07% | -0.19% | 341 | 382 | 723 | 1.80% | -1.13% | 0.03% | 238 | 469 | 707 |
| Tra Vinh | 187 | 830 | 1,017 | 0.70% | -0.06% | 0.08% | 215 | 821 | 1,036 | 0.71% | -0.06% | 0.09% | 954 | 62 | 1,016 |
| Soc Trang | 425 | 736 | 1,161 | 0.89% | -0.96% | -0.33% | 540 | 617 | 1,157 | 1.20% | -0.87% | -0.02% | 623 | 481 | 1,105 |
| Bac Lieu | 271 | 673 | 944 | 0.71% | 0.26% | 0.39% | 298 | 669 | 967 | 0.47% | -0.03% | 0.12% | 286 | 680 | 966 |
| Ca Mau | 269 | 913 | 1,181 | -0.11% | -0.11% | -0.11% | 277 | 941 | 1,218 | 0.15% | 0.15% | 0.15% | 301 | 880 | 1,181 |
| **Total (Urbanization Rate )** | **4,611** | **12,934** | **17,545** | **0.57%** | **0.01%** | **0.15%** | **5,159** | **12,721** | **17,881** | **0.56%** | **-0.08%** | **0.09%** | **4,920** | **12,545** | **17,465** |
| | (26.3 %) | | | | | | (28.9 %) | | | | | | (28.2 %) | | |

Source: Worked by Survey Team, based on Viet Nam Population Projection for the Period 2019–2069

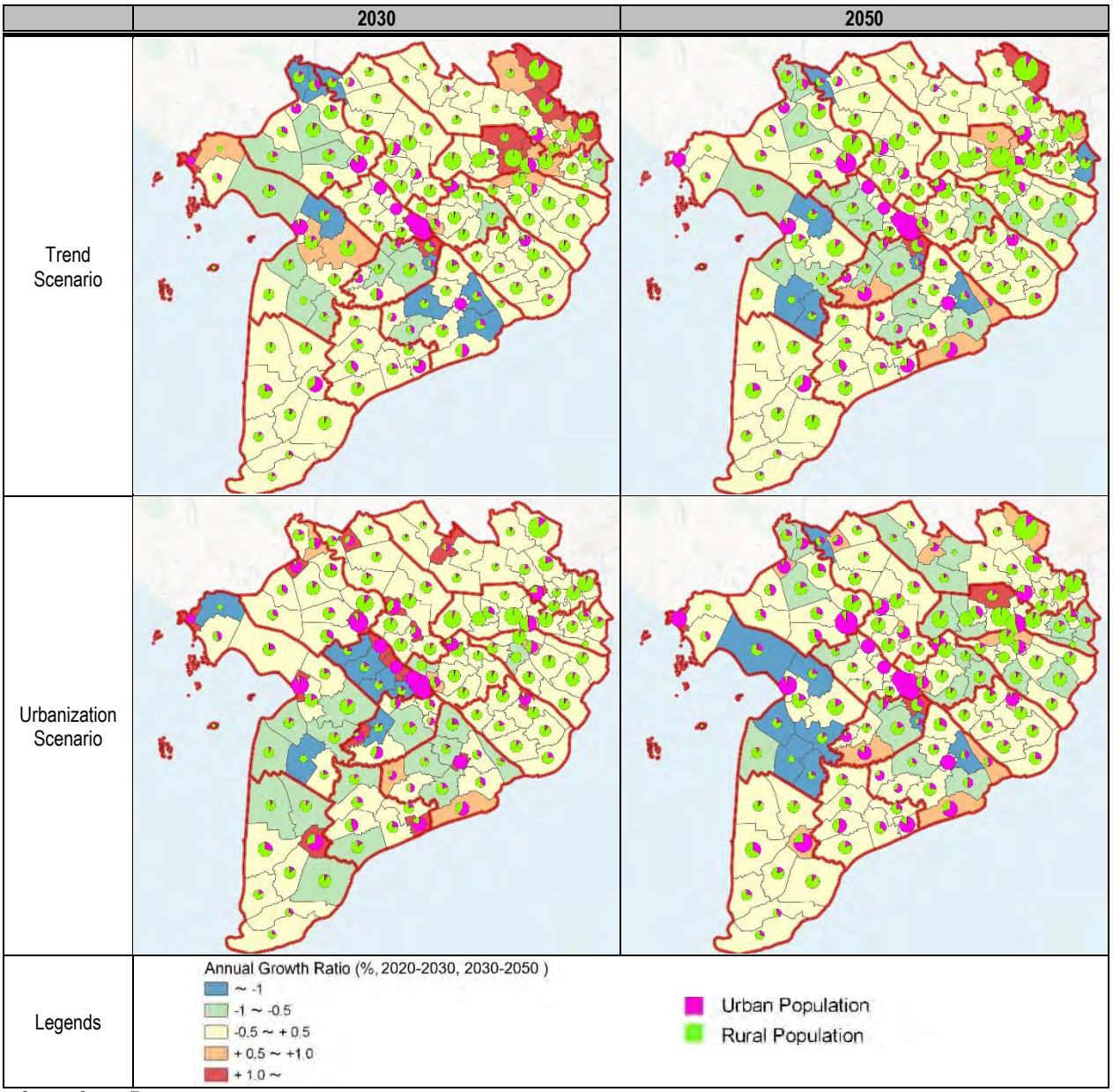
**Urbanization scenario** projected that urbanization would drastically progress, referring to the urbanization rate in other large metropolitan areas (Hanoi, Ho Chi Minh, and Danang). The urbanized population is assumed to be 5.60 million in 2030 and 6.73 million in 2050.

**Table 5.1.5 Urbanization Scenario: Projected Future Population in Mekong Delta (2030, 2050)**

| City / Province | 2030 | | | | | | 2050 | | | | | | Reference: Estimated Values in 2030, by Mekong Delta Plan for 2021-2030, Vision by 2050 (WB) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Population (000) | | | Population (000) | | | Population (000) | | | Annual Growth Ratio 2030–2050 | | | | | |
| | Urban | Urban | Urban | Urban | Urban | Urban | Urban | Rural | Total | Urban | Rural | Total | Urban | Rural | Total |
| Long An | 351 | 1,515 | 1,865 | 2.55% | 0.63% | 0.96% | 457 | 1,542 | 1,999 | 1.33% | 0.09% | 0.35% | 297 | 1,718 | 2,015 |
| Dong Thap | 380 | 1,188 | 1,568 | 2.23% | -0.85% | -0.19% | 461 | 1,105 | 1,566 | 0.97% | -0.36% | -0.01% | 315 | 1,214 | 1,529 |
| An Giang | 735 | 1,080 | 1,815 | 2.00% | -1.87% | -0.50% | 894 | 923 | 1,817 | 0.99% | -0.78% | 0.01% | 597 | 1,082 | 1,679 |
| Tien Giang | 259 | 1,567 | 1,827 | 0.47% | 0.32% | 0.34% | 320 | 1,533 | 1,853 | 1.05% | -0.11% | 0.07% | 269 | 1,602 | 1,871 |
| Vinh Long | 211 | 805 | 1,016 | 2.19% | -0.58% | -0.07% | 253 | 748 | 1,001 | 0.91% | -0.36% | -0.07% | 129 | 892 | 1,021 |
| Ben Tre | 153 | 1,129 | 1,282 | 1.96% | -0.30% | -0.06% | 180 | 1,058 | 1,238 | 0.81% | -0.32% | -0.17% | 198 | 1,127 | 1,325 |
| Kien Giang | 656 | 1,122 | 1,777 | 2.98% | -0.96% | 0.31% | 826 | 1,016 | 1,843 | 1.16% | -0.49% | 0.18% | 185 | 1,577 | 1,762 |
| Can Tho | 1,137 | 236 | 1,374 | 2.82% | -4.51% | 1.06% | 1,227 | 236 | 1,462 | 0.38% | -0.01% | 0.31% | 527 | 762 | 1,289 |
| Hau Giang | 295 | 424 | 719 | 4.07% | -2.29% | -0.19% | 361 | 362 | 723 | 1.01% | -0.78% | 0.03% | 238 | 469 | 707 |
| Tra Vinh | 230 | 787 | 1,017 | 2.84% | -0.60% | 0.08% | 285 | 750 | 1,036 | 1.07% | -0.24% | 0.09% | 954 | 62 | 1,016 |
| Soc Trang | 524 | 637 | 1,161 | 3.04% | -2.39% | -0.33% | 635 | 522 | 1,157 | 0.96% | -0.99% | -0.02% | 623 | 481 | 1,105 |
| Bac Lieu | 334 | 610 | 944 | 2.85% | -0.73% | 0.39% | 416 | 551 | 967 | 1.10% | -0.51% | 0.12% | 286 | 680 | 966 |
| Ca Mau | 332 | 850 | 1,181 | 2.02% | -0.82% | -0.11% | 416 | 802 | 1,218 | 1.13% | -0.29% | 0.15% | 301 | 880 | 1,181 |
| **Total (Urbanization Rate )** | **5,598** | **11,947** | **17,545** | **2.53%** | **-0.78%** | **0.15%** | **6,732** | **11,149** | **17,881** | **0.93%** | **-0.35%** | **0.09%** | **4,920** | **12,545** | **17,465** |
| | (31.9 %) | | | | | | | | | | | | (28.2 %) | | |

Source: Worked by Survey Team, based on Viet Nam Population Projection for the Period 2019 – 2069

The following figure compares the projected urban and rural populations in 2030 and 2050.




Source: Survey Team

**Figure 5.1.2 Urban and Rural Population Distribution by District by Scenario (2030, 2050)**

### 3) GRDP

**Trend Scenario.** The scenario projected that the share of industrial structure would not drastically change, referring to the projected values in VITRANSS3.

**Urbanization Scenario.** For the outlook of the gross regional development product in the future, each city/province prepared the Socio-Economic Development Master Plan. The available plans are reviewed as shown in Table 5.1.6, and it is assumed that the development targets (in 2030) of each city/province will be achieved in 2050.

## Table 5.1.6 Summarized Socio-economic Development Outlook by Some Provinces in Mekong Delta

<table>
<tr><th>Province</th><th>Source</th><th>Description in terms of economy</th></tr>
<tr><td>Long An</td><td>Decision No. 1349/QD-TTg dated October 3, 2012 of the Prime Minister approving the master plan for socio-economic development of Long An province to 2020, vision to 2030.</td><td>・ The average economic growth rate in 2012–2030 will reach 12.5% per year, of which the period of 2012–2020 will increase by 13% per year.<br>・ By 2030, GRDP per capita will reach 172 million VND/person/year (about 8,000 USD);<br>・ The proportion of agriculture, industry, and service sectors in the GRDP structure accounts for 7%, 48%, and 45%, respectively.</td></tr>
<tr><td>Tien Giang</td><td>Decision No. 142/QD-TTg dated January 28, 2015 of the Prime Minister approving the adjustment of the master plan for socio-economic development of Tien Giang province to 2020, orientation to 2030.</td><td>・ The average economic growth rate of the GRDP) is about 9.5–10.5% in 2021–2030.<br>・ The GRDP in 2030 (at 2010 constant prices) will increase by about 2.6 times compared to that of 2020.<br>・ Per capita income in 2030 will reach about USD10,300–11,900.<br>・ The economic structure will shift towards being modern and efficient, gradually forming and developing a knowledge-based economy.<br>・ The proportion of the non-agricultural sector in 2030 will account for about 86% of the total GRDP.</td></tr>
<tr><td>Vinh Long</td><td>Decision No. 1824/QD-TTg dated December 25, 2018 of the Prime Minister approving the adjustment of the master plan for socio-economic development of Vinh Long province to 2020, vision to 2030.</td><td>・ The average economic growth rate from 2021 to 2025 will increase by 7.5% per year and 7% per year from 2026 to 2030.<br>・ Per capita income will reach about USD2,500 by 2025 and about USD3,600 by 2030.<br>・ The proportion of agriculture, forestry, and fishery accounts for 23%, industry-construction accounts for 28.5%, and services account for 48.5% of the economic structure by 2025, and by 2030, are 17.8%, 32.6%, and 49.6%, respectively.</td></tr>
<tr><td>Kien Giang</td><td>Decision No. 388/QD-TTg dated April 10, 2018 of the Prime Minister approving the adjustment of the master plan for socio-economic development of Kien Giang province to 2020, orientation to 2030.</td><td>・ The GRDP in 2020–2030 will increase by an average of about 8-9% per year.<br>・ Per capita income will reach about USD8,100–9,300 by 2030. The proportion of non-agricultural sector in 2030 will account for more than 75% of the total GRDP.</td></tr>
<tr><td>Can Tho</td><td>Resolution No. 59/NQ-TW dated August 5, 2020 of the Politburo on construction and development of Can Tho City to 2030 and a vision to 2045.</td><td>・ In 2021–2025, Can Tho strives to achieve GRDP growth rate of about 7.5–8% per year.<br>・ By 2025, the GRDP per capita will reach USD6,200–6,800 and USD9,400-11,000 by 2030.<br>・ Projection of the economic structure:
<table>
<tr><th></th><th>2025</th><th>2030</th></tr>
<tr><td>Services</td><td>54%</td><td>56%</td></tr>
<tr><td>Industry and construction</td><td>34%</td><td>34%</td></tr>
<tr><td>Agriculture</td><td>6%</td><td>4%</td></tr>
<tr><td>Product tax minus product subsides</td><td>6%</td><td>6%</td></tr>
</table></td></tr>
<tr><td>Tra Vinh</td><td>Decision No. 1443/QD-TTg dated October 31, 2018 of the Prime Minister approving the adjustment of the master plan for socio-economic development of Tra Vinh province to 2020, vision to 2030.</td><td>・ In 2021–2030, the GRDP will increase by an average of about 11–12% per year.<br>・ Per capita income will reach 190–200 million VND/person/year.<br>・ Total investment capital of the whole society is about VND180,000–200,000 billion.<br>・ By 2030, the growth rate of agriculture, forestry, and fishery will reach 2.5% per year.</td></tr>
<tr><td>Bac Lieu</td><td>Resolution No. 04/2011/NQ-HDND dated September 22, 2011 of the People's Council of Bac Lieu province on the master plan for socio-economic development of Bac Lieu province to 2020, vision to 2030.</td><td>・ The economic growth rate in 2011–2030 will reach an average of 10% per year.<br>・ The economic structure by 2030 would be agriculture accounts for 18%, industry-construction accounts for 42%, and services account for 40%.</td></tr>
<tr><td>Ca Mau</td><td>Decision No. 537/QD-TTg dated April 4, 2016 of the Prime Minister approving the adjustment of the master plan for socio-economic development of Ca Mau province to 2020, orientation to 2030.</td><td>・ The GRDP in 2021–2025 will increase by 7% per year and in 2026–2030 will be 6.9% per year.<br>・ Per capita GRDP in 2025 will reach about USD4,400–4,500 and in 2030 will be about USD6,800–6,900.<br>・ Projection of the economic structure:
<table>
<tr><th></th><th>2025</th><th>2030</th></tr>
<tr><td>Services</td><td>45.7%</td><td>49.0%</td></tr>
<tr><td>Industry and construction</td><td>34.2%</td><td>35.3%</td></tr>
<tr><td>Agriculture</td><td>17.1%</td><td>13.1%</td></tr>
<tr><td>Product tax minus product subsides</td><td>3.0%</td><td>2.6%</td></tr>
</table>
・ The average annual total social investment capital for 2021–2025 will reach about 28% GRDP and for 2026–2030 about 26–27% GRDP.</td></tr>
</table>

Source: Worked by Survey Team, based on Socio-economic Development Plans in City / Provinces

The GRDP in the target years (2030, 2050) is assumed as shown in Table 5.1.7 and Table 5.1.8. In the urbanization scenario, the GRDP is projected to be much higher than the values in the trend scenario, and the industrial structures are projected to be more specialized in the tertiary sector than in the industrial sector and agricultural sector.

**Table 5.1.7 Trend Scenario: Projected Future Gross Regional Development Product of City / Provinces in Mekong Delta (2030, 2050)**

| Province | 2020 | | | | 2030 | | | | 2050 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total (Billion. VND) | % of Primary | % of Secondary | % of Tertiary | Total (Billion. VND) | % of Primary | % of Secondary | % of Tertiary | Total (Billion. VND) | % of Primary | % of Secondary | % of Tertiary |
| Long An | 80,575 | 16% | 50% | 34% | 153,545 | 10% | 62% | 28% | 477,995 | 6% | 77% | 17% |
| Dong Thap | 54,682 | 36% | 19% | 45% | 83,097 | 42% | 23% | 35% | 191,808 | 59% | 18% | 23% |
| An Giang | 54,113 | 36% | 14% | 51% | 85,662 | 44% | 14% | 42% | 197,914 | 61% | 11% | 28% |
| Tien Giang | 59,272 | 39% | 26% | 35% | 97,719 | 37% | 32% | 31% | 230,552 | 42% | 36% | 23% |
| Vinh Long | 34,554 | 33% | 19% | 48% | 49,070 | 34% | 21% | 45% | 89,260 | 41% | 21% | 38% |
| Ben Tre | 32,408 | 37% | 18% | 44% | 46,885 | 29% | 20% | 50% | 78,391 | 32% | 22% | 46% |
| Kien Giang | 68,957 | 33% | 20% | 47% | 102,811 | 41% | 22% | 37% | 201,400 | 51% | 20% | 29% |
| Can Tho | 52,230 | 10% | 33% | 57% | 101,323 | 8% | 50% | 42% | 336,804 | 6% | 70% | 24% |
| Hau Giang | 23,533 | 26% | 23% | 51% | 32,757 | 34% | 25% | 41% | 74,289 | 48% | 24% | 28% |
| Tra Vinh | 38,788 | 32% | 33% | 36% | 69,478 | 24% | 53% | 23% | 202,952 | 18% | 70% | 12% |
| Soc Trang | 35,035 | 46% | 13% | 41% | 50,117 | 48% | 16% | 36% | 100,138 | 58% | 14% | 28% |
| Bac Lieu | 29,201 | 43% | 19% | 39% | 44,987 | 48% | 21% | 31% | 109,474 | 58% | 22% | 20% |
| Ca Mau | 41,318 | 34% | 30% | 36% | 66,874 | 41% | 32% | 27% | 193,720 | 66% | 20% | 14% |
| **Total** | **604,667** | **31%** | **26%** | **43%** | **984,327** | **31%** | **34%** | **35%** | **2,484,696** | **35%** | **43%** | **23%** |

Source: Worked by Survey Team

**Table 5.1.8 Urbanization Scenario: Projected Future Gross Regional Development Product of City / Provinces in Mekong Delta (2030, 2050)**

| Province | 2020 | | | | 2030 | | | | 2050 | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total (Billion. VND) | % of Primary | % of Secondary | % of Tertiary | Total (Billion. VND) | % of Primary | % of Secondary | % of Tertiary | Total (Billion. VND) | % of Primary | % of Secondary | % of Tertiary | |
| Long An | 80,575 | 16% | 50% | 34% | 208,992 | 12% | 50% | 37% | 554,517 | 7% | 48% | 45% | |
| Dong Thap | 54,682 | 36% | 19% | 45% | 162,404 | 28% | 24% | 48% | 496,825 | 18% | 27% | 55% | 1) |
| An Giang | 54,113 | 36% | 14% | 51% | 122,348 | 28% | 18% | 54% | 281,267 | 18% | 20% | 62% | 1) |
| Tien Giang | 59,272 | 39% | 26% | 35% | 153,735 | 28% | 33% | 39% | 407,906 | 14% | 37% | 49% | |
| Vinh Long | 34,554 | 33% | 19% | 48% | 69,576 | 27% | 24% | 49% | 141,821 | 18% | 33% | 50% | |
| Ben Tre | 32,408 | 37% | 18% | 44% | 96,251 | 30% | 23% | 47% | 294,450 | 19% | 27% | 54% | 1) |
| Kien Giang | 68,957 | 33% | 20% | 47% | 155,911 | 30% | 21% | 49% | 358,424 | 25% | 22% | 53% | |
| Can Tho | 52,230 | 10% | 33% | 57% | 107,647 | 7% | 34% | 59% | 224,784 | 4% | 34% | 62% | |
| Hau Giang | 23,533 | 26% | 23% | 51% | 46,077 | 21% | 25% | 55% | 91,241 | 13% | 24% | 63% | 1) |
| Tra Vinh | 38,788 | 32% | 33% | 36% | 115,200 | 25% | 37% | 38% | 352,418 | 16% | 41% | 44% | 1) |
| Soc Trang | 35,035 | 46% | 13% | 41% | 83,734 | 36% | 20% | 44% | 203,957 | 23% | 27% | 50% | 1) |
| Bac Lieu | 29,201 | 43% | 19% | 39% | 75,739 | 34% | 25% | 41% | 200,958 | 21% | 31% | 47% | 1) |
| Ca Mau | 41,318 | 34% | 30% | 36% | 80,900 | 25% | 35% | 40% | 160,199 | 13% | 35% | 52% | |
| **Total** | **604,667** | **31%** | **26%** | **43%** | **1,478,514** | **25%** | **30%** | **45%** | **3,768,767** | **16%** | **33%** | **52%** | |

1) The Socio-economic Development Plan is not available and assumed from other provinces' trends
Source: Worked by Survey Team, based on Socio-economic Development Plans in City / Provinces

## 5.2. Outline of the Demand Forecasting Framework

### 5.2.1. Overview

In principle, the VITRANSS3 traffic database will be fully utilized in the study, while additional traffic survey results and local socio-economic data, particularly at the district level, will be the major inputs for the database update to project the local traffic demand within the Mekong Delta.

The Study will basically trace the forecast methodology applied by VITRANSS3, i.e., the four-step forecast model. The demand forecast model for VITRANSS3 is based on the traditional four-step model for passengers and freight and was applied to (i) traffic generation and attraction, (ii) traffic distribution, (iii) modal split, and (iv) traffic assignment, as shown in Figure 5.2.1.

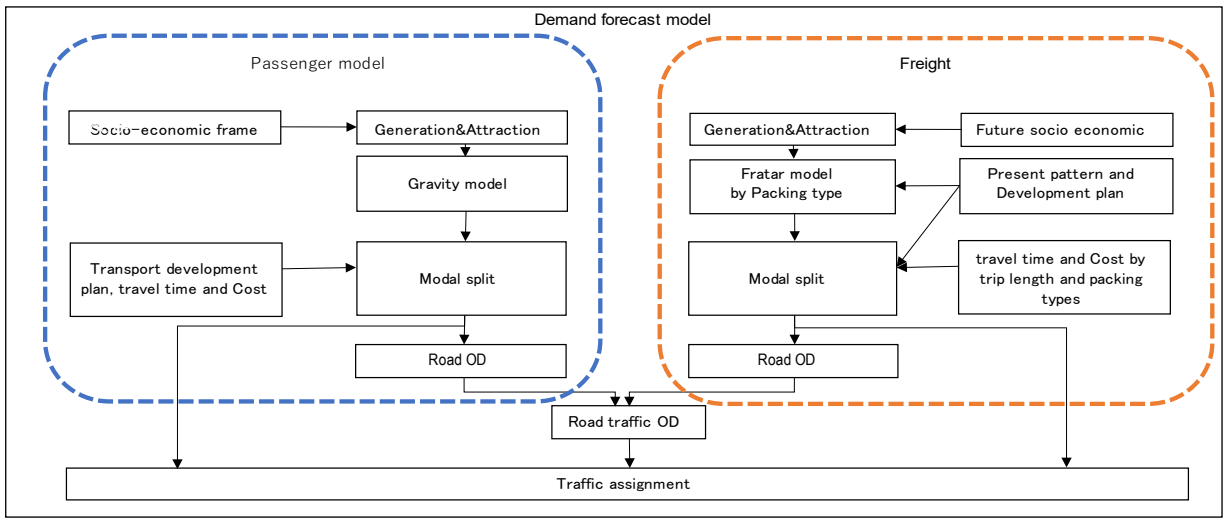
(i) **Trip Generation:** Calculate the number of trips starting in each zone for a particular trip purpose.

(ii) **Trip Distribution:** Produce a table on the number of trips starting and ending in each zone.

(iii) **Modal Split:** Allocate various trips to the available transportation modes (e.g., bus, train, walking, and private vehicles).

(iv) **Traffic Assignment:** Identify the specific routes on each transportation mode that will be selected by the travelers.

The key objective of the four-step model is to determine future traffic volumes on the road or rail network under various assumptions and economic growth.




Source: VITRANSS-3 (2020)

**Figure 5.2.1 Model Structure for Demand Forecast**

Table 5.2.1 shows how to update the traffic demand forecast from the VITRANSS3 to this Mekong study:

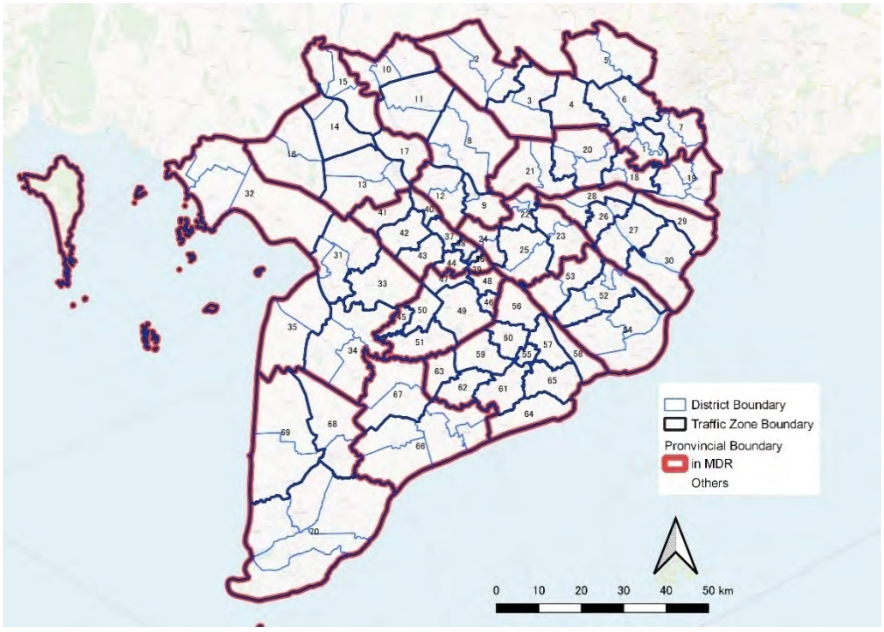
**Table 5.2.1 How to Update VITRANSS 3 Traffic Demand Forecast**

| Item | VITRANSS3 | This Mekong Study |
|---|---|---|
| Target Years | 2019 (existing), 2030, 2050 | 2022 (existing), 2030, 2050 |
| Zoning System | Provinces and Special Cities (63 zones in total, 13 zones in Mekong Delta) | Districts within the Mekong Delta but some zones are merged (70 zones in Mekong Delta) |
| Socio-economic Framework | Developed by the VITRANSS-3 Study Team | Update the VITRANSS-3 Socio-economic Framework, from the latest Census (2019). 1) Trend Scenario and 2) Urbanization Scenario are developed but only 2) is applied. |
| Traffic Type | Passenger, cargo | Passenger, cargo |
| Existing O-D Pattern | Traffic survey results in 2019 | Medicated by (i) the inter-zonal O-D patterns developed in METROS (2013) study and (ii) traffic survey in the study |
| Present Transport Network | Present conditions in 2019 | Modification to the latest conditions |
| Future Transport Network | Forming by NSP projects and others | Modification and addition |
| Modal Split and Traffic Assignment | Road, rail, IWT, shipping, and aviation | Road, rail, IWT, shipping, and aviation with focus on road and IWT within the Mekong Delta |

Source: The Survey Team

## 5.2.2. Zoning System

The zoning system applied in VITRANSS3, which is the nationwide transport master plan study, is based on the boundaries of cities and provinces. For this study, which focuses on the regionwide traffic movement in terms of passenger traffic and freight traffic, the zoning is too rough, and the zones are divided according to the district boundaries. For the time savings of the assignment calculation, zones in the edge are merged into one. Figure 5.2.2 visualizes the zoning system for thins study.

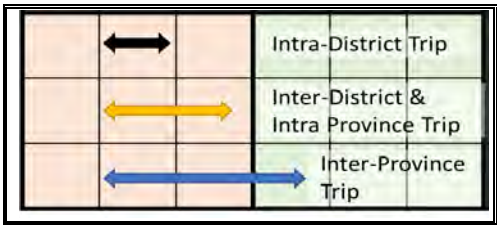



Source: The Survey Team

**Figure 5.2.2 Zoning System for this Study**

### 5.2.3. Updating the patterns of OD matrix

As mentioned above, the VITRANSS3 traffic demand forecasting model is to develop the traffic demand between cities and provinces, not traffic within the city/province but between districts. The traffic demand forecasting models developed in the "Data Collection Survey on Railways in Major Cities in Vietnam (METROS, 2016)" was referred to for the estimate of the inter-district trip pattern. In the METROS Study, a comprehensive person-trip survey was conducted in Ho Chi Minh City and adjoining provinces, including Long An, Binh Duong, and Dong Nai. The trip patterns for the adjoining provinces are analyzed as shown in Figure 5.2.3, and the extracted inter-district trips ratio is applied as values for this Study.




| | Long An | Binh Duong | Dong Nai | Average |
|---|---|---|---|---|
| Inter-District & Intra Province Trip (A) | 160,106 | 426,930 | 135,357 | 240,798 |
| Inter-Province Trip (B) | 346,051 | 769,337 | 369,501 | 494,963 |
| (A)/(B) | 46.27 % | 55.49 % | 36.63 % | 46.65 % |

Source: Data Collection Survey on Railways in Major Cities in Vietnam (METROS, 2016)

**Figure 5.2.3 Analyzed Trip Patterns of Long An, Binh Duong, and Dong Nai Province**

### 5.2.4. Update of Transport Network

The base-year and future transport network is based on the VITRANSS3 traffic demand forecasting model and updated according to the objectives of the study.

#### 1) Existing Road Network

Unlike VITRANSS3, this study covers the inter-district trips and the existing road network. From the existing database, which covers only the national highway network, the provincial road may be reflected in the digitalized transport network. The inventory of the provincial road in the Mekong Delta is prepared to assume the network parameters including the traffic capacity and designed travel speed.


| Cd | Province | Width (m) | No. of Lanes | Designed Speed (kph) |
|---|---|---|---|---|
| DT943 | An Giang | 5,5–7 | 2 | 40–60 |
| DT948 | An Giang | 5,5 | 2 | 40 |
| DT942 | An Giang | 7 | 2 | 60 |
| DT978 | Bac Lieu | 3–5,5 | 2 | 40 |
| DT01 | Bac Lieu | 2,5–5 | 2 | 30 |
| DT980B | Bac Lieu | 5 | 2 | 40 |
| DT919 | Can Tho | 7 | 2 | 60 |
| DT923 | Can Tho | 12 | 2 | 60 |
| DT922 | Can Tho | 7 | 60 | 60 |
| DT850 | Dong Thap | 7 | 2 | 60 |
| DT845 | Dong Thap | 7 | 2 | 60 |
| DT837 | Dong Thap | 5,5 | 2 | 40 |
| DCT02 | Dong Thap | 18 | 4 | 100 |
| DT12 | Kien Giang | 4 | 2 | 30 |
| DT30 | Kien Giang | 4 | 2 | 30 |
| DT963 | Kien Giang | 5 | 2 | 40 |
| DT962 | Kien Giang | 5,5–7 | 2 | 60 |
| DT008 | Soc Trang | 5 | 2 | 40 |
| DT934 | Soc Trang | 7 | 2 | 60 |
| DT006 | Soc Trang | 6 | 2 | 40 |
| DT935 | Soc Trang | 6 | 2 | 40 |
| DT864 | Tien Giang | 5,5 | 2 | 40 |

Source: the Survey Team

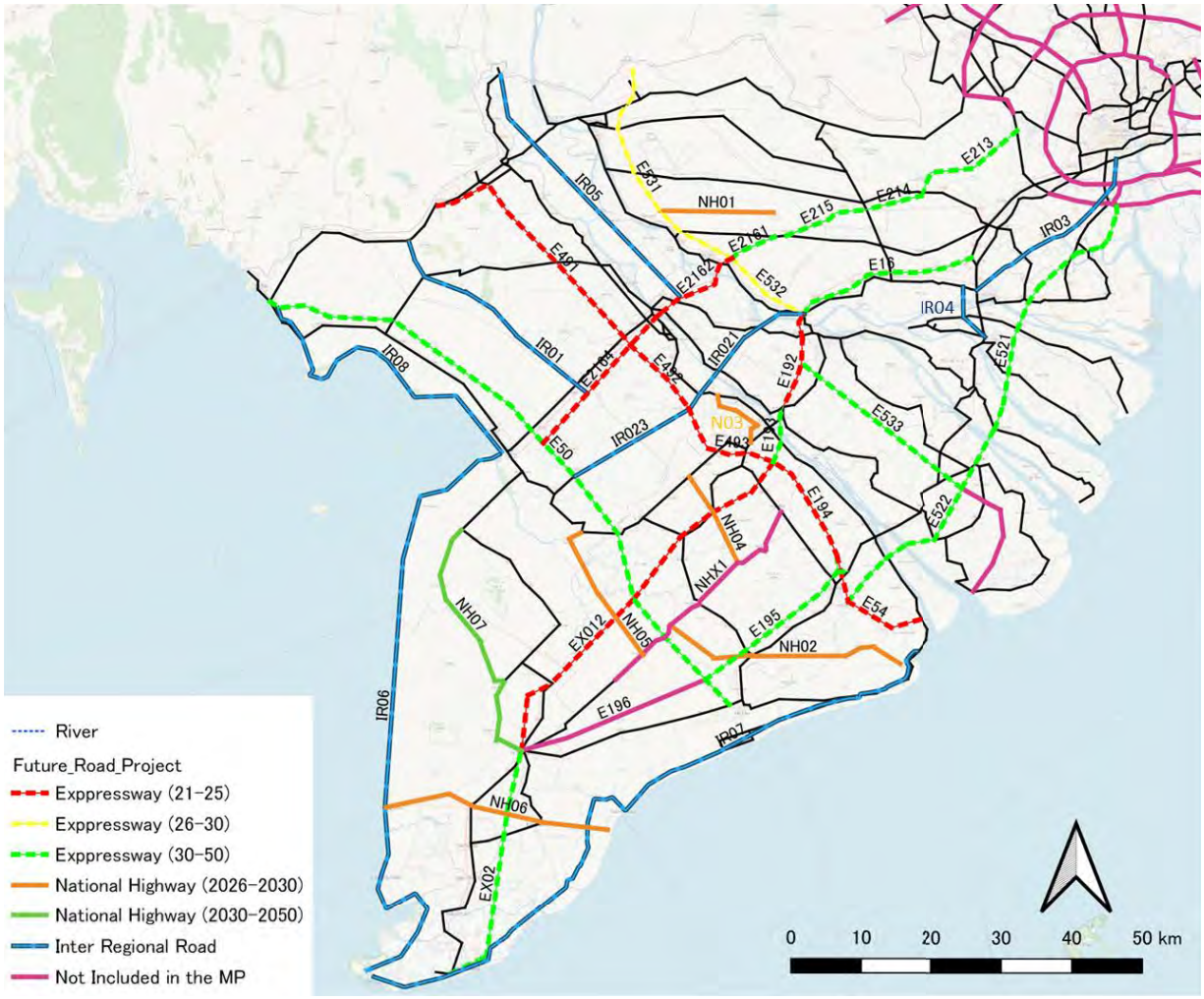
**Figure 5.2.4 Inventory of the Provincial Roads in Mekong Delta**

### 2) Future Road Network

For the future road network, there are some references for the transport projects in the Mekong Delta. In this study, the following studies are referred to:

- VITRANSS3 Study Project List,
- Mekong Delta Plan for 2021-2030, Vision by 2050 (World Bank, 2022), and
- list of the projects managed by PMU My Thuan.

The referred road network is shown in Figure 5.2.5 and Table 5.2.2.




Source: Worked by the Survey Team, based on the various sources

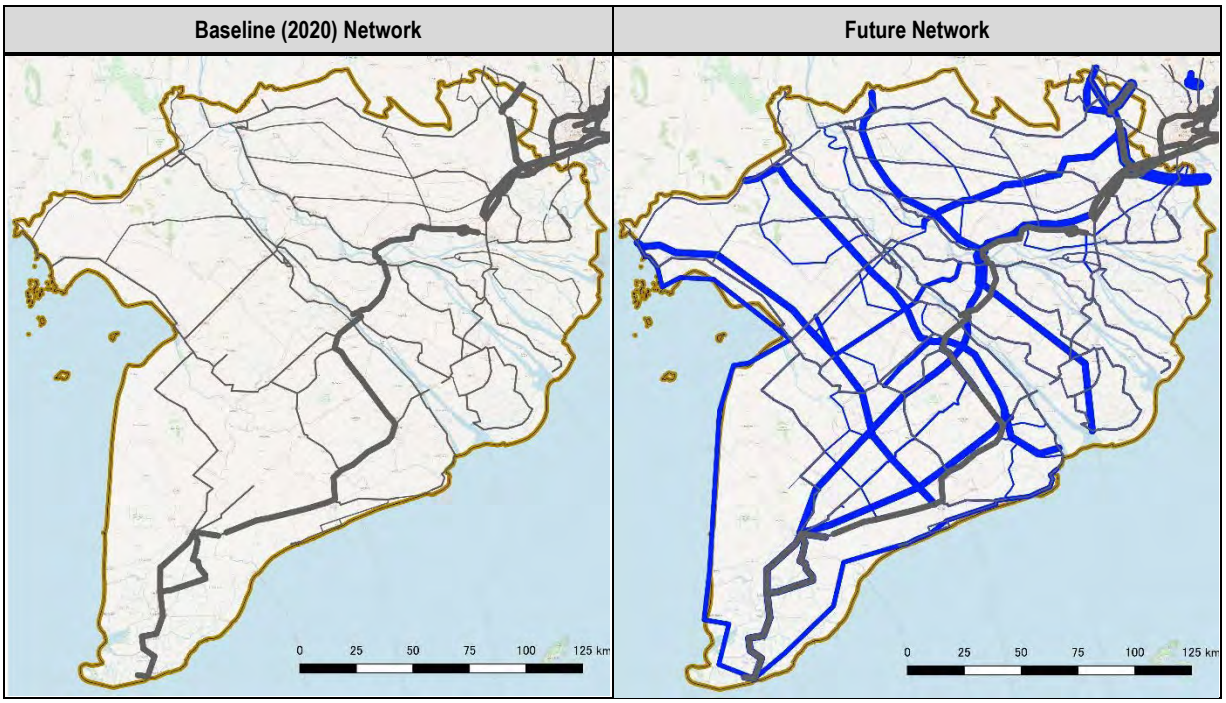
**Figure 5.2.5 Referred Transport Project Map in Mekong Delta**

### Table 5.2.2 Referred Transport Project List in Mekong Delta

| | Cd | Name | Source | | |
|---|---|---|---|---|---|
| | | | VITRAN SS3 | WB Study | PMU My Thuan |
| VITRANSS3 Project List | E16 | Trung Luong–My Thuan | ○ | ○ | × |
| | E19 | **Can Tho–Ca Mau** | | | |
| | | E19-1: My Thuan 2 Bridge Section | ○ | ○ | × |
| | | E19-2: My Thuan–Can Tho Expressway | ○ | ○ | ○ |
| | | E19-3: Can Tho 2 Bridge section | ○ | ○ | × |
| | | E19-4: Can Tho–Soc Trang: E49-4 | ○ | ○ | ○ |
| | | E19-5:Soc Trang–Bac Lieu | ○ | ○ | × |
| | | E19-6: Bac Lieu–Ca Mau | ○ | × | × |
| | E21 | **Ngoc Hoi–Chon Thanh–Rac Gia** | | | |
| | | E21-1: Ngoc Hoi–Chon Thanh section | ○ | ○ | × |
| | | E21-2: Chon Thanh–Duc Hoa section | ○ | ○ | × |
| | | E21-3: Duc Hoa–Thanh Hoa) | ○ | ○ | × |
| | | E21-4: Thanh Hoa–Tan Thanh section | ○ | ○ | × |
| | | E21-5: Tan Thanh–My An section | ○ | ○ | × |
| | | **E21-6: My An–Cao Lanh section** | | | |
| | | E21-6-1: My An–Cao Lanh Expressway | ○ | ○ | ○ |
| | | E21-6-2: (Improvement of) Cao Lanh–Lo Te Road | ○ | ○ | |
| | | E21-6-3: Vam Cong Bridge Section (Existing) | ○ | ○ | ○ |
| | | E21-6-4: (Improvement of) Lo Te–Rach Soi Road | ○ | ○ | ○ |
| | E49 | **Chau Doc–Can Tho–Soc Trang** | | | |
| | | E49-1: Chau Doc–An Giang Section | ○ | ○ | ○ |
| | | E49-2: An Giang–Can Tho North Section | ○ | ○ | |
| | | E49-3: An Giang–Can Tho South Section | ○ | ○ | |
| | E50 | Ha Tien–Rach Gia–Bac Lieu | ○ | ○ | × |
| | E51 | Go Dau–Xa Mat | ○ | ○ | × |
| | E52 | **Nha Be (HCM City)–My Tho (Tien Giang)–Ben Tre–Tra Vinh** | | | |
| | | E52-1: | ○ | ○ | × |
| | | E52-2: | ○ | ○ | × |
| | | E52-3: Dai Ngai Bridge Section | ○ | ○ | × |
| | | E52-4: | ○ | ○ | × |
| | E53 | **Hong Ngu–Tra Vinh** | | | |
| | | E53-1: Hong Ngu–Cao Lanh | ○ | ○ | × |
| | | E53-2: Cao Lanh–An Huu | ○ | ○ | ○ |
| | | E53-3: An Huu–Tra Vinh | ○ | ○ | × |
| | | E53-4 | ○ | | |
| | E54 | Soc Trang–Tran De | ○ | ○ | ○ |
| Listed in MEKONG DELTA REGION PLAN FOR 2021–2030, VISION BY 2050 and Other Source | EX01 | Bac–Nam Expressway | | | |
| | | EX01-1: Component 1: (Can Tho–Hau Giang) | × | ○ | ○ |
| | | EX01-2 Component 2 (Hau Giang–Ca Mau) | × | ○ | ○ |
| | EX02 | Bac–Nam Expressway (Extention) | × | ○ | × |
| | IR01 | Inter-Regional Roads 01 | × | ○ | × |
| | IR02 | **Inter-Regional Roads 02** | | | |
| | | IR02-1 | × | ○ | × |
| | | **IR02-2 O' Mon Bridge Section** | × | ○ | × |
| | | IR02-3 | × | ○ | × |
| | IR03 | Inter-Regional Roads 03 | × | ○ | × |
| | IR04 | Inter-Regional Roads 04 (Rach Mieu 2 Bridge) | × | × | ○ |
| | IR05 | Inter-Regional Roads 05 | × | ○ | × |
| | IR06 | Inter-Regional Roads 06 (Coastal Road) | × | ○ | × |
| | IR07 | Inter-Regional Roads 07(Coastal Road) | × | ○ | × |
| | IR08 | Inter-Regional Roads 08 (Coastal Road) | × | ○ | × |
| | N01 | National Road 01 | × | ○ | × |
| | N02 | National Road 02 | × | ○ | × |
| | N03 | National Road 03 | × | ○ | × |
| | N04 | National Road 04 | × | ○ | × |
| | N05 | National Road 05 | × | ○ | × |
| | N06 | National Road 06 | × | ○ | × |
| | N07 | National Road 07 | × | ○ | × |

Source: The Survey Team

Referring to all the road projects, the future traffic demand forecast network was developed, as shown in Figure 5.2.6, assuming that all projects will be achieved by 2050 even if seemingly unrealistic. The projects to be reflected in each target year (2030 and 2050) will be finalized.



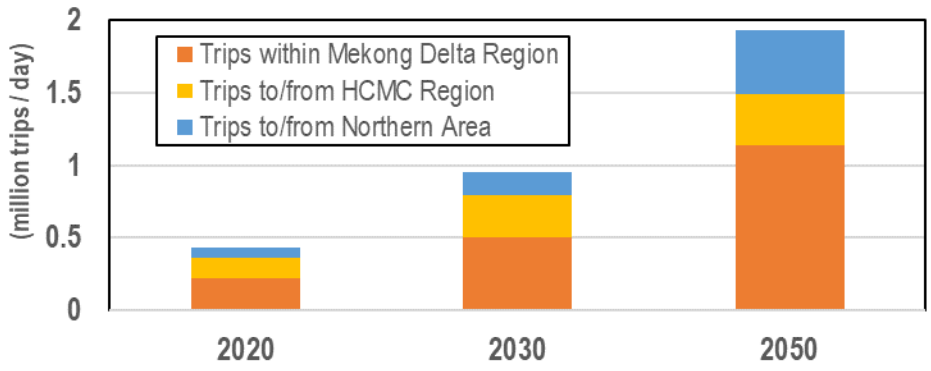

1) The line width shows the traffic capacity.
Source: The Survey Team

**Figure 5.2.6 Tentative Baseline and Future Network [1)]**

## 5.3. Result of Traffic Demand Forecast

### 5.3.1. Estimated Traffic Demand around Mekong Delta

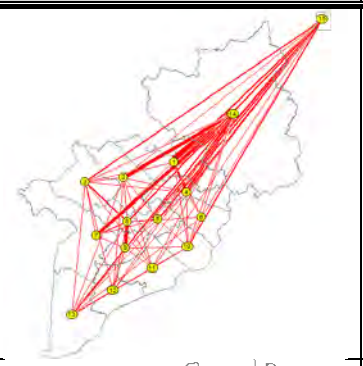
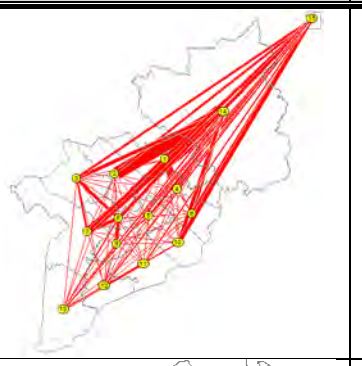
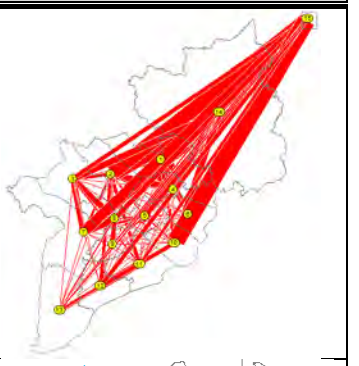
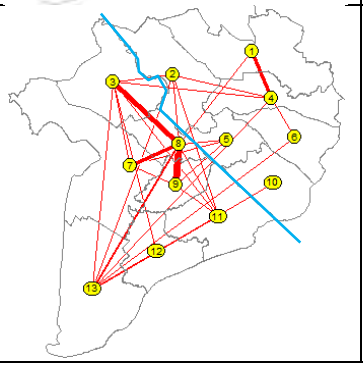
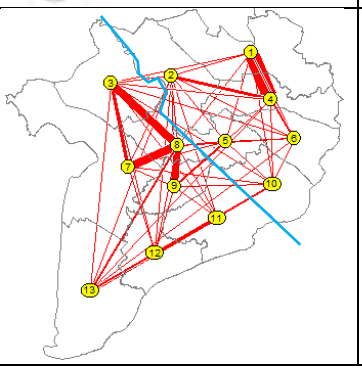
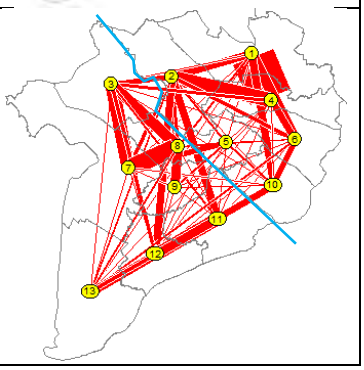
Based on the existing and projected socio-economic frameworks in the urbanization scenario, the travel demand in the Mekong Delta is estimated. Figure 5.3.1 shows the trip demand by target year, which is divided into (i) trips within Mekong Delta, (ii) trips between Mekong Delta and Southeast (Ho Chi Minh) Region, and (iii) trips between Mekong Delta and others in the northern area. Reflected by the rapid urbanization and industrial modernization, which are projected in the urbanization case socio-economic framework, the trips within Mekong Delta are estimated to grow rapidly. The impact of trips to/from the Ho Chi Minh Region will be huge until 2030, but there will be more impacts from others in the northern part in 2050.




1) excluding intra-zonal (district) trip
Source: The Survey Team

**Figure 5.3.1 Estimated Traffic Demand in Mekong Delta, 2020, 2030, and 2050**

Figure 5.3.2 visualizes the trip distribution in the provincial level. The impacts of trips to/from the Mekong Delta seems to be extensive. In 2050, trips to/from northern part will be much higher. Currently, the number of trips crossing Hau River is limited since the insufficient number of bridges obstruct the traffic. This is projected to continue in the future, and the traffic demand derived by the new bridge infrastructure is not yet fully reflected.

| | 2020 | 2030 | 2050 |
|---|---|---|---|
| Whole [1] ( OD Pairs Less than 2,500 trips per day are not shown) |  |  |  |
| Only Trips within Mekong Delta [2] (OD PairsLess than 1,000 trips per day are not shown) |  |  |  |

1) 1 dot = 2,500 trips per day
2) 1 dot = 1,000 trips per day
Source: The Survey Team

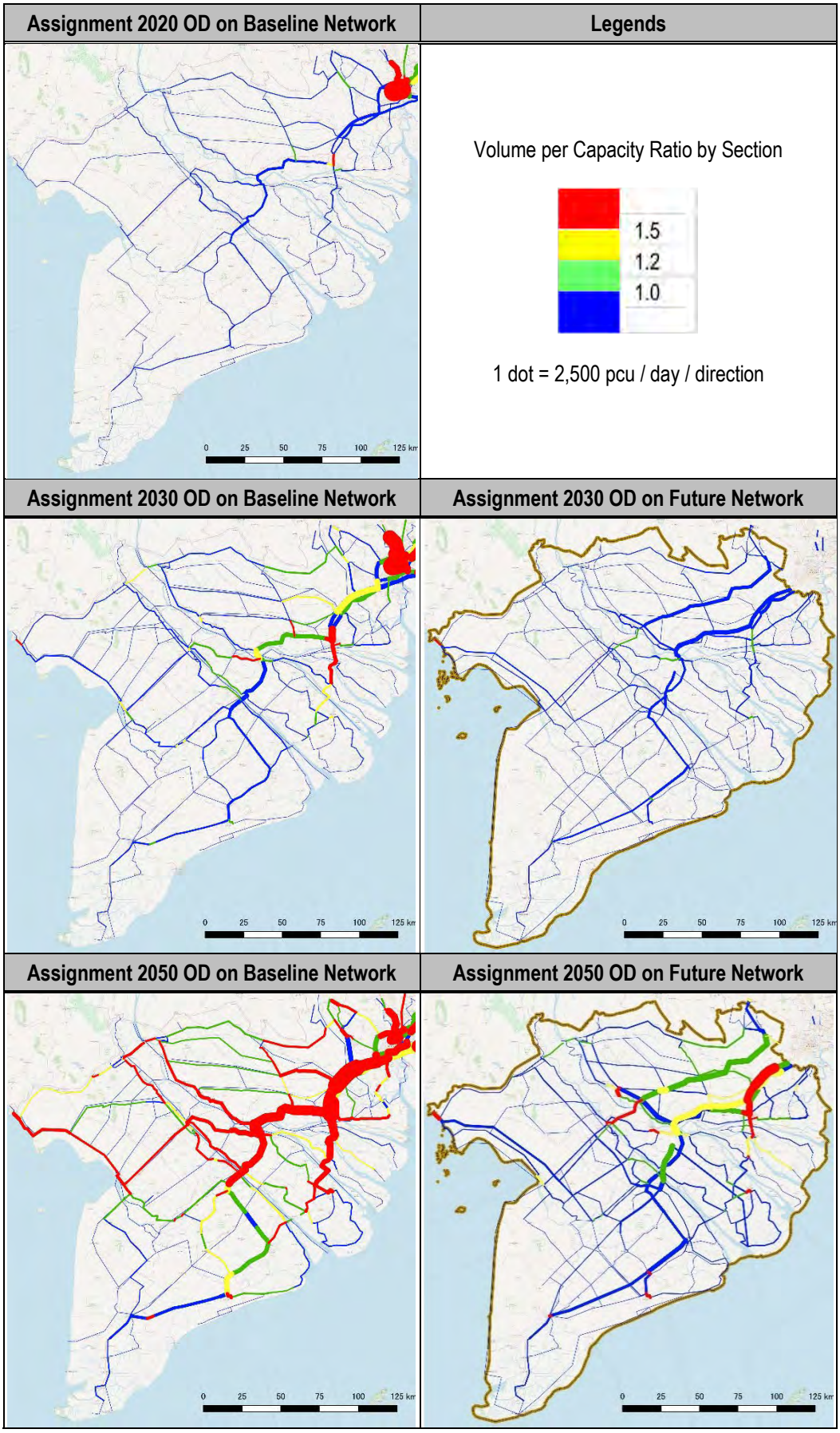
**Figure 5.3.2 Desire Lines of Travel Demand between Provinces in 2020, 2030, and 2050**

### 5.3.2. Traffic Assignment regarding Transport Capacity and Traffic Demand

Based on the estimated baseline and future traffic demand (2030 and 2050), the baseline and future transport networks were assessed.

Although the Mekong Delta currently has no severe traffic congestion, solving it is still necessary to achieve regional sustainable development with urbanization and industrial modernization.

Should a comprehensive road network be built, traffic congestion will be removed in the region, except for the roads along the industrial economic corridors connecting to Ho Chi Minh City. On the other hand, the current traffic demand model does not reflect the derived traffic demand by the new bridge infrastructure and seaport project. It should be noted that the result is tentative, and further investigation is necessary.




Source: The Survey Team

**Figure 5.3.3 Comparison of the Tentative Traffic Assignment Results**

## 5.4. Traffic Assignment Results on the Target Projects

### 5.4.1. Performance Indicator of the Target Project

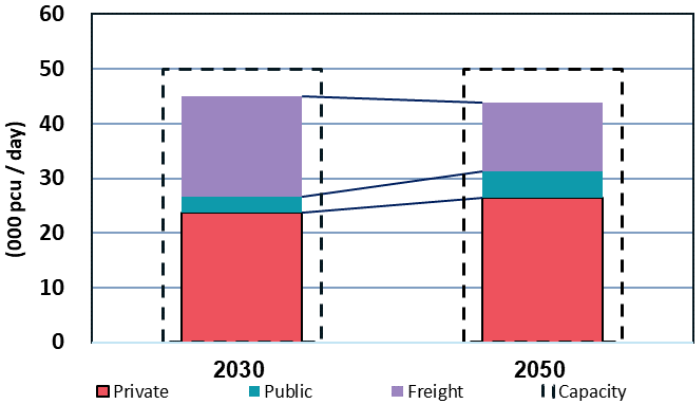
#### 1) IPC Project

Table 5.4.1 shows the performance indicators for the target project, IPC, and Figure 5.4.1 shows the changes in cross-sectional traffic volumes in the target year. It is assumed that the cross-sectional traffic volume will be 44,900 pcu/day in both directions in 2030 and 43,779 pcu/day in 2050, and the demand will not exceed the capacity. Between 2030 and 2050, both private and public passenger traffic is increasing, while logistics vehicle traffic is decreasing. It is suggested that freight traffic demand has been dispersed as the road network for the vehicle movements has been developed.

**Table 5.4.1 Major Performance Indicators of the Target Project (IPC) in 2030 and 2050**

| Year | | 2030 | 2050 |
|---|---|---|---|
| Length (km) | | 21.9 | |
| Traffic Volume (PCU / day) | Private | 23,800 | 26,500 |
| | Public | 2,900 | 4,700 |
| | Freight | 18,200 | 12,600 |
| | **Total** | **44,900** | **43,800** |
| Road Design | | 2 x 2 Lanes | |
| Capacity (PCU/day) | | 50,000 | |
| V/C | | 0.90 | 0.88 |
| Travel Speed (km/h) | Design | 80 | 80 |
| | Minimum | 21 | 21 |

Source: The Survey Team




Source: The Survey Team

**Figure 5.4.1 Sectional Traffic Volume of the Target Project (IPC) in 2030 and 2050**

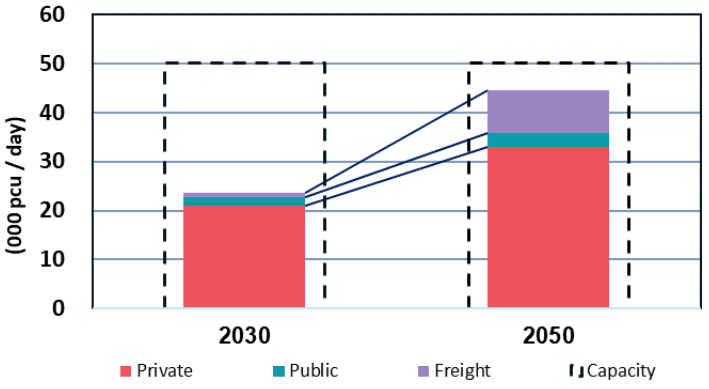
#### 2) NH61C Project

Table 5.4.2 shows the performance indicators for the target project, IPC, and Figure 5.4.2 shows the changes in cross-sectional traffic volumes in the target year. It is assumed that the cross-sectional traffic volume will be 23,500 pcu/day in both directions in 2030 and 44,500 pcu/day in 2050, and the demand will not exceed the capacity. In 2030, private vehicles are dominant (89%) but the share of freight traffic is expected to be increased (3.4 % in 2030 and 19.6 % in 2050).

**Table 5.4.2 Major Performance Indicators of the Target Project (NH61C) in 2030 and 2050**

| Year | | 2030 | 2050 |
|---|---|---|---|
| Length (km) | | | 11.3 |
| Traffic Volume (PCU / day) | Private | 20,900 | 33,000 |
| | Public | 1,800 | 2,800 |
| | Freight | 800 | 8,700 |
| | Total | 23,500 | 44,500 |
| Road Design | | 2 x 2 Lanes | |
| Capacity (PCU/day) | | 50,000 | |
| V/C | | 0.47 | 0.89 |
| Travel Speed (km/h) | Design | 80 | 80 |
| | Minimum | 62 | 21 |

Source: The Survey Team




Source: The Survey Team

**Figure 5.4.2 Sectional Traffic Volume of the Target Project (NH61C) in 2030 and 2050**

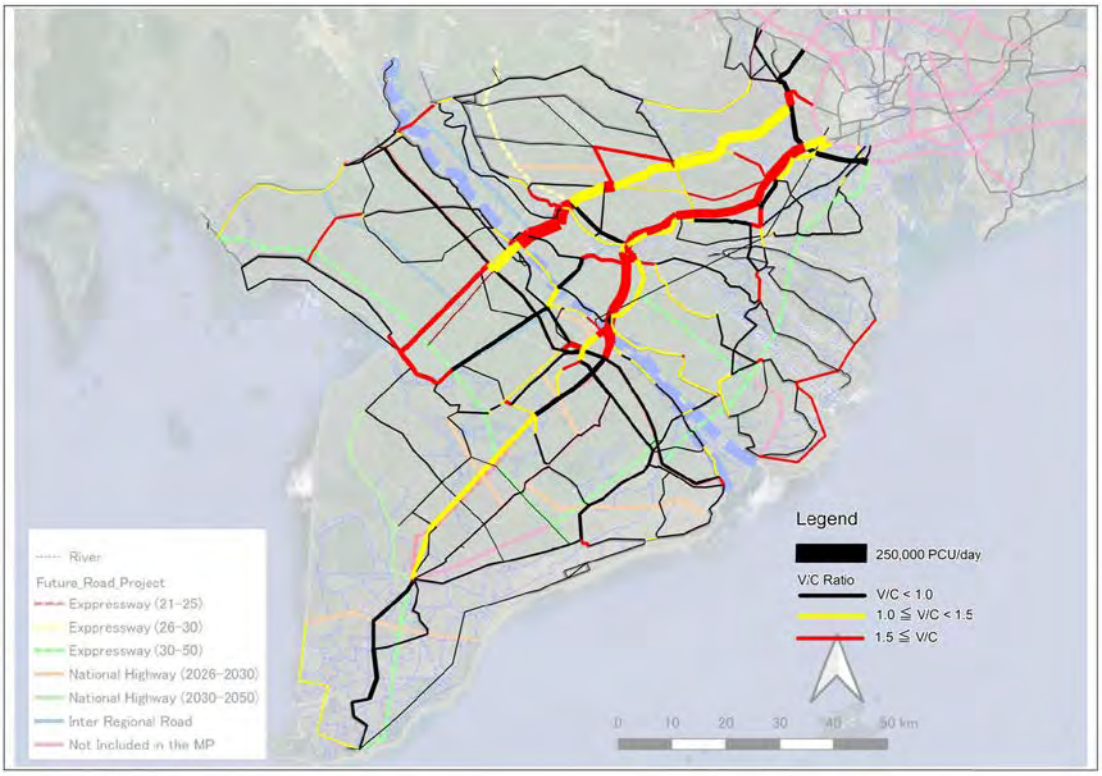
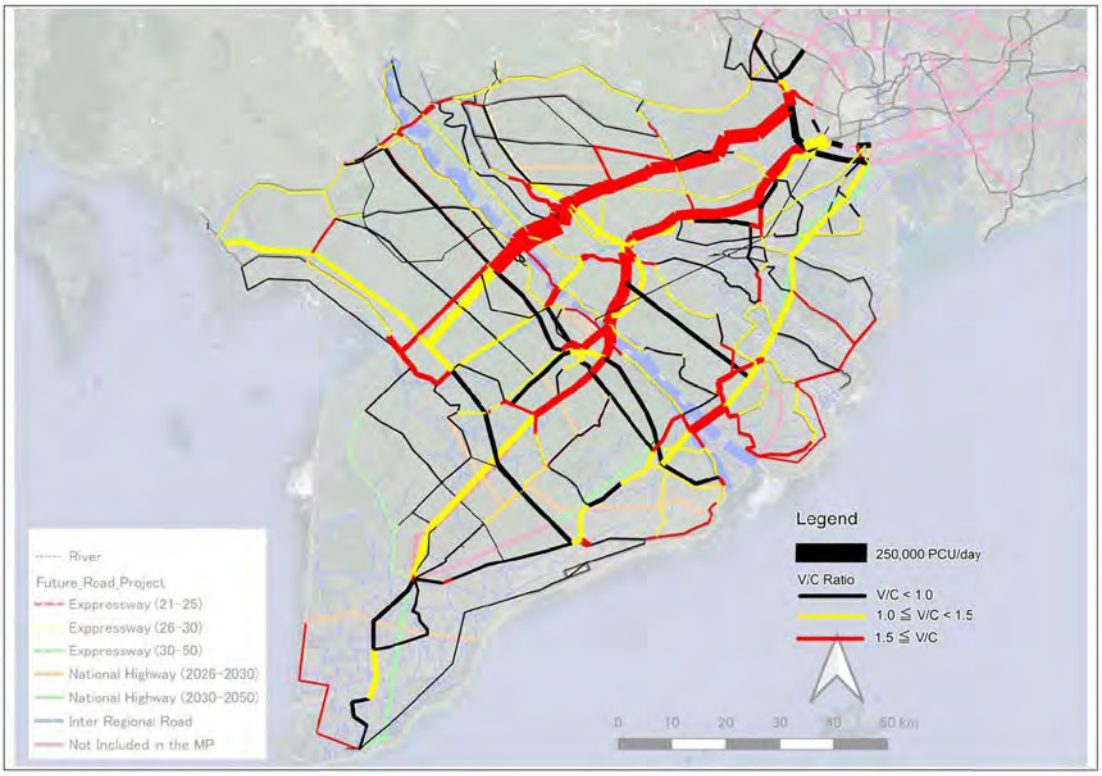
### 5.4.2. Overall Network Performance Indicator in the Mekong Delta Region, with / without the Target Project

In order to estimate the impact of the target project (IPC) on the road network in the Mekong Delta region, the key performance indicators for each scenario are summarized in Table 5.4.3 Although the project is an arterial road of about 22 km within a huge area (40,816 square kilometers), it is estimated that, vehicle transport will be more efficient by about 3 million pcu-km or 28,000 pcu-hours in 2030, suggesting a reduction in vehicle operating costs and travel time costs which will be the economic benefit of the project. On the other hand, in 2050, if the region grows as assumed in 5.1, it is expected that the traffic volume will exceed the traffic capacity in the regional level, reducing the effectiveness of the project. If a drastic development of the transport infrastructure in the region is impossible, a strategy to improve the efficiency of the transport system (i.e., TDM, TSM for passenger and freight traffic) is required.

**Table 5.4.3 Overall Network Performance Indicators in the Mekong Delta Region by the Development Scenario**

| Item | | 2030 | | | 2050 | | |
|---|---|---|---|---|---|---|---|
| | | Base Case | IPC Case | IPC + O Mon Bridge | Base Case | IPC Case | IPC + O Mon Bridge |
| Travel Demand | Person Trip (000) | 2,047 | 2,048 | 2,051 | 4,056 | 4,055 | 4,063 |
| Road Traffic Demand | PCU-km (000) | 116,271 | 113,177 | 113,316 | 187,232 | 186,090 | 186,642 |
| | PCU-hours (000) | 3,106 | 3,078 | 3,048 | 5,272 | 5,268 | 5,193 |
| Network Performance | Ave V/C Rate | 0.90 | 0.86 | 0.86 | 1.17 | 1.16 | 1.15 |
| | Ave Travel Speed (km/h) | 37.4 | 36.8 | 37.2 | 35.5 | 35.3 | 35.7 |

Source: The Survey Team

| | |
|---|---|
| 2030 |  |
| 2050 |  |



Source: The Survey Team

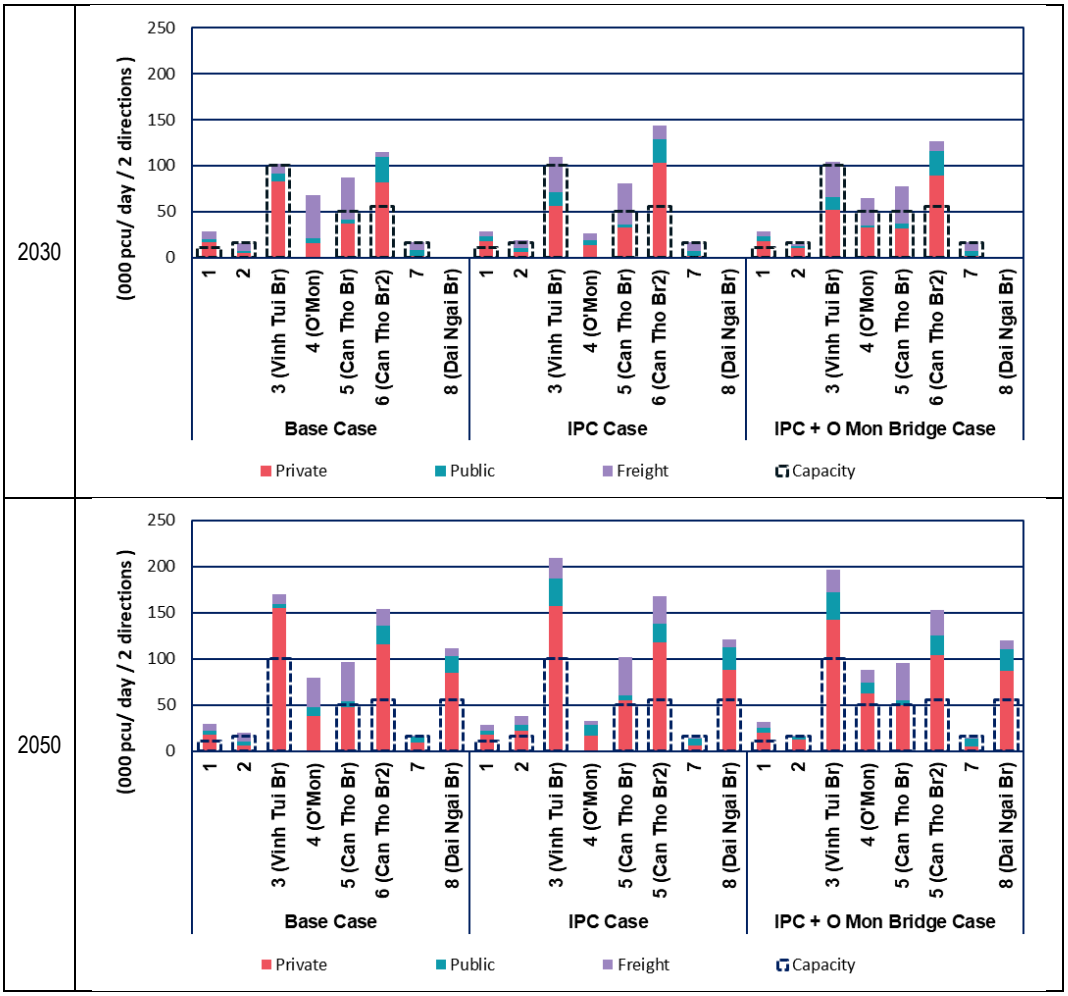
**Figure 5.4.3 Traffic Assignment Result in 2030, 2050 (for IPC + O Mon Bridge Scenario)**

### 5.4.3. Cross Sectional Traffic Volume on Hau River by Development Scenario

The cross-sectional traffic volumes at the bridges and other services across the Hau River (Figure 5.4.4) are summarized as shown in Figure 5.4.5. Traffic volumes are also observed in the Base Case and IPC Case at the O'Mon Bridge (4), but this refers to the traffic carried by the existing ferry service. As also Figure 5.4.2 shows, it is suggested that the existing and planned bridges may not be sufficient to support the traffic in the Mekong Delta region.

Source: The Survey Team

**Figure 5.4.4 The Location of the Crossing Sections on Hau River**




Source: The Survey Team

**Figure 5.4.5 Cross Sectional Traffic Volume on Hau River**

# 6. Development Studies on the Target Projects

In this study, the following actions were conducted for assisting to formulate the target projects.

- Preliminary study
- Review of “draft Pre-Feasibility Study (F/S) prepared by Vietnamese localities

The outputs of the study are described in the following sections, respectively.

- Section 6.1: Inter-provincial Corridor (IPC) (Can Tho Section)
- Section 6.2: National Highway (NH) 61C

## 6.1. IPC (Can Tho Section)

### 6.1.1. Current Situations and Studying Range

The IPC has been officially specified for the first time and approved by Decision No. 287/QD-TTg dated 28 February 28 (Mekong Delta Regional Development Plan). Individual project preparation study had not been conducted when this study specified the IPC as the target project.

The IPC will be developed by each province/city from the preparation stage. Therefore, before starting the studies by each city and province, the Study Team conducted a preliminary study of “Can Tho road section,” studying the essential points throughout the whole route for assisting formulation of the project. The study condition was “initial 2-lanes, ultimate 4-lanes” in accordance with the project proposal and confirmation with Can Tho Department of Transportation (DOT) in the meetings in August 2022.

Based on the study mentioned above, Can Tho DOT would prepare and provide a draft Pre-F/S with JICA study team until the end of December 2022 for review. However, the following situation was confirmed with Can Tho DOT in January 2023:

- the lane number was changed to “initially 4-lanes” from “initial 2-lanes, ultimate 4-lanes,” and
- draft Pre-F/S was still under preparation.

Therefore, the following actions were taken by the Study Team instead of draft Pre-F/S review:

- clarification of changed contents in draft Pre-F/S under preparation
- comments on under preparing draft Pre-F/S’s contents which JICA study team clarified with referring to the preliminary study even though the study condition is different.

**Table 6.1.1 Current Status of Project Preparation (IPC)**

<table>
<tr><th colspan="2">City / Province<br>Items</th><th>Dong Thap Province</th><th colspan="2">Can Tho City<br>The basis of Section 6.1.2</th><th>Kien Giang Province</th></tr>
<tr><td rowspan="4">Project Proposal</td><td rowspan="4">Submit</td><td rowspan="4">[Not submit]<br>At the meeting (Aug. 26, 2022), confirmation to submit as Development Policy Operation (DPO) program to the Ministry of Planning and Investment (MPI)</td><td colspan="2">[Already] No.2678/ UBND-XDDT July 13, 2022</td><td rowspan="4">[Already] No. 1200/ UBND-KT, July 19, 2022</td></tr>
<tr><td>Component 3:<br>O Mon bridge</td><td>Component2: Road section<br>Initial 2-lanes, ultimate 4-lanes</td></tr>
<tr><td colspan="2">Revised<br>The basis of Section 6.1.3</td></tr>
<tr><td>[Revised to Can Tho People's Committee (CPC) byDOT]<br>Ref.: 3474 /TTr-SGTVT, Dec. 2, 2022, Project2</td><td>[Revised to CPC Can Tho by DOT]<br>Ref.: 3474 /TTr-SGTVT, Dec. 2, 2022, Project1<br>Initial 4-lanes</td></tr>
<tr><td></td><td>Approval</td><td colspan="3">[Not approved]</td><td></td></tr>
<tr><td rowspan="2">Draft Pre-FS</td><td>Proceeded draft Pre-F/S</td><td>[Not proceeded]</td><td colspan="2">[Proceeded]<br>Can Tho city has been preparing a draft Pre-F/S</td><td>[Not proceeded]</td></tr>
<tr><td>Provide to JICA</td><td>-</td><td colspan="2">[Not submitted] Draft Pre-FS will be provided at end of February</td><td>-</td></tr>
</table>

* Specified components of the **target project** are written in green color

Source: The Study Team

The study/action taken in this study was shown as follows in respect of each project proposal.

**Table 6.1.2 Study/Action in This Study Depending on Project Proposal**

| Outline | Contents in This Study | Project Proposal as Basis | Number of Lanes |
|---|---|---|---|
| Section 6.1.2 | The Preliminary Study | No.2678/ UBND-XDDT July 13, 2022 | **Initial 2-lanes**, Ultimate 4-lanes |
| Section 6.1.3 | Clarification of draft Pre-F/S Contents (Instead of Review of Draft Pre-F/S) | Ref.:3474 / TTr-SGTVT, Dec. 2, 2022, Project1 | **4-lanes** from initial stage |

Source: The Study Team

## 6.1.2. Outline of Preliminary Study

The IPC will be developed by each province/city from the preparation stage. Therefore, before starting the individual study separately, a preliminary study of the whole route was necessary to unify the route and formulate important common policies/specifications. In addition, the target project, “Can Tho road section”, was studied furthermore, especially about medium and small bridge plans, cost estimate and Operation and Maintenance (O&M) plan for draft Pre-F/S and JICA’s review. As mentioned in Table 6.1.2, the study condition of the preliminary study was “initial 2-lanes, ultimate 4-lanes” based on the project proposal and confirmation with Can Tho DOT in the meetings in August 2022.

### 1) Whole Route

#### (a) Common Essential Points

Based on the result of the preliminary study, essential points to be unified through the whole route were summarized/extracted in Table 6.1.3.

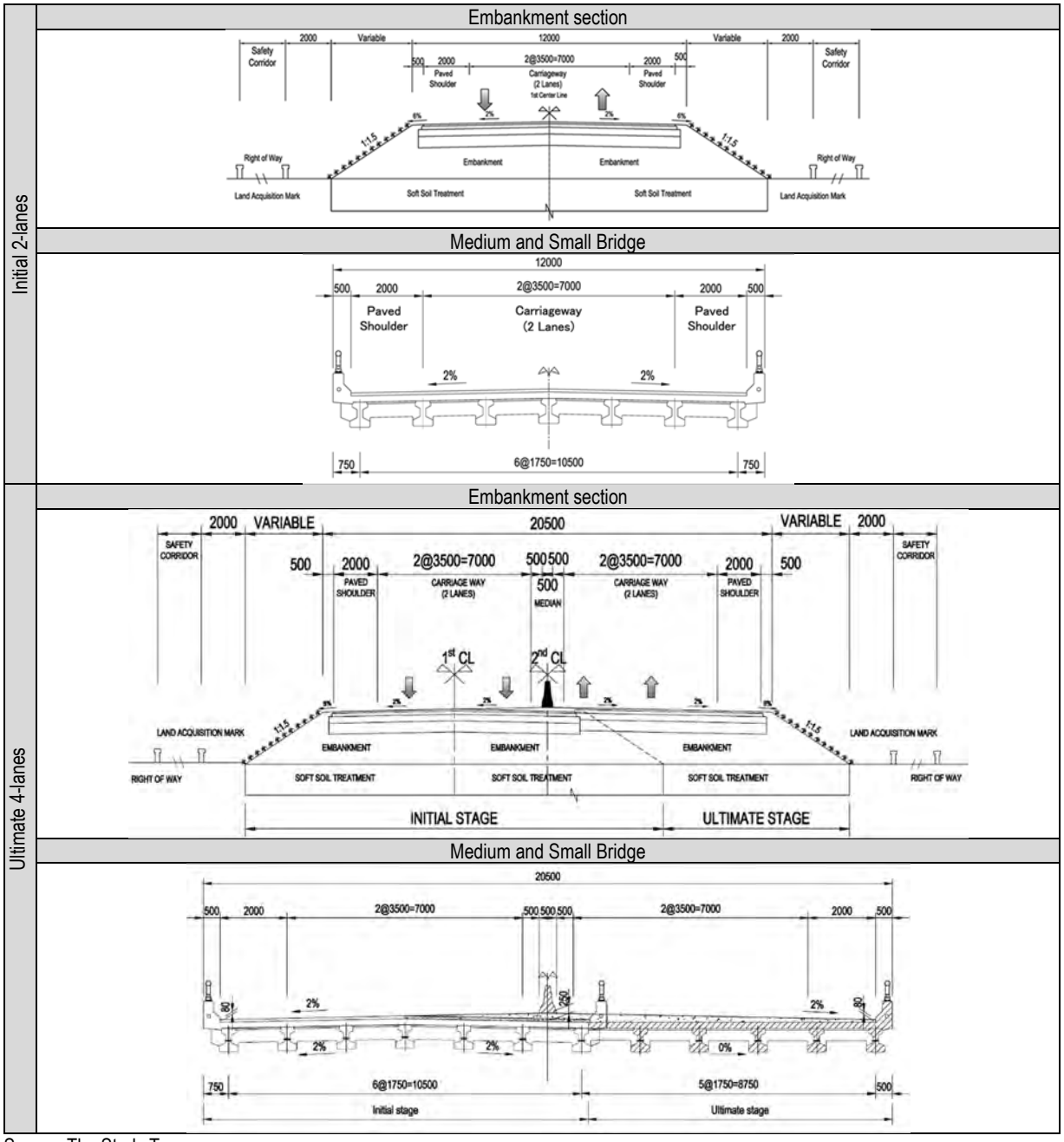
**Table 6.1.3 Outline of the Whole Route**

| Studied Points | Description |
|---|---|
| Role of IPC | ● Perform as the intermediate corridor between eastern and western North–South Expressways<br>● Serve the transport system even due to climate change<br>● Promote the roadside development of the industrial/urban zone as an accessible high-standard road |
| Road Class / Grade (Design) | IPC / National highway Grade III Road – plain |
| Design Speed | V=80 km/h |
| Required Road Surface Height | The design water level is set at HWL (4%) as a national highway structure. Additionally, the appropriate impact of sea-level rise due to climate change shall be considered. The following set value is referred to the other project in the MDR with scenario Representative Concentration Pathways (RCP) 4.5 by the Ministry of Natural Recourses and Environmental (MONRE).<br>[Embankment section] After 25 years, the difference from HWL (4%) is 15 cm higher<br>[Bridge section] After 100 years, the difference from HWL (4%) is 46 cm higher<br>*The reason for "100 years for bridge" is due to the difficulty of changing the formation height of bridges |
| Concept of Access from Roadside | IPC is classified as a "Partially controlled access road: New highway" per Circular No. 39/2021/TT-BGTVT, 31 December 2021. |
| Interchange and Intersection | The concept of interchanges and intersections of IPC are planned for crossing/connecting only arterial roads specified as either existing/planning expressways, national highways, or provincial roads. |
| Concept of Connectivity with Roadside | The main access to the IPC is from interchanges/intersections. The optimum way of connection from roadside shall be by frontage roads with access points at an interval (e.g., 2 km interval). The locality/ developer will consider arranging the frontage road system when the urban/ industrial areas are planned. |
| Navigation Clearance | The required navigation clearance of the canal was considered for all bridges, in accordance with standard TCVN 5664:2009. The HWL is assumed to be 5% for all bridges. |
| Clearance of Roads | The clearance on crossroads was considered for the planning of all bridges in accordance with related standards: TCVN 5729:2012, TCVN 4054:2005, and TCVN 10380:2014. |

Source: The Study Team

### (b) Typical Cross Sections

The typical cross sections for 2-lanes at the initial stage and 4-lanes at the ultimate stage of "the embankment section" and "medium and small bridge" are shown in Figure 6.1.1, respectively.




Source: The Study Team

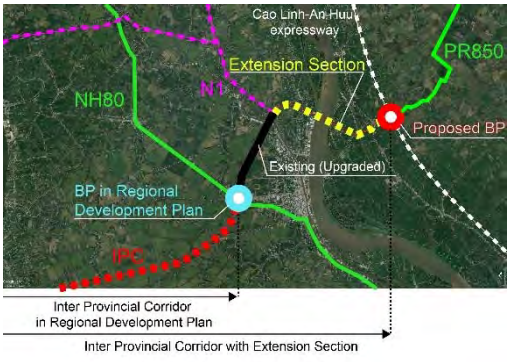
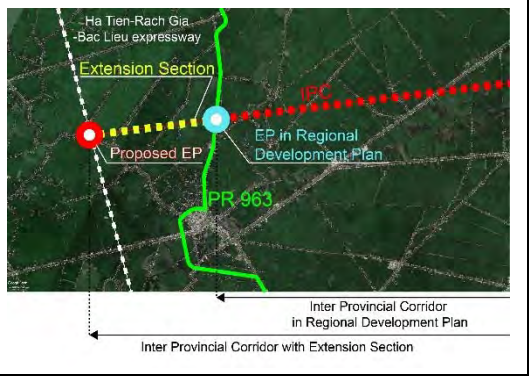
**Figure 6.1.1 Typical Cross Sections**

### (c) Route Plan

The route plan was studied for the whole route as following process:

- Study Appropriate Begging Point (BP) and End Point (EP):To set the extended BP and EP for connecting to main road network (expressway).
- Conditions of Route Alternative Study:To define the conditions for the route alternative study.
- Evaluation of Route Candidates Explained by Localities:To evaluate the two route candidates in accordance with the conditions above.
- Route Alternative Study in the Dong Thap Section:To select the optimum route based on the route alternative study in Dong Thap.

**Table 6.1.4 Proposed Beginning and End Points**

| Item | BP | EP |
|---|---|---|
| Mekong Delta Regional Development Plan | Intersection with NH80 in Sa Dec City | Intersection with Provincial Road (PR) 963 |
| Proposed Route by the Study Team (with extension section) | Interchange with Cao Lanh–An Huu Expressway | Interchange with Ha Tien–Rach Gia–Bac Lieu Expressway |
| Location |  |  |

Source: The Study Team edited on Google Earth

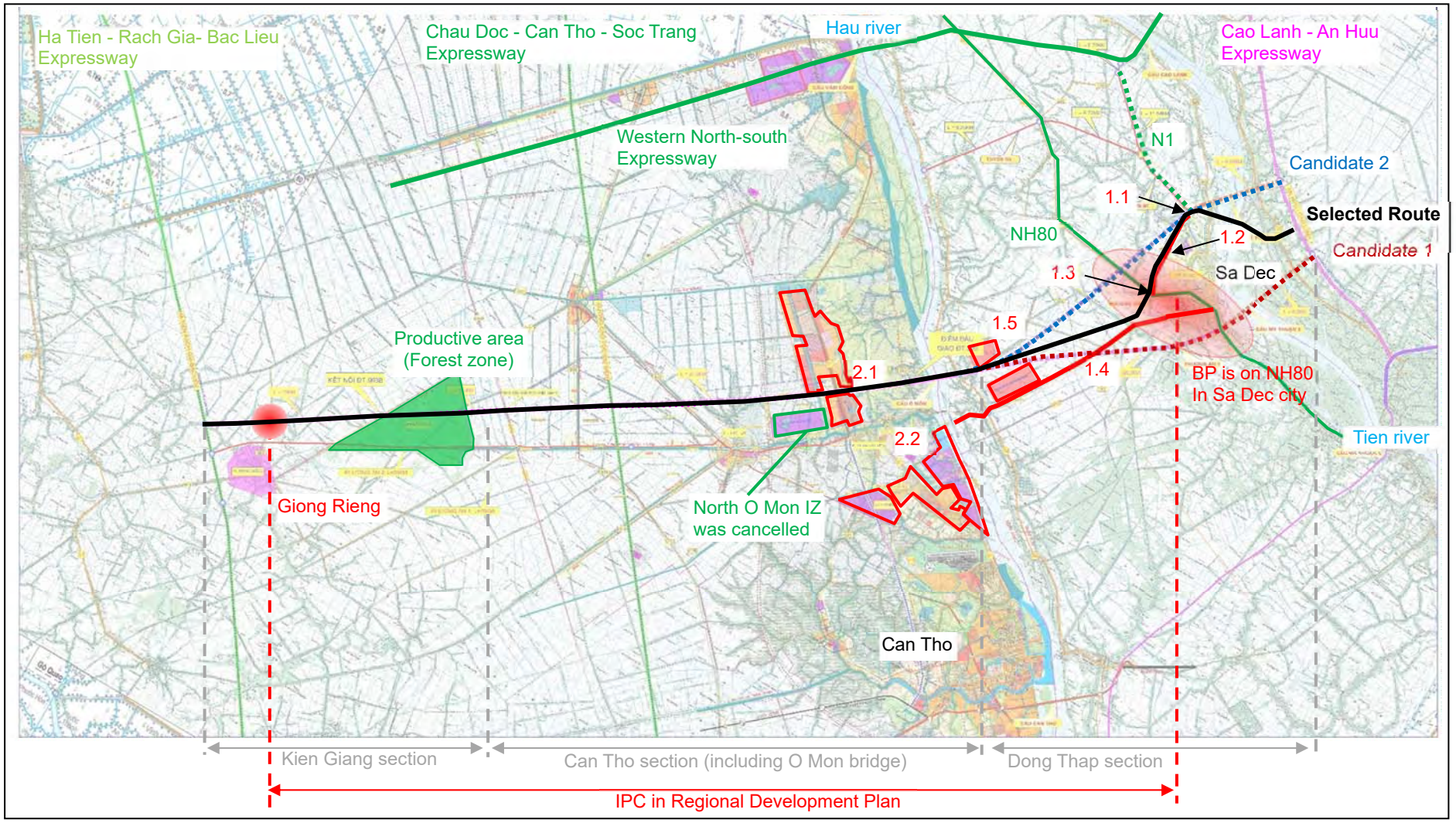
With reference to the future development plan and current conditions surrounding the route, major design controls were identified as listed in Table 6.1.5. Although each city/province is updating the development plan (as an integrated masterplan), it was assured and confirmed by every city and province in the meetings with the Study Team that the design controls, which were specified based on the current development plans, will not be much different in the integrated masterplans. The selected route alignment is shown in Figure 6.1.2 with design controls.

### Table 6.1.5 Design Controls along IPC

| Province | No. | Item | Remarks |
|---|---|---|---|
| 1. Dong Thap | 1.1 | Intersection with N1 and PR852B | Roundabout intersection. Roundabout will not be the appropriate intersection type. The intersection shall be re-designed and constructed. |
| | 1.2 | PR852B | Coinciding with PR852B, which is a newly built Grade III road. In the first meeting with DOT in Dong Thap province, utilization/coinciding of PR852B was suggested by DOT. |
| | 1.3 | Intersection with NH80 | |
| | 1.4 | Muong Khai – Doc Phu canal | In the reply letter "No. 1368/SGTVT-KHTC" to Can Tho from Dong Thap, Dong Thap requested to adjust the alignment with 300 m clearance/offset from "Muong Khai – Doc Phu canal" for future development.<br>* Because of this design control, tentatively, the side of future widening was set to the WESTERN side. |
| | 1.5 | Industrial/urban zone*1 | In the future development plan in Dong Thap province, there is the "Song Hau industrial zone (IZ)," in Thanh commune and an urban area in Phong Hoa commune. |
| 2. Can Tho | 2.1 | Development plan*1 | Nort O Mon IZ was cancelled, but other development plans are still active. |
| | 2.2 | O Mon thermal power plant*1 | O Mon thermal power plant with industrial zone, O Mon IZ (planned), Tra Noc 1 IZ, and Tra Noc 2 IZ. |
| 3. Kien Giang | - | - | "Productive area (forest zone)," but it was confirmed that it is not a protected area in terms of safeguards. |

Note: *1 This area of industrial zone will need to be confirmed based on the future land use plan

Source: The Study Team




Source: Edited by the Study Team based on the route alternative studied by Can Tho City

**Figure 6.1.2 Selected Route with Design Controls**

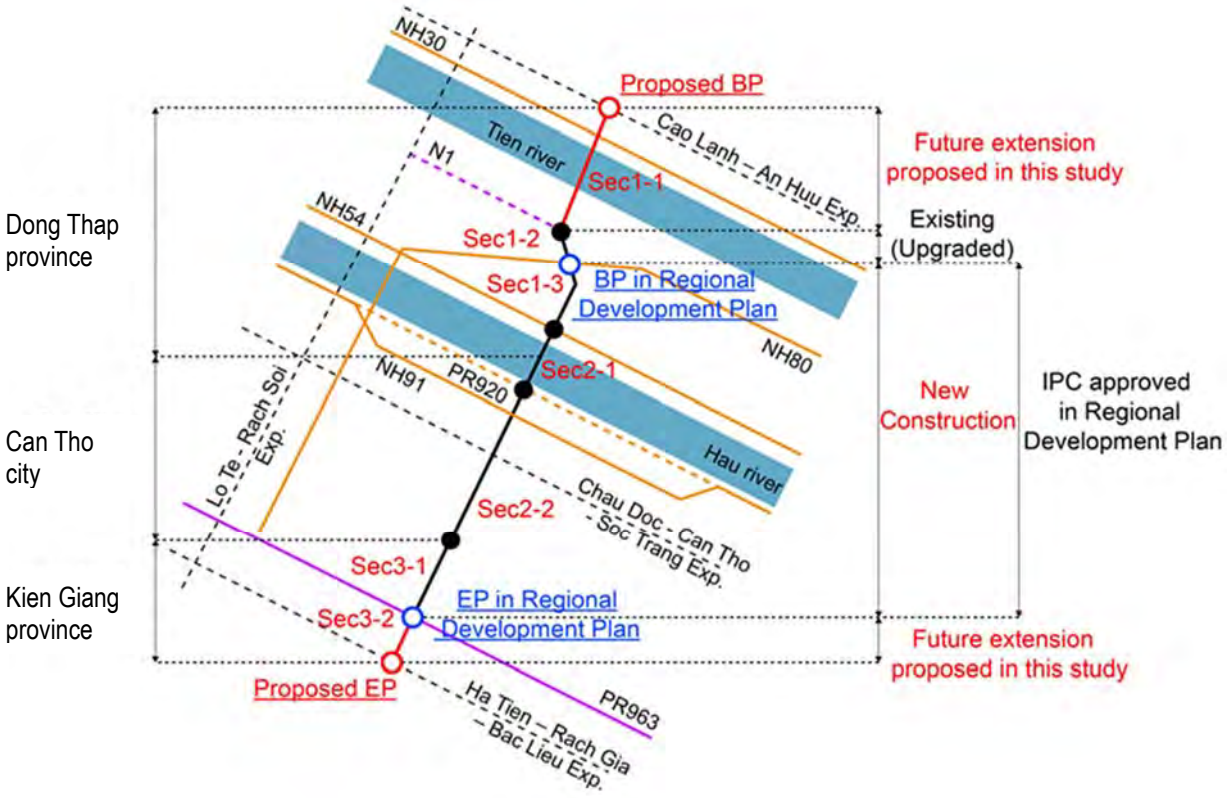
### (d) Section Boundary

On the selected route, the section arrangement was studied, as shown in Table 6.1.6 and the schematic image in Figure 6.1.3, considering the city and province boundaries. The section arrangement is based on the project proposals by each province and the proposal of extension sections by the Study Team.

**Table 6.1.6 Section Arrangement of IPC**

| City / Province | Section | Length (km) | | Section | | Remarks |
|---|---|---|---|---|---|---|
| | | | | BP | EP | |
| Dong Thap | 1-1 | 8.44 | 29.38 | Cao Lanh – An Huu Exp. | Intersection at N1 | This section is expected as future extension including Sa Dec Bridge<br>One stage: 4-lanes construction |
| | 1-2 | 5.87 | | Intersection at N1 | Intersection at NH80 | Coinciding/utilizing DT853B |
| | 1-3 | 15.07 | | Intersection at NH80 | Intersection at NH54 | Initial: 2-lanes<br>Ultimate: 4-lanes |
| Can Tho | 2-1 | 3.43 | 30.63 | Intersection at NH54 (in Dong Thanp) | Intersection at PR920 (planned road) | O Mon bridge section<br>One stage: 4-lanes construction |
| | 2-2 | 27.20 | | Intersection at PR920 (planned road) | Boundary between Can Tho and Kien Giang | Initial: 2-lanes<br>Ultimate: 4-lanes |
| Kien Giang | 3-1 | 16.07 | 20.34 | Boundary between Can Tho & Kien Giang | PR963 | Initial: 2-lanes<br>Ultimate: 4-lanes |
| | 3-2 | 4.27 | | PR963 | Ha Tien – Rach Gia – Bac Lieu Exp. | This section is expected as future extension<br>Initial: 2-lanes<br>Ultimate: 4-lanes |

Source: The Study Team




Source: The Study Team

**Figure 6.1.3 Section Arrangement of IPC**

### 2) Can Tho Road Section

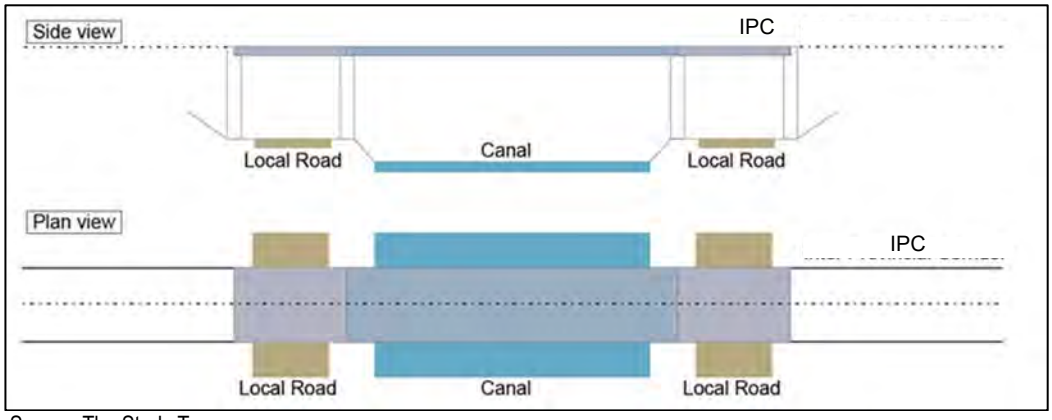
The outline of the target project, “Can Tho road section,” was studied furthermore than other sections, especially the medium and small bridge plans, cost estimate and O&M plan for draft Pre-F/S, and JICA’s review.

#### (a) Bridge Plan (Medium and Small Bridges)

Many canals with local roads were identified on the whole route of the IPC. In total, 41 medium and small bridges were planned for crossing the canals and local roads in the Can Tho road section.

The planning policy for medium and small bridges is summarized below.

- As much as possible, the alignment is designed to be straight to shorten travel time as a high-standard road, for better drivability, and traffic safety. Although many medium and small bridges are needed on the route for passing over canals and local roads, the alignment was not adjusted for improving the skew of the IPC and cross objects (structures/rivers).
- Typical girder type, usually used in Vietnam (slab girder, PC-I girder, etc.), is adopted in the planning of medium and small bridges.
- For crossing a road, the required clearance shall be considered in accordance with the Vietnamese standard (TCVN 10380:2014).
- For crossing a canal, the required navigation clearance shall be considered in accordance with the Vietnamese standard (TCVN 5664:2009).
- To pass over local roads running along a canal, firstly one bridge overpassing together with the canal is considered (refer to Figure 6.1.4). If the bridge span on the local road is smaller than “12.5 m,” a box-culvert type bridge abutment was planned on the local road.




Source: The Study Team

**Figure 6.1.4 Typical Image of Overpassing a Canal and Local Roads**

With reference to the policy above, the preliminary bridge plan was studied based on the site conditions at every crossing point. However, in this preliminary study, obtainable information for bridge planning was limited. Widths of canals and roads were identified only on Google Earth. Based on the information, the medium and small bridges on the Can Tho road section were studied referring to the existing bridge plan in Kien Giang Province (referring to Letter 864/UBND-KT, only Kien Giang province has a bridge plan on IPC). The list of medium and small bridges is shown in Table 6.1.7.

Table 6.1.7 List of Medium and Small Bridges (Can Tho Road Section)[1]

| No. | STA. | Width of Canal & Road (m)*1 | Canal Navigation Clearance*2 | Bridge Length (m) (Span Arrangement) |
|---|---|---|---|---|
| 1 | KM 18+300 | 3+12+3 | 10x3 | 32.5 (24.5) |
| 2 | KM 18+500 | 3+12+3 | 10x3 | 57.5 (12.5+24.5+12.5) |
| 3 | KM 18+865 | 3+15+3 | 10x3 | 57.5 (12.5+24.5+12.5) |
| 4 | KM 19+597 | 3+15+3 | 10x3 | 51.6 (12.5+18.6+12.5) |
| 5 | KM 19+725 | 3+12+3 | 10x3 | 32.5 (24.5) |
| 6 | KM 20+192 | 3+15+3 | 10x3 | 42.5 (BA*4+24.5+BA) |
| 7 | KM 21+275 | 7.5+30+7.5 | 15x4 | 57.5 (12.5+24.5+12.5) |
| 8 | KM 22+080 | 5+25+5 | 10x3 | 51.6 (12.5+18.6+12.5) |
| 9 | KM 22+658 | 3+15+3 | 10x3 | 32.5 (24.5) |
| 10 | KM 22+938 | 5+20+5 | 10x3 | 51.6 (12.5+18.6+12.5) |
| 11 | KM 23+435 | 0+32+9 | 25x6 | 90 (24.5+33+24.5) |
| 12 | KM 25+600 | 5+25+5 | 10x3 | 57.5 (12.5+24.5+12.5) |
| 13 | KM 28+550 | 3+25+3 | 10x3 | 51.6 (12.5+18.6+12.5) |
| 14 | KM 28+748 | 3+15+3 | 10x3 | 51.6 (12.5+18.6+12.5) |
| 15 | KM 29+658 | 3+20+3 | 10x3 | 42.5 (BA+24.5+BA) |
| 16 | KM 29+960 | 3+15+3 | 10x3 | 36.6 (BA+18.6+BA) |
| 17 | KM 30+475 | 4+25+4 | 10x3 | 57.5 (12.5+24.5+12.5) |
| 18 | KM 31+052 | 3+15+3 | 10x3 | 36.6 (BA+18.6+BA) |
| 19 | KM 31+447 | 3+15+3 | 10x3 | 36.6 (BA+18.6+BA) |
| 20 | KM 31+620 | 3+15+3 | 10x3 | 36.6 (BA+18.6+BA) |
| 21 | KM 31+972 | 3+12+3 | 10x3 | 36.6 (BA+18.6+BA) |
| 22 | KM 32+440 | 3+20+3 | 10x3 | 57.5 (12.5+24.5+12.5) |
| 23 | KM 33+015 | 3+15+3 | 10x3 | 36.6 (BA+18.6+BA) |
| 24 | KM 33+126 | 3+11+3 | 10x3*3 | 32.5 (24.5) |
| 25 | KM 33+820 | 5+35+5 | 25x6 | 90 (24.5+33+24.5) |
| 26 | KM 34+170 | 3+12+3 | 10x3 | 42.5 (BA+24.5+BA) |
| 27 | KM 34+755 | 3+12+3 | 10x3 | 42.5 (BA+24.5+BA) |
| 28 | KM 35+064 | 3+12+3 | 10x3 | 42.5 (BA+24.5+BA) |
| 29 | KM 35+732 | 3+15+3 | 10x3 | 51 (BA+33+BA) |
| 30 | KM 36+030 | 3+25+3 | 10x3 | 90 (24.5+33+24.5) |
| 31 | KM 39+155 | 0+12+0 | 10x3 | 41 (33) |
| 32 | KM 40+247 | 0+12+0 | 10x3 | 41 (33) |
| 33 | KM 40+883 | 5+45+5 | 15x4 | 107 (3x33) |
| 34 | KM 41+500 | 3+15+3 | 10x3 | 42.5 (BA+24.5+BA) |
| 35 | KM 42+088 | 3+15+3 | 10x3 | 68 (33+33) |
| 36 | KM 42+765 | 3+25+3 | 15x4 | 51.6 (12.5+18.6+12.5) |
| 37 | KM 43+380 | 3+15+3 | 10x3 | 32.5 (24.5) |
| 38 | KM 43+870 | 3+15+3 | 10x3 | 32.5 (24.5) |
| 39 | KM 44+447 | 3+20+3 | 10x3 | 42.5 (BA+24.5+BA) |
| 40 | KM 45+088 | 3+15+3 | 10x3 | 32.5 (24.5) |
| 41 | KM 45+762 | 3+22+3 | 10x3 | 63.8 (18.6+18.6+18.6) |

Note: *1 Widths of canal and road were measured on Google Earth map
*2 Canal navigation clearance was assumed based on the standard TCVN 5664:2009
*3 Canal width seems almost equal or shorter than minimum navigation clearance (class VI: 10x3). There is possibility the assumed clearance is out of the standard TCVN 5664:2009
*4: BA: Box culvert type bridge abutment
Source: The Study Team

### (b) Project Cost Estimate

**[Time of Cost Estimate]**

The cost estimate was conducted at the end of August 2022.

[1] This list is just reference of the JICA study team result. In the updated Project Proposal (Document No.13 dated Feb 20, 2023) the number of bridges have been updated to “30 works crossing rivers including 25 bridges, 5 viaducts”. For furthermore study from this preliminary study, this list need to be updated based on the latest Project Proposal accordingly.

**[Composition of Initial Investment Cost]**

The structure of the initial investment cost is applied according to:

- the provisions of Decree 10/2021/ND-CP dated 9 February 2021, the management of construction investment costs, and
- Circular No. 11/2021/TT-BXD dated 31 August 2021, of the Ministry of Construction guiding the determination and management of construction investment costs.

**[Composed Items and Applied Method/Calculation]**

The applied methods and calculation are listed in Table 6.1.8.

**Table 6.1.8 The Applied Method and Calculation of Each Investment Cost Items**

| Item | | Applied Method/Calculation |
|---|---|---|
| 1. Compensation, support, and resettlement costs | | • Based on the general regulations of each locality where the project is located<br>• Separately calculated based on the classification of stage construction |
| 2. Construction cost | | • The method of calculating quantity and unit price of construction works<br>• Unit prices are determined according to the norm*1 and applied investment rate of other similar projects |
| 3. Cost of project management, cost of construction investment consultancy, and other costs | | • Calculated 15% of construction cost |
| 4.Contingency expenses | 4.1 Physical contingency | • Calculated 10% (Kps) of the subtotal amount of (1+2+3)<br>• Tentatively calculated with this rate depending on the complexity of the works of a project and geological conditions of the construction site |
| | 4.2 Price contingency | • Calculated in reference to a construction period according to a project implementation plan and average price escalation of the last 5 years in the project area at least*2. |
| 5. Tax, VAT | | • 10% of (2+3+4) is calculated as VAT |

Note: *1 Basis of the norm is the "the construction work investment unit cost and the general construction price of structural parts in 2021, No. 610/QD-BXD by MOC dated 13 July 2022."

*2 In accordance with the guidance in Circular No. 11/2021/TT-BXD dated 31 August 2021.

Source: The Study Team

**[Result of Cost Estimate]**

The result of the cost estimation of the initial investment cost of the Can Tho road section is shown in Table 6.1.9 (as a reference, the ultimate stage: the 4-lane cost is also shown). Based on rough comparison, the estimated investment cost in Project Proposal (No.3474 /TTr-SGTVT, Dec. 2, 2022, Project1, Initial 4-lanes) is not much different from JST estimation. Details of the cost estimate by JST are in Table 6.1.10 and Table 6.1.11.

* The Project proposal has been updated as "Document No. 13/ TT dated 20/02/2023". Therefore, this cost estimate is just reference of JICA Study team result. The latest total investment cost shall be referred to the latest Project proposal.

## Table 6.1.9 Initial Investment Cost (Can Tho Road Section)

Unit: Billion VND

| Estimation by JST | | | | Project Proposal No. 3474/TTr-SGTVT | Difference |
|---|---|---|---|---|---|
| Item | (1) Initial | (2) Ultimate | (3) Total (1+2) | (4) Total | (5) Total (4-3) |
| 1. Compensation, supports and re-settlement | 457.78 | 387.44 | **845.21** | **998.10** | **152.89** |
| 2. Construction cost | 1,646.20 | 1,205.31 | **2,851.51** | **2,913.00** | **61.49** |
| 2.1 Road section | 914.87 | 482.16 | **1,397.04** | - | - |
| 2.2 Bridge section | 731.33 | 541.51 | **1,272.84** | - | - |
| 2.3 Intersection Km 23+320 | - | 181.64 | **181.64** | - | - |
| 3. Project management cost,Construction investment consultancy cost, Others | 246.93 | 180.80 | **427.73** | **349.50** | **-78.23** |
| **Sub Total (1+2+3) (Excluded Contingencies)** | 2,350.91 | 1,773.54 | **4,124.45** | **4,260.60** | **136.15** |
| 4. Contingencies (4.1+4.2) | 347.29 | 262.00 | **609.28** | **489.40** | **-119.88** |
| 4.1 Physical Contingency | 235.09 | 177.35 | **412.45** | - | - |
| 4.2 Price Contingency | 112.20 | 84.64 | **196.84** | - | - |
| 5.Tax(10% VAT is considered for item 2,3,4) | 217.28 | 159.09 | **376.37** | **375.19 *calculated by JST** | **-1.18** |
| **Total Investment Cost (1+2+3+4+5)** | **2,915.48** | **2,194.62** | **5,110.10** | **5,125.19** | **15.09** |

Source: The Study Team

## Table 6.1.10 Quantity and Unit Rate of Road Section (Can Tho Road Section)

***Value-added Tax (VAT) Included** **Unit: VND**

| N0 | ITEM | Length (Km) | Quantities | | Unit price | | Amount | |
|---|---|---|---|---|---|---|---|---|
| | | | Initial Stage | Ultimate Stage | Initial Stage | Ultimate Stage | Initial Stage | Ultimate Stage |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8)=(4)*(6) | (9) =(5)*(7) |
| | **Section 2-2, [18+000 (at PR920) - 45+750 (boundary between Can Tho and Kien Giang)]** | **25.159** | 25.16Km | 25.16Km | 40,000,000,000 | 20,000,000,000 | 1,006,360,000,000 | 503,180,000,000 |

Source: The Study Team

## Table 6.1.11 Quantity and Unit Rate of Medium and Small Bridges (Can Tho Road Section)

***VAT Included** **Unit: VND**

| No, | Name of bridge | Arrangement of span (m) | Lengh (m) | Width (m) | | Quantities (m2) | | Unit price | | Amount | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Initial Stage | Ultimate Stage | Initial Stage | Ultimate Stage | Initial Stage | Ultimate Stage | Initial Stage | Ultimate Stage |
| (1) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12)=(8)*(10) | (13)=(9)*(11) |
| 1 | Kenh 1 | 24.5 | 32.5 | 12 | 20.5 | 390 | 276.25 | 34,000,000 | 35,500,000 | 13,249,891,200 | 9,806,875,000 |
| 2 | Kenh 2 | 12,5+24,5+12,5 | 57.5 | 12 | 20.5 | 690 | 488.75 | 29,000,000 | 30,500,000 | 20,208,720,000 | 14,906,875,000 |
| 3 | Kenh 3 | 12,5+24,5+12,5 | 57.5 | 12 | 20.5 | 690 | 488.75 | 29,000,000 | 30,500,000 | 20,208,720,000 | 14,906,875,000 |
| 4 | Kenh 3a | 12,5+18,6+12,5 | 51.6 | 12 | 20.5 | 619.2 | 438.6 | 29,000,000 | 30,500,000 | 18,135,129,600 | 13,377,300,000 |
| 5 | Kenh 4 | 24.5 | 32.5 | 12 | 20.5 | 390 | 276.25 | 34,000,000 | 35,500,000 | 13,249,891,200 | 9,806,875,000 |
| 6 | Kenh 5 | BA+24,5+BA | 42.5 | 12 | 20.5 | 510 | 361.25 | 34,000,000 | 35,500,000 | 17,326,780,800 | 12,824,375,000 |
| 7 | Muong Khai 1 | 12,5+24,5+12,5 | 57.5 | 12 | 20.5 | 690 | 488.75 | 29,000,000 | 30,500,000 | 20,208,720,000 | 14,906,875,000 |
| 8 | Muong Khai 2 | 12,5+18,6+12,5 | 51.6 | 12 | 20.5 | 619.2 | 438.6 | 29,000,000 | 30,500,000 | 18,135,129,600 | 13,377,300,000 |
| 9 | Kenh 5a | 24.5 | 32.5 | 12 | 20.5 | 390 | 276.25 | 34,000,000 | 35,500,000 | 13,249,891,200 | 9,806,875,000 |
| 10 | Rach Phe | 12,5+18,6+12,5 | 51.6 | 12 | 20.5 | 619.2 | 438.6 | 29,000,000 | 30,500,000 | 18,135,129,600 | 13,377,300,000 |
| 11 | Vien Lua-QL91 | 24,5+33+24,5 | 90.0 | 12 | 20.5 | 1080 | 765 | 38,000,000 | 39,500,000 | 40,602,868,186 | 30,217,500,000 |
| 12 | Vien Lua | 12,5+24,5+12,5 | 57.5 | 12 | 20.5 | 690 | 488.75 | 29,000,000 | 30,500,000 | 20,208,720,000 | 14,906,875,000 |
| 13 | Kenh 6 | 12,5+18,6+12,5 | 51.6 | 12 | 20.5 | 619.2 | 438.6 | 29,000,000 | 30,500,000 | 18,135,129,600 | 13,377,300,000 |
| 14 | Kenh 6a | 12,5+18,6+12,5 | 51.6 | 12 | 20.5 | 619.2 | 438.6 | 29,000,000 | 30,500,000 | 18,135,129,600 | 13,377,300,000 |
| 15 | Kenh 7 | BA+24,5+BA | 42.5 | 12 | 20.5 | 510 | 361.25 | 34,000,000 | 35,500,000 | 17,326,780,800 | 12,824,375,000 |
| 16 | Kenh 8 | BA+18,6+BA | 36.6 | 12 | 20.5 | 439.2 | 311.1 | 29,000,000 | 30,500,000 | 12,863,289,600 | 9,488,550,000 |
| 17 | Nha Tho | 12,5+24,5+12,5 | 57.5 | 12 | 20.5 | 690 | 488.75 | 29,000,000 | 30,500,000 | 20,208,720,000 | 14,906,875,000 |
| 18 | Xeo Cong | BA+18,6+BA | 36.6 | 12 | 20.5 | 439.2 | 311.1 | 29,000,000 | 30,500,000 | 12,863,289,600 | 9,488,550,000 |
| 19 | Moc Quan | BA+18,6+BA | 36.6 | 12 | 20.5 | 439.2 | 311.1 | 29,000,000 | 30,500,000 | 12,863,289,600 | 9,488,550,000 |
| 20 | Ta Luot | BA+18,6+BA | 36.6 | 12 | 20.5 | 439.2 | 311.1 | 29,000,000 | 30,500,000 | 12,863,289,600 | 9,488,550,000 |
| 21 | Cay Bun | BA+18,6+BA | 36.6 | 12 | 20.5 | 439.2 | 311.1 | 29,000,000 | 30,500,000 | 12,863,289,600 | 9,488,550,000 |
| 22 | Luong Duong | 12,5+24,5+12,5 | 57.5 | 12 | 20.5 | 690 | 488.75 | 29,000,000 | 30,500,000 | 20,208,720,000 | 14,906,875,000 |
| 23 | Kenh 9 | BA+18,6+BA | 36.6 | 12 | 20.5 | 439.2 | 311.1 | 29,000,000 | 30,500,000 | 12,863,289,600 | 9,488,550,000 |
| 24 | Kenh 9a | 24.5 | 32.5 | 12 | 20.5 | 390 | 276.25 | 34,000,000 | 35,500,000 | 13,249,891,200 | 9,806,875,000 |
| 25 | Kenh Dung | 24,5+33+24,5 | 90.0 | 12 | 20.5 | 1080 | 765 | 38,000,000 | 39,500,000 | 40,602,868,186 | 30,217,500,000 |
| 26 | Dong Hiep 1 | BA+24,5+BA | 42.5 | 12 | 20.5 | 510 | 361.25 | 34,000,000 | 35,500,000 | 17,326,780,800 | 12,824,375,000 |
| 27 | Dong Hiep 2 | BA+24,5+BA | 42.5 | 12 | 20.5 | 510 | 361.25 | 34,000,000 | 35,500,000 | 17,326,780,800 | 12,824,375,000 |
| 28 | Dong Hiep 3 | BA+24,5+BA | 42.5 | 12 | 20.5 | 510 | 361.25 | 34,000,000 | 35,500,000 | 17,326,780,800 | 12,824,375,000 |
| 29 | Dong Hiep 4 | BA+33+BA | 51.0 | 12 | 20.5 | 612 | 433.5 | 38,000,000 | 39,500,000 | 23,008,291,972 | 17,123,250,000 |
| 30 | Kenh 10 | 24,5+33+24,5 | 90.0 | 12 | 20.5 | 1080 | 765 | 38,000,000 | 39,500,000 | 40,602,868,186 | 30,217,500,000 |
| 31 | Kenh 11 | 33 | 41.0 | 12 | 20.5 | 492 | 348.5 | 38,000,000 | 39,500,000 | 18,496,862,173 | 13,765,750,000 |
| 32 | Kenh 12 | 33 | 41.0 | 12 | 20.5 | 492 | 348.5 | 38,000,000 | 39,500,000 | 18,496,862,173 | 13,765,750,000 |
| 33 | Kenh Ngang | 3x33 | 107.0 | 12 | 20.5 | 1284 | 909.5 | 38,000,000 | 39,500,000 | 48,272,298,843 | 35,925,250,000 |
| 34 | Kenh 13 | BA+24,5+BA | 42.5 | 12 | 20.5 | 510 | 361.25 | 34,000,000 | 35,500,000 | 17,326,780,800 | 12,824,375,000 |
| 35 | Kenh 14 | 33+33 | 68.0 | 12 | 20.5 | 816 | 578 | 38,000,000 | 39,500,000 | 30,677,722,629 | 22,831,000,000 |
| 36 | Kenh 15 | 12,5+18,6+12,5 | 51.6 | 12 | 20.5 | 619.2 | 438.6 | 29,000,000 | 30,500,000 | 18,135,129,600 | 13,377,300,000 |
| 37 | Kenh 16 | 24.5 | 32.5 | 12 | 20.5 | 390 | 276.25 | 34,000,000 | 35,500,000 | 13,249,891,200 | 9,806,875,000 |
| 38 | Kenh 17 | 24.5 | 32.5 | 12 | 20.5 | 390 | 276.25 | 34,000,000 | 35,500,000 | 13,249,891,200 | 9,806,875,000 |
| 39 | Kenh 18 | BA+24,5+BA | 42.5 | 12 | 20.5 | 510 | 361.25 | 34,000,000 | 35,500,000 | 17,326,780,800 | 12,824,375,000 |
| 40 | Kenh 19 | 24.5 | 32.5 | 12 | 20.5 | 390 | 276.25 | 34,000,000 | 35,500,000 | 13,249,891,200 | 9,806,875,000 |
| 41 | Kenh Ranh | 18,6+18,6+18,6 | 63.8 | 12 | 20.5 | 765.6 | 542.3 | 29,000,000 | 30,500,000 | 22,422,892,800 | 16,540,150,000 |
| | **TOTAL section 2,2** | | **2,041.0** | | | | | | | **804,463,074,348** | **595,658,750,000** |

Source: The Study Team

### (c) O&M Plan and Cost

The O&M plan and cost are important factor for evaluation of a project from the viewpoints of technical and financial aspects, especially by ODA partner side. ODA partner concerns sustainability of services quality after operation start. In this subsection, the O&M plan and cost are summarized based on provided information (including actual budget in recent years) from each organization, and the regulations.

**[Applicable Standards and Regulations]**

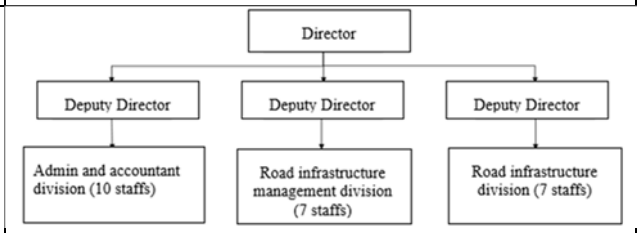
- [TCCS 07:2013/TCBVN] Technical standards for regular road maintenance
- [Circular No.37/2018/TT-BGTVT] Regulations on Management, Operation and Maintenance of Road Construction Works, Circular No. 41/2021/TT-BGTVT on Amendments to Circular No. 37/2018/TT-BGTVT.

**[Information of Managing Organization]**

The collected information to evaluate the capability of the organization is summarized in Table 6.1.12.

Based on the collected information, the “Road and Waterway Management Section under Can Tho DOT” was evaluated as having sufficient experience (handling similar road structures of the same type as the target project) and capability from technical and financial viewpoints.

**Table 6.1.12 Collected information about O&M(Can Tho Road Section)**

| Item | Description | Remark |
|---|---|---|
| O&M Operator/ Administrator | Road and Waterway Management Section under Can Tho DOT | |
| Establishment | Established in 1996 | |
| Structure of the Organization | Total personnel is 28 people, including 1 Director, 3 Deputy Director, 14 technicians, 10 office staffs |  |
| Budget | About 80 billion VND/year | For 156 km road and 85,1 km waterway |
| Maintenance Works | Manage following subcontracted works:<br>● Routine maintenance, inspection works<br>● Clearing obstacles and regulating traffic<br>● Repair works (periodic and big repair) | |
| Maintained Infrastructure | ● Bridge, road (155,96 km)<br>● Waterway (85,10 km) | ● Specifically major provincial roads and NH.91, Quang Trung bridges, Cai Rang bridge.<br>● Ba Lang river, Phong Dien canal (Can Tho river); Cau Nhiem canal; Tra Noc river; Thot Not canal; Xang O Mon canal (Ba Dam canal). It is expected that 52,35 km will be added for management in 2023 including KH8 canal, Bon Tong canal, Dung canal. |

Source: The Study Team

**[O&M Cost]**

The O&M cost was estimated for economic analysis, JICA review, and appropriate budget allocation of Can Tho DOT during the project period, as follows, in accordance with the relevant standards and collected information.

**Table 6.1.13 Cost Estimate of O&M Cost (Can Tho Road Section)**

| Item | Applied Value / Rates for 27.2km in Can Tho | Reference |
|---|---|---|
| Project Period | 30 years | Project proposals |
| Routine maintenance work | ● Initial 2-lanes: 84.3 million VND / km * 27.2 km = 2,293 million VND/year<br>● Ultimate: 4-lanes: 168.6 million VND / km * 27.2 km = 4,587 million VND/year | According to norms, each city / province estimated |
| Periodic repair work (including repair work due to settlement) | ● Initial 2-lanes: 4,000 million VND/year<br>● Ultimate: 4-lanes: 80,000 million VND/year | Collected recent 3 years actual cost from Can Tho City (15 billion VND/year for NH61C: 10.2km in Can Tho for 2-lanes) |
| Big repairment work (Every 15 years, big pavement repairment work is planned as 42 % of original asphalt pavement) | ● Iniitial 2-lanes: 6,014 million VND / km * 27.2 km = 164,000 million VND<br>● Ultimate: 4-lanes: 12,028 million VND / km * 27.2 km = 328,000 million VND | No.37/2018/TT-BGTVT<br>*Unit rate of asphalt pavement: 14,320 million VND / km * 42 % = 6,014.4 million VND / km |

Source: The Study Team

## Table 6.1.14 Estimated O&M Cost (Can Tho Road Section)

| | Can Tho | | |
|---|---|---|---|
| IPC | Length | | 27.2 km |
| | Routine maintenance | Periodic repair work | Big repairment work |
| | 84 mil.VND/km/year | 40000mil. VND for 27.2km | 6014mil. VND/km for 2-lanes |

Unit: million VND

| | | Year | Routine maintenance | Periodic repair work | Big repairment work |
|---|---|---|---|---|---|
| | | 2022 | | | |
| | | 2023 | | | |
| | | 2024 | | | |
| | | 2025 | | | |
| | | 2026 | | | |
| | | 2027 | | | |
| Initial 2-lanes | 1 | 2028 | 2,293 | 40,000 | |
| | 2 | 2029 | 2,293 | 40,000 | |
| | 3 | 2030 | 2,293 | 40,000 | |
| | 4 | 2031 | 2,293 | 40,000 | |
| | 5 | 2032 | 2,293 | 40,000 | |
| | 6 | 2033 | 2,293 | 40,000 | |
| | 7 | 2034 | 2,293 | 40,000 | |
| | 8 | 2035 | 2,293 | 40,000 | |
| | 9 | 2036 | 2,293 | 40,000 | |
| | 10 | 2037 | 2,293 | 40,000 | |
| | 11 | 2038 | 2,293 | 40,000 | |
| | 12 | 2039 | 2,293 | 40,000 | |
| | 13 | 2040 | 2,293 | 40,000 | |
| | 14 | 2041 | 2,293 | 40,000 | |
| Widening to 4-lanes<br>All of work cost is<br>double of 2-lanes | 15 | 2042 | 4,587 | 80,000 | 164,000 |
| | 16 | 2043 | 4,587 | 80,000 | |
| | 17 | 2044 | 4,587 | 80,000 | |
| | 18 | 2045 | 4,587 | 80,000 | |
| | 19 | 2046 | 4,587 | 80,000 | |
| | 20 | 2047 | 4,587 | 80,000 | |
| | 21 | 2048 | 4,587 | 80,000 | |
| | 22 | 2049 | 4,587 | 80,000 | |
| | 23 | 2050 | 4,587 | 80,000 | |
| | 24 | 2051 | 4,587 | 80,000 | |
| | 25 | 2052 | 4,587 | 80,000 | |
| | 26 | 2053 | 4,587 | 80,000 | |
| | 27 | 2054 | 4,587 | 80,000 | |
| | 28 | 2055 | 4,587 | 80,000 | |
| | 29 | 2056 | 4,587 | 80,000 | |
| | 30 | 2057 | 4,587 | 80,000 | 328,000 |

Source: The Study Team based on information from Can Tho DOT

### 6.1.3. Clarification of Underprepared Draft Pre-F/S

Based on the preliminary study, Can Tho DOT would prepare and provide a draft Pre-F/S with the Study Team until the end of December 2022 for review. However, the following situation was confirmed with Can Tho DOT in January 2023:

- The lane number was changed to “initially 4-lanes” from “initial 2-lanes, ultimate 4-lanes.”
- Draft Pre-F/S was still under preparation.

Therefore, these actions were taken by the Study Team instead of the draft Pre-F/S review:

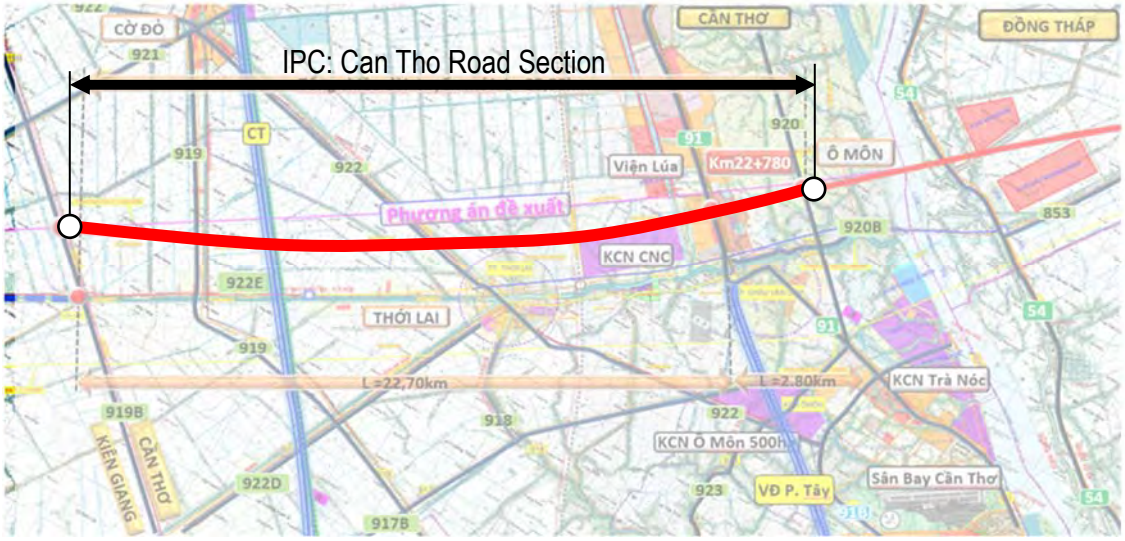
- Clarification of changed contents in draft Pre-F/S under preparation.
- Comments on preparing draft Pre-F/S’s contents, which the Study Team clarified by referring to the preliminary study even though the study condition is different.

#### 1) The Changes in the Current Project Contents

Major changes in the current project proposal are described as follows:

**[Route Alignment]**

The whole route alignment has been modified and studied by the Dong Thap Province in cooperation with other provinces. The route of the target project (Can Tho road section) seems to have not changed based on the information gathered from the meeting. The current shown route is as follows:




Source: The Study Team edited the presentation material from the meeting on 17 January 2023.

**Figure 6.1.5 Current Route Plan of Can Tho Road Section**

**[Lane Number]**

The major change in the current proposal is the lane number from “initial 2-lanes, ultimate 4-lanes” to “initial 4-lanes.” The cross section is shown in the current project proposal as follows:


Source: The Revised Project Proposal, Ref.: 3474 /TTr-SGTVT, 2 December 2022

**Figure 6.1.6 Proposed Cross-section in the Current Project Proposal**

**[Interchanges and Intersections]**

In the preliminary study, the tentative plan of “interchanges and intersections” was proposed with the condition of “initial (2-lanes) and ultimate stage (4-lanes).” In the current project proposal, the plan for “interchanges and intersections” was not mentioned. The plan/design shall be scrutinized in the Pre-F/S because the appraisal of the loan project will be conducted/ justified based on Pre-F/S.

In the case of “initial 4-lanes construction,” the technical and financial justification of plan/design (e.g., grade-separated or not, connectivity from the roadside, and so on) of interchanges and intersections is necessary because the plan cannot be changed in the future due to the 4-lanes construction at the initial stage. It is difficult to change or add the structure for a 4-lane road.

The policy of road connection by intersection shall be clarified. For planning and designing intersections, technically type of intersection shall be justified depending on the traffic demand forecast and planed class of crossing road.

### 2) Clarification of Draft Pre-F/S Contents with DOT

As the basis of the clarification, the contents/components have been changed from the preliminary study above. The draft Pre-F/S contents (changed points and the application referring to JICA study team inputs) were confirmed before the completion of the draft Pre-F/S instead of its review.

The clarified points were separated into two parts.

- Firstly, the changed contents were clarified and commented on from technical viewpoints.
- Apart from the changes, the draft Pre-F/S contents under preparation were confirmed by referring to the study result of the preliminary study.

Therefore, two points are mainly clarified to Can Tho City:

- Clarification of the addition and adjustment of components and the reasons
- Clarification of the status of draft pre-f/s concerning the pre-input points by the Study Team

The next tables show the summarized correspondence between Can Tho City and the Study Team regarding the two clarified points.

**Table 6.1.15 Clarification of Addition and Adjustment of Component and the Reasons**

| | Item | Addition and Adjustment | Clarification or Important Points to be Noticed | Reply by Can Tho city | Comments by JICA Study Team |
|---|---|---|---|---|---|
| A | Lane Numbers | Change to 4 lanes from 2-lanes in Can Tho Road Section at initial construction stage | - This decision was made depending on traffic demand forecast?<br>- Other provinces keep stage-construction, initial 2-lanes, ultimate: 4-lanes? | (1) According to the planning orientation of the Mekong Delta in the period of 2021-2030, the vision to 2050 approved in Decision No. 287/QD-TTg dated February 28, 2022 of the Prime Minister.<br>(2) According to the infrastructure development orientation of Can Tho city in the period of 2021-2030, with a vision to 2050, which is under submission for approval.<br>The inter-regional (inter-provincial) road is planned with 4 lanes; In the next step, a survey and traffic demand forecast will be conducted to confirm the investment scale. | - Next step means in Pre-F/S? Plan/design shall be scrutinized in the Pre-F/S, because appraisal of loan project will be conducted/ justified based on Pre-F/S. While having traffic demand forecast in the next step, it is important to set other province's lane-numbers. Need to coordinate/adjust with other provinces<br>- Initially 4-lanes is understandable. How about future plan? More lanes are planned? In item B below, Can Tho city road section will be widened to 6-lanes having consistency with O Mon bridge? |
| B | | O Mon bridge is 4 lanes + 3.0m bike Lane at both Sides | The total width of O Mon bridge is wider than other sections. In future, 6-lanes carriageway operation is preferred / desired? | (1) The width of O Mon bridge is planned to ensure 4 lanes for motorized vehicles and 2 lanes for nonmotorized vehicles corresponding to the number of lanes of approach road to the bridge. To ensure traffic safety on the bridge, it is required to arrange a hard median between motorized and non-motorized lane, so the total width of the bridge is larger than other sections.<br>(2) Since O Mon bridge is a large bridge with complicated structure, future expansion of the bridge is impossible; However, with the width of the bridge between the two outer railing edges of 24.5m, it is possible to reorganize the traffic to ensure the operation of 6 motorized lanes | Study team understand that it is difficult to expand lane-number on large-scale bridge. |
| C | BP/EP of Can Tho Road Section | 2.2 km longer than original plan | What is the difference of 2.2km from original plan? BP or EP of the road section was changed? | According to the original plan, the beginning point of the route connects with NH91.<br>Correct the EP of the route section, the starting point connects with provincial road 920 as planned, and it is also the connection point of O Mon bridge. The proposed route length is 25.5Km. | Study team understand that BP of road section is on PR920. |
| D | Route alignment | Entire route alignment | JICA study team got information that entire route alignment has been adjusted/revised by the consultant of Dong Thap province. Is there any update from Dong Thap? | The route alignment in the project proposal provided to the JICA study team is the agreed inter-regional alignment so far | Which is the latest alignment? Could you specify with plan view? Whole alignment which Dong Thap has been modified is preferred to be shared. |

| | Item | Addition and Adjustment | Clarification or Important Points to be Noticed | Reply by Can Tho city | Comments by JICA Study Team |
|---|---|---|---|---|---|
| E | Possibility of change in Pre-F/S | **All of items above** | These additional points were not technically studied by JICA. The possibility of changes in following stage (in Pre-F/S) after approval of project proposal want to be confirmed. | | As mentioned item E,F above, plan/design of some items shall be scrutinized in the Pre-F/S, because appraisal of loan project will be conducted/justified based on Pre-F/S. |

Source: The Study Team

**Table 6.1.16 Clarification of Current Status of Draft Pre-F/S with Respect to Pre-input Points by JICA Study Team**

| | Pre-Input Points | Description | Reply by Can Tho city about Pre-F/S | Comments by JICA Study Team |
|---|---|---|---|---|
| a | Unified Policies/ Functions/ Specifications through the Whole Route (Consistency among provinces) | All loan candidate routes, both of NH61C and IPC, are passing several city/provinces. As one route, the same level of service quality of road shall be provided on entire route.<br>Therefore, the important policies/ functions/ specifications, which directly affect service quality of road, shall be unified on entire route, such as measures against climate change as all-weather road, road surface height, and cross-sectional lane elements.<br>Items from c-j are unified among provinces? | Unified on the whole route | No objection |
| b | O&M Cost | As O&M cost, budget shall be kept, especially for repairing of road planed height due to settlement by soft soil. | Put in the project cost | Please include into O&M plan. As the policy of road operation, it is important to be included. |
| c | Road grade | National highway Grade III road – plain | Grade III Road- Plain | No objection |
| d | Design speed | V=80 km/h | V=80 km/h | No objection |
| e | Required Road Surface Height | Design water level is set at HWL (4%) as national highway structures as all-weather road, so appropriate sea-level rise shall be considered. Following set value is referred to the other projects in the MDR (with the scenario RCP4.5 by MONRE).<br>[Embankment section] After 25 years, the difference from HWL (4%) is 15 cm<br>[Bridge section] After 100 years, the difference from HWL (4%) is 46 cm | Road surface height takes appropriated sea-level rise into consideration. | No objection |
| f | Concept of access from roadside | IPC is classified “2: Partially controlled access road: New highway” as stated in Circular No. 39/2021/TT-BGTVT dated 31 Dec 2021. | No access from roadside | No objection.<br>Interchanges and intersections of IPC are planned for crossing/ connecting only arterial roads specified as either existing/ planning |

| | Pre-Input Points | Description | Reply by Can Tho city about Pre-F/S | Comments by JICA Study Team |
|---|---|---|---|---|
| | | | | expressway, national highway, or provincial road.<br>Interchanges are planned for connecting to expressways. Depending on the connecting road class, the concept of interchange and intersection is summarized in Table 8.4. |
| g | Interchange and Intersection | The concept of interchanges and intersections of IPC are planned for crossing/connecting only arterial roads specified as either existing/planning expressway, national highway, or provincial road.<br>Depending on the connecting road class, the concept of interchange and intersection is summarized in Appendix Table 2.4.and tentative plan is in Appendix Table & Figure 2.12 | Connect with Chau Doc – Can Tho-Soc Trang expressway by interchange and with other road in the route by intersections | In the preliminary study, the tentative plan of "interchanges and intersections" was proposed with the condition of "initial (2-lanes) and ultimate stage (4-lanes)". In the current project proposal, the plan of "interchanges and intersections" was not mentioned. Plan/design shall be scrutinized in the Pre-F/S, because appraisal of loan project will be conducted/ justified based on Pre-F/S.<br>In the case of "initial 4-lanes construction", technical and financial justification of plan/design (e.g. grade-separated or not, connectivity from roadside and so on) of interchanges and intersections is necessary, because the plan can not be changed future due to 4-lanes construction at the initial stage. It is difficult to change / add the structure for 4-lanes road.<br>The policy of road connection by intersection shall be clarified. For planning and designing intersections, technically type of intersection shall be justified depending on the traffic demand forecast and planed class of crossing road. |
| h | Concept of Connectivity with Roadside | The main access to the IPC is from interchanges/intersections. The optimum way of connection from roadside shall be by frontage roads with access points to the IPC at an interval (e.g., 2 km interval from an adjacent access point) as a partially controlled access road. The locality/ developer will consider arranging the frontage road system as roadside access when the urban/ industrial areas are planned. | Connection points will be planned; connection road will be added to the planned connection points when urban/Industrial areas are developed | No objection |
| i | Navigation Clearance | The required navigation clearance of the canal was considered for medium and small bridges, in accordance with standard TCVN 5664:2009. The HWL is assumed to be 5% for all medium and small bridges. | Navigation clearance shall comply with TCVN 5664:2009 | No objection<br>*Considering water-level rise due to climate change |
| j | Clearance of Roads | The clearance on crossroads were considered for the planning of medium and small bridges in accordance with related standards TCVN 5729:2012, TCVN 4054:2005, and TCVN 10380:2014 | Clearance of roads shall comply with Standard TCVN 5729:2012, TCVN 4054:2005 and TCVN 10380:2014 | No objection<br>*Considering water-level rise due to climate change |

Source: The Study Team

### 3) Project Cost and O&M Cost

**[Project Cost]**

In the current project proposal, in accordance with the component change (lane number: initial 4-lanes), the investment cost was changed.

In this study, only clarification of changes and throwing comments was conducted from technical viewpoints based on the revised project contents for IPC: Can Tho Road section. Can Tho DOT did not provide drawings and detailed cost estimate sheets with the draft Pre-F/S until the end of December 2022, so the review of the cost estimate was not conducted in this study.

**[O&M Cost]**

Under the component change (lane number: initial 4-lanes), the O&M cost was changed and updated accordingly. In the preliminary study, the condition was “initial 2-lanes, after 15 years ultimate 4-lanes.” In the updated cost, the condition is “initial 4-lanes.”

The unit rate was assumed to be the same as the preliminary study (4-lanes rates are double of 2-lanes).

**Table 6.1.17 Cost Estimate of O&M Cost (initial 4-lanes, Can Tho Road Section)**

| Item | Applied Value / Rates for 27.2km in Can Tho | Reference |
|---|---|---|
| Operation Period | 30 years | Project Proposals |
| Routine Maintenance Work | ● Initial: 4-lanes: 168.6 million VND / km * 27.2 km = 4,587 million VND/year | According to norms, each city and province estimated |
| Periodic Repair Work (including repair work due to settlement) | ● Initial: 4-lanes: 80,000 million VND/year | Collected recent 3 years actual cost from Can Tho City (15 billion VND/year for NH61C: 10.2km in Can Tho for 2-lanes) |
| Big Repairment Work (Every 15 years, big pavement repairment work is planned as 42 % of original asphalt pavement) | ● Ultimate: 4-lanes: 12,028 million VND / km * 27.2 km = 328,000 million VND | No. 37/2018/TT-BGTVT<br>*Unit rate of asphalt pavement: 14,320 million VND / km * 42 % = 6,014.4 million VND / km (for 2-lanes) |

Source: The Study Team

### Table 6.1.18 Estimated O&M Cost (Can Tho Road Section)

Unit: million VND

| Can Tho | | | |
|---|---|---|---|
| IPC | Length | | 27.2 km |
| | Routine maintenance | Periodic repair work | Big repairment work |
| | 169 mil.VND/km/year | 80000mil. VND for 27.2km | 12029mil. VND/km for 4-lanes |

| Year | | Routine maintenance | Periodic repair work | Periodic repair work |
|---|---|---|---|---|
| | 2022 | | | |
| | 2023 | | | |
| | 2024 | | | |
| | 2025 | | | |
| | 2026 | | | |
| | 2027 | | | |
| 1 | 2028 | 4,587 | 80,000 | |
| 2 | 2029 | 4,587 | 80,000 | |
| 3 | 2030 | 4,587 | 80,000 | |
| 4 | 2031 | 4,587 | 80,000 | |
| 5 | 2032 | 4,587 | 80,000 | |
| 6 | 2033 | 4,587 | 80,000 | |
| 7 | 2034 | 4,587 | 80,000 | |
| 8 | 2035 | 4,587 | 80,000 | |
| 9 | 2036 | 4,587 | 80,000 | |
| 10 | 2037 | 4,587 | 80,000 | |
| 11 | 2038 | 4,587 | 80,000 | |
| 12 | 2039 | 4,587 | 80,000 | |
| 13 | 2040 | 4,587 | 80,000 | |
| 14 | 2041 | 4,587 | 80,000 | |
| 15 | 2042 | 4,587 | 80,000 | 328,000 |
| 16 | 2043 | 4,587 | 80,000 | |
| 17 | 2044 | 4,587 | 80,000 | |
| 18 | 2045 | 4,587 | 80,000 | |
| 19 | 2046 | 4,587 | 80,000 | |
| 20 | 2047 | 4,587 | 80,000 | |
| 21 | 2048 | 4,587 | 80,000 | |
| 22 | 2049 | 4,587 | 80,000 | |
| 23 | 2050 | 4,587 | 80,000 | |
| 24 | 2051 | 4,587 | 80,000 | |
| 25 | 2052 | 4,587 | 80,000 | |
| 26 | 2053 | 4,587 | 80,000 | |
| 27 | 2054 | 4,587 | 80,000 | |
| 28 | 2055 | 4,587 | 80,000 | |
| 29 | 2056 | 4,587 | 80,000 | |
| 30 | 2057 | 4,587 | 80,000 | 328,000 |

Source: The Study Team based on information from Can Tho DOT

## 6.2. NH61C

### 6.2.1. Current Situations and Studying Range

NH61C has been designated to be upgraded and widened to 4-lanes before Decision No. 287/QDTTg dated 28 February 2022 (Mekong Delta Regional Development Plan). The status of the project preparation study by both Can Tho City and Hau Giang Province were as follows when the Study Team specified NH61C as the target project:

- [Can Tho City] No project preparation study was conducted.
- [Hau Giang Province] They have a draft Pre-F/S for “state budget,” but the project scheme has been changed to “applying DPO program as climate change adaption” and “applying Official Development Assistance (ODA) as JICA loan project.”

According to the status above, the Study Team was required to conduct a pre-input study to accelerate the preparation of draft pre-F/S from October to November 2022. As same as IPC, NH61C passes different cities and provinces, thus uniformity of important common policies/ specifications was necessary throughout the whole route. The result of this study was expected as a reference or basis of pre-F/S from the outstanding technical viewpoints for JICA’s review.

Both the city and provinces agreed with JICA that the draft pre-F/S was expected to be provided in December 2022 to be reviewed by the Study Team. However, the preparation status was different by city and province. Depending on the preparation status, actions by the Study Team were conducted.

**[Can Tho City]**

The following situation was confirmed with Can Tho DOT in January 2023:

- Draft Pre-F/S was still under preparation.
- Currently project proposal has been revised to change the type of 2-intersections as grade separated.

Therefore, these actions were taken by the Study Team instead of reviewing the draft Pre-F/S.

- Clarification of changed contents in draft Pre-F/S under preparation
- Comments on preparing draft Pre-F/S’s contents which the Study Team clarified by referring to the pre-input study even though the project component was changed.

**[Hau Giang Province]**

The draft Pre-F/S was provided in December 2022, and the review by the Study Team was conducted as planned with reference to the pre-input study.

**Table 6.2.1 Current Status of Project Preparation for ODA Project (NH61C)**

| Items \ City / Province | | Can Tho City | Hau Giang Province |
|---|---|---|---|
| | | The basis of Section 6.2.2 | |
| Project Proposal | Submit | [Already] No.2678/ UBND-XDDT 13 July 2022<br>As component1*1 | [Already]<br>No. 113/ TTr-UBND |
| | | The basis of Section 6.2.3.1)<br>[Revised to CPC by DOT]<br>Ref: 3474 /TTr-SGTVT, 2 December 2022, Project 1, component 1<br>Change the type of 2-intersections as grade separated: *1<br>- At BP of NH61C with crossing NH1A<br>- Interchange with the West Ring Road | |
| | Approval | [Not approved] | |
| Pre-FS | Proceeded draft Pre-F/S | [Proceeded]<br>Can Tho city has been preparing draft Pre-F/S | [Already]*2 The basis of Section 6.2.3.2) |
| | Provide to JICA | [Not submitted]<br>Draft Pre-FS will be provided at end of February | [Already] Provided on Dec.28, 2022 |

*1 Specified components of the **target project** are written in green color

*2 Apart from this draft Pre-F/S for ODA, draft pre-F/S for state budget project was prepared in the past.

Source: The Study Team

The action taken in this study was summarized as follows depending on the project preparation status of each city / province.

**Table 6.2.2 Study/Action in This Study Depending on Project Preparation Status**

| Outline | Contents in This Study | Project Proposal or Draft Pre-F/S as Basis | Description |
|---|---|---|---|
| **Section 6.2.2** (Can Tho city and Hau Giang province) | Pre-input Study | [Can Tho city]<br>No.2678/UBND-XDDT 13v July 2022<br>[Hau Giang province]<br>-No. 113/ TTr-UBND<br>-Draft pre-F/S prepared for state budget project | Not including the change of type of 2-intersections (in Can Tho City) |
| **Section 6.2.3 1) Can Tho Section** | Clarification of draft Pre-F/S Contents (Instead of Review of Draft Pre-F/S) | Ref: 3474 /TTr-SGTVT, 2 December 2022, Project1, component 1 | Including the change of type of 2-intersections |
| **Section 6.2.3. 2) Hau Giang Section** | Review of draft Pre-F/S | Draft Pre-F/S provided in December 2022 | Revised from "draft Pre-F/S for state budget project" |

Source: The Study Team

## 6.2.2. Pre-Input Study for Draft Pre-F/S of Loan Candidates

The Study Team was required to conduct the pre-input study to accelerate the preparation of draft Pre-F/S from October to November 2022. NH61C passes different cities and provinces; thus, uniformity of important common policies/ specifications was necessary throughout the whole route. The result of this study was expected as a reference or basis of the pre-F/S from outstanding technical viewpoints for JICA's review.

In this section, the result of the pre-input study conducted by the Study Team from October to November 2022 is shown as shared composition and contents to Can Tho City and Hau Giang Province. After the pre-input study by the Study Team, the project proposal has been revised to the type of 2-intersections as grade separated.

### 1) Background

As candidate projects for JICA's loan, "NH61C: Widening project: Can Tho city and Hau Giang Province" has been specified.

In this study, a review of the draft pre-F/S prepared by the city/province is required to review and formulate the projects. However, the progress of the draft pre-F/S being prepared is shown in Table 6.2.3 (at the time: October 2022). The draft pre-F/S was provided in December 2022 to be reviewed by the Study Team.

**Table 6.2.3 Status of Project Preparation as of October 2022**

| City / Province | | Can Tho City | Hau Giang Province |
|---|---|---|---|
| Items \ Route / Road | | NH61C | |
| Project Proposal | Submit | 【Already】<br>No.2678/ UBND-XDDT 13 July 2022<br>Component1 | 【Already】<br>No. 113/ TTr-UBND |
| | Approval | Not approved | |
| Pre-F/S | Proceeded draft Pre-F/S | Not proceeded | Not proceeded<br>* Draft pre-F/S for state budget project was prepared. However, it needs to be updated for DPO and ODA project supported by JICA |
| | Provide to JICA | Not provided | |

Source: The Study Team

### 2) Location of Candidate Projects

The locations of candidate project are shown in Figure 6.2.1.


Source: Edited by The Study Team based on the Prime Minister in Decision No. 1454/QĐ-TTg dated September 1, 2021

**Figure 6.2.1 Location of Candidate Projects**

### 3) Purpose of Pre-Input Study

According to the current project status, the Study Team conducted the pre-input/acceleration study for the preparation of draft pre-F/S and required procedures from October to December. 2022. The result of this study is expected as reference of the pre-F/S from the outstanding technical viewpoints.

### 4) Basis and Contents of Pre-Input Study

The study contents of the pre-input study are summarized in reference to the base study:

- For NH61C, the base study is the “draft pre-F/S as state budget project” in Hau Giang Province and the project proposal (at the time: October 2022).

**Table 6.2.4 Contents of Pre-Input Study referring to Base Study**

| Name of Study | **[Basis]** Draft Pre-F/S* and PJT proposal | Scope of This Pre-Input Study | |
|---|---|---|---|
| Province / City | Hau Giang | | Can Tho |
| Measures against Climate Change (Policies of Plan / Design) | **NO** | **YES** Need to be confirmed | Pre-input study will be conducted as same contents as Hau Giang province |
| Applicable Standards | YES | - | |
| Route Plan | YES | - | |
| Bridge Plan | YES | - | |
| Widening Method and Construction Plan | **NO** | **YES** Technical important points shall be studied | |
| O&M Plan and Cost | **NO** | **YES** Need O&M cost for Economic analysis | |
| Cost Estimate | YES | - | |

* Draft pre-F/S for state budget project
Source: The Study Team

### 5) Clarification of Pre-Input Study Conditions

#### (a) Expected Measures against Climate Change in Development Plan

The legal documents are as follows:

[Decision 1454 of the Prime Minister approving the Road Development Plan by 2030] NH61C is considered the main NH and is planned with 4 lanes.

[Decision No. 287 of the Prime Minister approving the Mekong Delta Region Master Plan, a, item 1, part VI] NH61C is prioritized for upgrade and improvement.

[Resolution No. 120 of the Government on the development of the Mekong Delta to adapt to climate change, 2. Viewpoints, c)] *“Respect natural laws and avoid violent interference with nature; select development models adaptive to natural conditions and friendly to the environment and develop sustainably with the motto “living with floods, brackish water and saltwater.”*

[Plan No. 209/KH-UBND, 17 December 2021, 4. Tasks to respond to climate change in the field and industry, d) Traffic field] *“Improve the resilience of the transport infrastructure; upgrading, renovating, land and waterway traffic works in flood and landslide areas.”*

[Decision No. 1725 of Hau Giang Province People's Committee on Transport Development Plan in Hau Giang Province] NH61C is planned with 4 lanes.

To implement Decision No. 1725, the province approved and implemented the project as in Decision No. 714, wherein Phase 1 includes 2 lanes and Phase 2 is 4 lanes.

[Decision No.3522/QD-UBND dated 24 November 2015 of Can Tho City People's Committee] This is a National Highway with a complete scale of 4 lanes with an embankment width of 23 m. Due to the difficulty in the capital, Phase 1 in 2012 had a cross section embankment width

of 11.5 m and a pavement width of 10 m. After nearly 10 years of operation, the road subsided at about 50 cm.

However, from these documents, measures against climate change in the road sector were not stipulated clearly. Therefore, in the meeting with localities on 8–9 November 2022, the Study Team showed and agreed on the understanding of how to adapt to climate change based on the abovementioned legal documents as follows:

- Surrounding NH61C, admit flood and inundation to the livelihood area (along the route)

  => Not resisted by dyke along the whole waterfront (not only along coastal but also river) and drainage system in the area

- Major roads will adapt to climate change as any active transportation system

  => Raise the planned height (PH) of the road as an “all-weather road”

**(b) The Role of NH61C (Policies of Plan/Design)**

Both Can Tho City / Hau Giang Province identified NH61C as “all-weather road against climate change.” Therefore, the appropriate PH of road shall be set as the condition.

**(c) Road Classification and Design Specifications**

As national highway class:*

- Road grade: Plain road grade III (TCVN 4054-2005)
- Design speed: V = 80 km/h

*Previously, the NH61C was planned to be upgraded to “expressway” class, but the Study Team confirmed that the road class will be kept as “national highway.”

**(d) Road Surface Height**

The designed high-water level (HWL) is set at 4% for the national highway structures. With this condition, climate change will be considered for widening lanes and existing lanes.

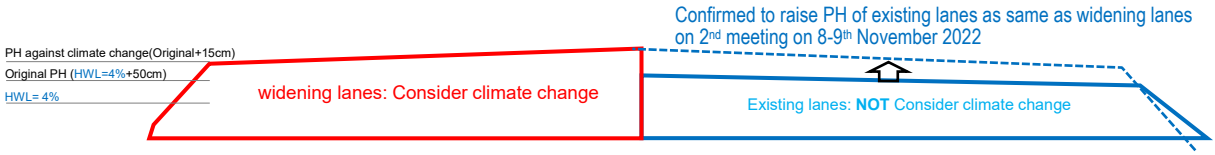
**(i) Widening Lanes**

PH of the road will be set as HWL = 4%,+ 25 years sea-level rise on RCP4.5 scenario (see Appendix2, 8.3.3.2) (b) Sea-level Rise Due to Climate Change). This is the probable scenario confirmed with Can Tho City and Hau Giang Province.

**(ii) Existing Lanes (Current Condition and Future Plan)**

The Study Team confirmed with Can Tho City and Hau Giang Province in the 1st meeting about the NO future plan of raising the PH of existing lanes as a measure against climate change. Even in the submitted PJT proposals, raising the PH was not included. However, as the same road with existing 2-lanes and widening 2-lanes, the difference in road surface height on the cross-section shall NOT occur for smooth and safe road operation and a measure against climate change (see Figure 6.2.2).

In the 2nd meeting with localities on 8–9 November 2022, the Study Team confirmed to raise the PH of existing lanes and include the construction cost in the PJT proposal.

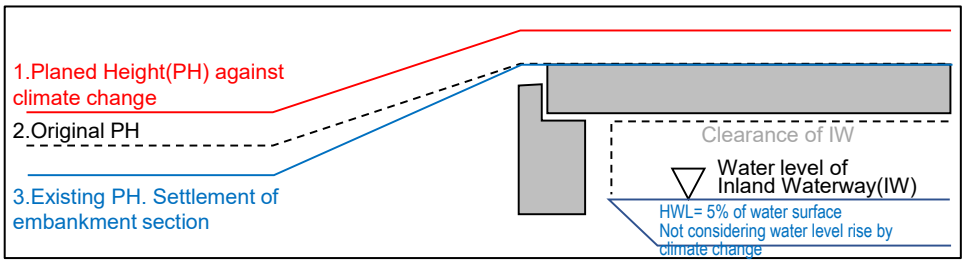



Source: The Study Team

**Figure 6.2.2 Cross-Sectional Image with Several Road Surface Heights on NH61C**

On the condition of the existing road surface height, the existing elevation has been settled due to residual consolidation on soft soil from the original PH on the embankment section (see Figure 6.2.3).

Therefore, based on the current conditions, the appropriate solution shall be studied, especially the PH of the bridge and embankment section. (A comparison of options is explained in (1) Study on Measures against Climate Change on Existing Lanes.)




Source: The Study Team

**Figure 6.2.3 Sideview Image of Current Condition of Existing Lane on NH61C**

### (e) Clearance

#### (i) Navigation Clearance (Inland Waterway under Bridges)

The required navigation clearance of the canal was considered for bridges in accordance with standard TCVN 5664:2009. Most of the bridges on NH61C are over canal class III–VI. The water level: H is assumed to be 5% for all bridges.

**Table 6.2.5 Navigation Clearance of Inland-waterway**

| Class | Dimension of waterways (for canal) | | Navigation clearance (for canal) | |
|---|---|---|---|---|
| | Depth (m) | Width (m) | Width (m) | Height (m) |
| III | >3.0 | >35 | >30 | 7.0 |
| IV | >2.8 | >25 | >25 | 6.0 |
| V | >2.2 | >15 | >15 | 4.0 |
| VI | >1.3 | >10 | >10 | 3.0 |

Source: TCVN 5664:2009

#### (ii) Clearance of Roads

The clearance on crossroads is considered in accordance with related standards. Table 6.2.6 shows the class of roads and clearance.

**Table 6.2.6 Clearance of Roads**

| Type | Class of Road | | | Lateral Clearance (m) | Vertical Clearance (m) |
|---|---|---|---|---|---|
| Expressway | 120; 100; 80; 60 (km/h) | - | - | 15.0; 15.0; 13.5; 13.5 | 5.0 |
| National Highway | - | I, II, III, IV | - | 18.25; 13.5; 8.5; 5.5 | 4.75; 4.75; 4.75; 4.5 |
| Provincial road | - | III, IV, V | - | 8.5; 5.5; 4.75 | 4.75; 4.5; 4.5 |
| District road | - | VI | A | 6.5 | 4.5 |
| Commune road | - | - | A (B) | 6.5 (5.0) | 4.5 (3.5) |
| Village road | - | - | B C | 5.0 (3.0) | 3.5 (3.0) |
| People's road | - | - | D | 1.5 | - |

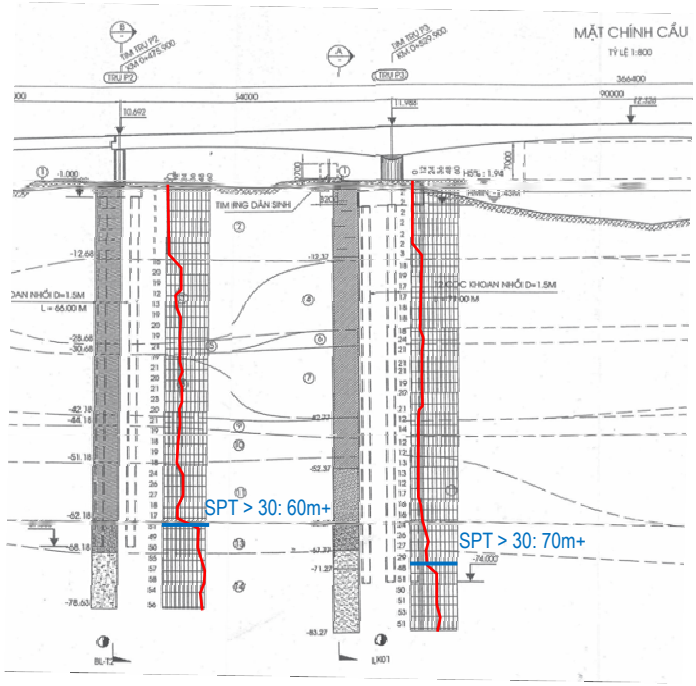
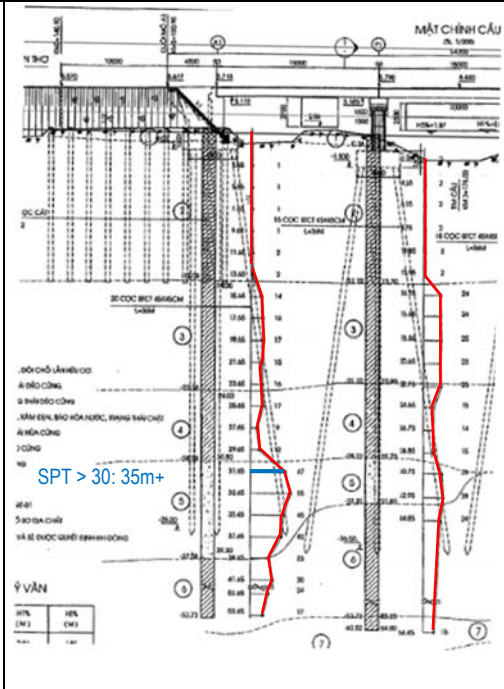
Source: TCVN 5729:2012, TCVN 4054:2005, and TCVN 10380:2014

### (f) Geotechnical Condition

Based on the as-built drawings of NH61C, the geotechnical condition was checked as a basis of the study. Observed conditions are as follows:

- Tick soft soil layer (60 m+) is observed on the large canal (Ba Lang Bridge).
- Most frequently observed soft soil layer depth is around (35m+) on medium and small canals (according to as-built drawings and depth of foundation piles if no available geotechnical data).

Mostly the bridges on NH61C are medium and small. Figure 6.2.4 shows an example of the geotechnical survey result (SPT: Standard Penetration Test).

| Tick Soft Soil Layer: **60 m+**<br>(Ba Lang Bridge on Large Canal) | Frequently Soft Soil Layer: **35 m+**<br>(Bà Mưu goi 2 Bridge on Small Canal) |
|---|---|
|  |  |

Source: As built drawings in Can Tho City section

**Figure 6.2.4 Identified Geotechnical Condition in As-Built Drawings**

### (g) Operation Period

Operation period is set as “30 years,” as stipulated in the PJT proposals of both the city and province.

## 6) Pre-Input Study

### (a) Study on Measures against Climate Change on Existing Lanes

Based on the conditions, the appropriate measures, which will be applied to existing lanes, were studied with two options (see Table 6.2.7).

In the table, the side view of the embankment and bridge is illustrated in case of water level rise due to climate change. The impact of the water level rise will directly strike the operation of the inland waterway (IW) because the clearance under the bridge will NOT be secured.

The point / difference of the options is how much navigation clearance will be secured.

**[Option 1]** This option will raise the whole route embankment and bridges, so the operation of IW will not be interfered with by the water level rise. However, it is technically difficult to raise PH of surface height of bridges because of complicated construction methods/procedures. At first, the need is to jack up the girders at the same time then additional concreting is necessary on abutments and piers. Safety of this construction work and soundness of girders will not be assured due to technically difficult works. Moreover, in a case, the existing support is not enough for new structure, additional supports (e.g., additional pile foundation) will be necessary. These points cause / affect more cost and construction period than option 2.

Among the bridges on the route, the biggest bridge is “Ba Lang Bridge” in Can Tho City. In the case of the Ba Lang Bridge, the site condition is more complicated because of the rigid structure between the one-pier and superstructure in addition to the common conditions above.

**[Option 2]** This option will raise only the embankment section, so operation of IW will be affected by water level rise. However, the function of an “all-weather road” is as same as option 1, and only simple road works (earthworks and pavement works) are required. In terms of cost and construction period, option 2 is more reasonable than option 1. Even if this option is reasonable, the additional construction cost of the embankment section (raising road surface height by approximately 45 cm) will be necessary.

The breakdown of 45 cm is:

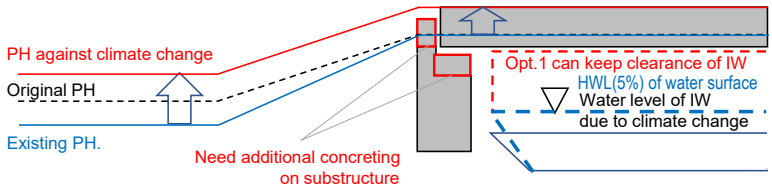
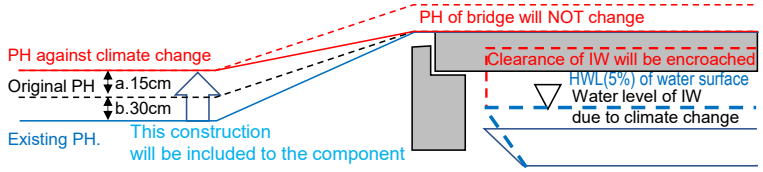
- a) 15 cm for climate change, and
- b) 30 cm for repair work of settlement of road surface height.*

* The residual consolidation was assumed already finish as of now. In the case of an average of 3 m embankment, the residual consolidation of 10% (30 cm) was already settled during the operation.

Therefore, the Study Team recommended option 2 as a reasonable plan and localities agreed to include the cost of raising the PH of the road (approximately 45 cm) in PJT proposals.

The other concern about raising PH is the expansion of the edge of embankment slope. The localities ensured that land acquisition had been conducted 3 m from the existing edge of the slope.

**Table 6.2.7 Options to Raise Road Elevation**

| Option | Description |
|---|---|
| Option 1: Raise Whole Route: Embankment and Bridges<br>  | **[Advantages]**<br>- All-weather Road<br>- IW also can be used without limitation<br>**[Disadvantages]**<br>- Big construction cost, and long construction period<br>- Complicated procedures (demolish deck-slab, jack-up girders, etc.)<br>- (Possible) Need more supports (e.g. additional pile foundation etc.) |
| Option 2: Raise Only Embankment Section (**Recommended**)<br>  | **[Advantages]**<br>- All-weather Road<br>- Simple work contents (pavement, earth works only)<br>=>Reasonable, best cost effectiveness<br>**[Disadvantages]**<br>- Only IW will be restricted in flood/climate change in rainy season, because clearance of IW can not be assured |

* The unit cost of rising PH on existing embankment section was estimated as “6,160 million VND / km”
Source: The Study Team

### (b) Number of Lanes

NH61C is considered as one of major high standard roads in Mekong Delta and the only road connecting 2 capital cities, Can Tho and Vi Thanh city. The Project will widen the current 2-lane to a 4-lane carriageway.

As reported in Chapter 5 of this report, the Study conducted traffic demand forecast on NH61C. From a traffic demand viewpoint, a 4-lane carriageway is deemed necessary in 2030, and it will be fully utilized in 2050 because of high V/C ratio.

### (c) Widening Method/Structure Type (Bridge Section)

#### (i) Selected Study Points

##### a) Study Points

For widening of bridges, there are three important points studied in this pre-input study:

- 1) widening method,
- 2) widening structure, and
- 3) construction method to minimize negative impact on the existing structure.

##### b) Bridge Type for the Study

There are a total of 41 bridges on the current NH61C, of which 40 bridges are categorized as medium and small and these consist of prestressed concrete (PC)-I girder bridges and PC slab girder bridges. The remaining bridge is a PC box girder bridge in the Can Tho section.

**Table 6.2.8 Existing Bridge List on NH61C**

| Section | No. | Bridge Name | Location | Span Arrangement (m) | Bridge Type | Notes |
|---|---|---|---|---|---|---|
| Can Tho | 1 | Ba Lang | Km0+574,9 | 39,1+40+54+90+54+40+39,1 | PC Box & Super T | widening |
| | 2 | Ba Hiep | Km1+945 | 3x15 | PC-Slab | widening |
| | 3 | Ba Dat | Km2+760 | 3x15 | PC-Slab | widening |
| | 4 | Ba Mưu | Km3+178 | 3x15 | PC-Slab | widening |
| | 5 | Rạch Sung | Km3+897,5 | 3x33 | PC-I | widening |
| | 6 | Tac Bào | Km7+7,5 | 3x24,54 | PC-I | widening |
| | 7 | So Dua | Km7+954 | 3x24,54 | PC-I | widening |
| Hau Giang | 1 | Trau Hoi | Km10+344 | 3x33+15+33 | PC-I & PC-Slab | widening |
| | 2 | Xang Moi | Km13+633 | 3x33 | PC-I | widening |
| | 3 | Tan Hiep | Km14+744 | 3x33+20+3x33 | PC-I & PC-Slab | widening |
| | 4 | Cau 2000 | Km16+736 | 3x24.54 | PC-I | widening |
| | 5 | Cau 3500 | Km18+097 | 3x15 | PC-Slab | widening |
| | 6 | Cau 4000 | Km18+639 | 3x15 | PC-Slab | widening |
| | 7 | Cau 5000 | Km19+648 | 3x15 | PC-Slab | widening |
| | 8 | Cau 6000 | Km20+621 | 1x20 | PC-Slab | widening |
| | 9 | Cau 7000 | Km21+809 | 3x20 | PC-Slab | widening |
| | 10 | Cau 8000 | Km22+351 | 3x33 | PC-I | widening |
| | 11 | Cau 9500 | Km24+166 | 3x20 | PC-Slab | widening |
| | 12 | Cau 10500 | Km25+187 | 1x20 | PC-Slab | widening |
| | 13 | Cau 11500 | Km26+200 | 3x15 | PC-Slab | widening |
| | 14 | Cau 13000 | Km27+763 | 15+2x33+15 | PC-I & PC-Slab | widening |
| | 15 | Cau 1400 | Km28+851 | 3x20 | PC-Slab | widening |
| | 16 | Chet Súng | Km31+161 | 3x15 | PC-Slab | widening |
| | 17 | Hoi Dong | Km32+209 | 3x15 | PC-Slab | widening |
| | 18 | Goc Mit | Km33+507 | 3x15 | PC-Slab | widening |
| | 19 | Ba Lien | Km34+060 | 3x20 | PC-Slab | widening |
| | 20 | Bon Thuoc | Km35+072 | 3x15 | PC-Slab | widening |
| | 21 | Cau Lo Da | Km36+980 | 15+20+15 | PC-Slab | Already widened |
| | 22 | Ba Keo | Km38+200 | 3x15 | PC-Slab | widening |
| | 23 | Vị Bình | Km38+757 | 20+33+20 | PC-I & PC-Slab | widening |
| | 24 | Cai Nhuc | Km39+717 | 3x20 | PC-Slab | widening |
| | 25 | Nam Lai | Km40+344 | 1x20 | PC-Slab | widening |
| | 26 | Tam Le | Km40+945 | 3x15 | PC-Slab | widening |
| | 27 | Chinh Tuyen | Km41+493 | 1x20 | PC-Slab | widening |
| | 28 | Dap Da | Km42+164 | 1x20 | PC-Slab | widening |
| | 29 | Mieu Hoi | Km42+757 | 3x15 | PC-Slab | widening |
| | 30 | Cau Lam | Km43+791 | 15+24.54+15 | PC-I & PC-Slab | widening |
| | 31 | Cai Sình | Km44+538 | 3x15 | PC-Slab | widening |
| | 32 | Xa Toan | Km45+450 | 1x20 | PC-Slab | widening |
| | 33 | Tram Bau | Km45+726 | 1x15 | PC-Slab | widening |
| | 34 | Kenh Moi | Km46+739 | 3x24.54 | PC-I | widening |

Source: The Study Team

In the following study, “PC-I girder bridges and PC slab bridges” are considered as typical bridge on NH61C and picked-up as the main subject of the study. PC box girder is considered as special bridge from others, so the specific considerations to be required for the widening of PC box girder are commented separately from typical bridge.

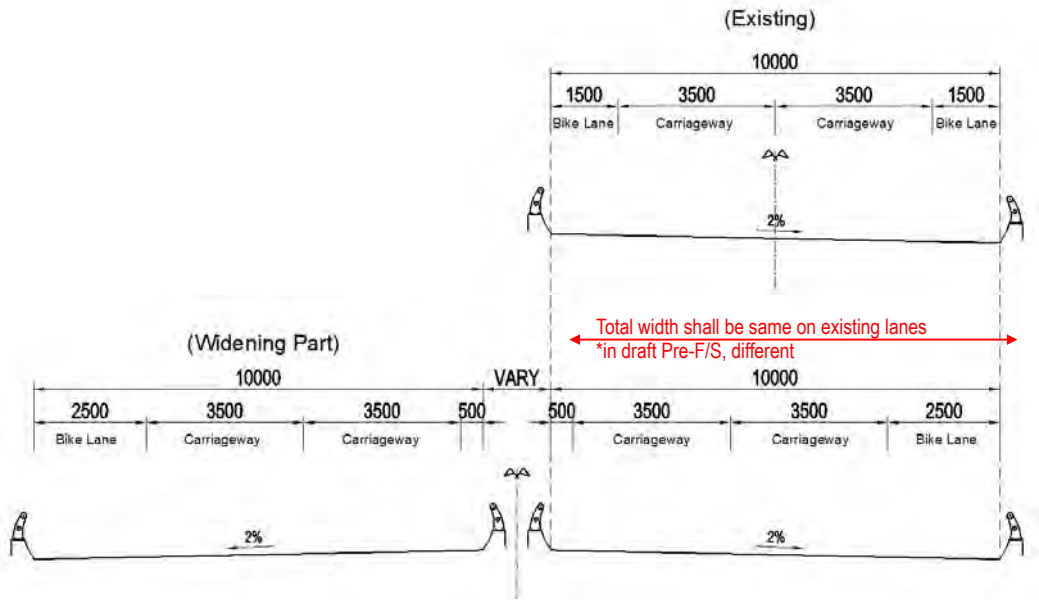
**(ii) Study on Respective Structure Part**

**a) Superstructure**

**[Cross-sectional Elements Relating to Superstructure]**

The existing and widening road width is shown in Figure 6.2.5.

In the meeting with Can Tho City and Hau Giang Province, it was confirmed that the total width of the existing road would no longer be changed and used as the 2 lanes road for Hau Giang bound with the same width after widening. Therefore, the existing bridge can be operated without additional widening in case a separate bridge is newly constructed as the widening section.




Source: The Study Team revised on Draft pre-F/S Report of NH61C upgrading and extending in Hau Giang province

**Figure 6.2.5 Road Width on Superstructure (Existing Lanes)**

**[Alternative Study for Superstructure]**

Two alternatives were compared for PCI girders and PC slab girders as bridge widening methods for the typical bridge.

- Alternative-1: Combined superstructure
- Alternative-2: Separated superstructure (500 mm distance between existing and new bridges for construction clearance)

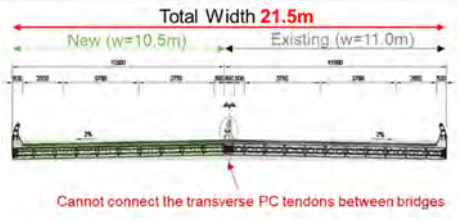
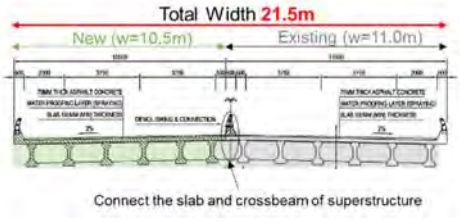
Alternative 1 requires traffic restrictions during the construction because of vibrations caused by existing traffic during the construction of the connecting slab. The vibration due to existing traffic will negatively affect the quality of the concrete at the connection. On the other hand, Alternative 2 does not require traffic restrictions during the construction because the existing and new structures are completely separated. Therefore, Alternative 2 is recommended.

However, the total structural width of Alternative 2 is 1.0 m wider than Alternative 1, so the main concern is the width of acquired land (width of the right of way). According to Can Tho City and Hau Giang Province, there will be no problem with land acquisition because the area, 3 m from the existing edge of the embankment slope, was acquired at the first stage of the construction. Moreover, Can Tho DOT mentioned their policy to prioritize the technical necessity of acquired land, i.e., they will acquire more land if technically necessary.

Since bridges on NH61C are limited in girder height by the clearance of the canal or road along the canal under the girder, the girder height of the new bridge should be equal to or less than that of the existing bridge. In the case of PC slab girders, transverse PC tendons are necessary to ensure the same girder height as the existing bridge, but it is very difficult to connect the PC tendons between the existing bridge and the new bridge. Thus, the combined widening method cannot be recommended for the PC slab girder.

Although the 1.0 m wider width slightly increases the construction cost of the bridge, this is acceptable considering the advantages, such as not necessary for traffic restrictions and the good constructability due to the separated structure.

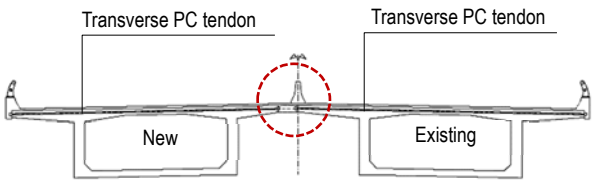
**Table 6.2.9 Comparison of Widening Method of Superstructure**

| Item | Alternative-1: Combined Superstructure | Alternative-2: Separated Superstructure |
|---|---|---|
| Cross-section | PC Slab Girder | |
| |  |  |
| | PCI Girder | |
| |  |  |
| Structure width | New 10.5 m / Total 21.5 m | New 11.0 m / Total 22.5 m |
| Cost<br>(only superstructure) | **1.00**<br>(assumed only from new structure width) | **1.05**<br>(assumed only from new structure width) |
| Traffic restriction during construction | **Need traffic restriction**<br>- Construction of the connection part<br>- Demolition of the existing railing<br>- Construction of the median | **No need restriction**<br>- New superstructure is an independent structure with existing one. |
| Constructability | **Difficult**<br>- Slab girder: very difficult to connect transverse PC tendons between new and existing.<br>- PCI girder: concrete for joints must be jet concrete, etc., to ensure quality even under vibration. | **No problem**<br>- Only need to confirm and take care of the space for construction and erection |
| Land acquisition | **No problem**<br>The total width of superstructure can be within the land acquisition width. | |
| Conclusion | Not recommend | **Recommend** |

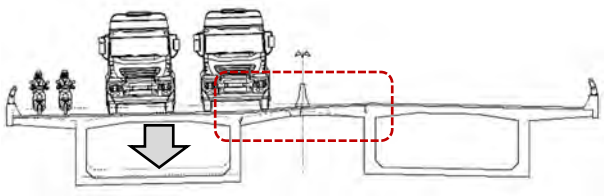
Source: The Study Team

For the PC box girder as the special bridge, the separated widening method is recommended because the combined widening method cannot be suitable for the following reasons:

- Connection of the transverse PC tendons between existing and new is very difficult.
- High possibility of cracks on slab due to deflection difference between existing and new box girders in service
- Extensive traffic restrictions during construction are required.




Difficulty of connection of transverse PC tendons



Cracks on slab due to deflection difference between existing and new box girders in service

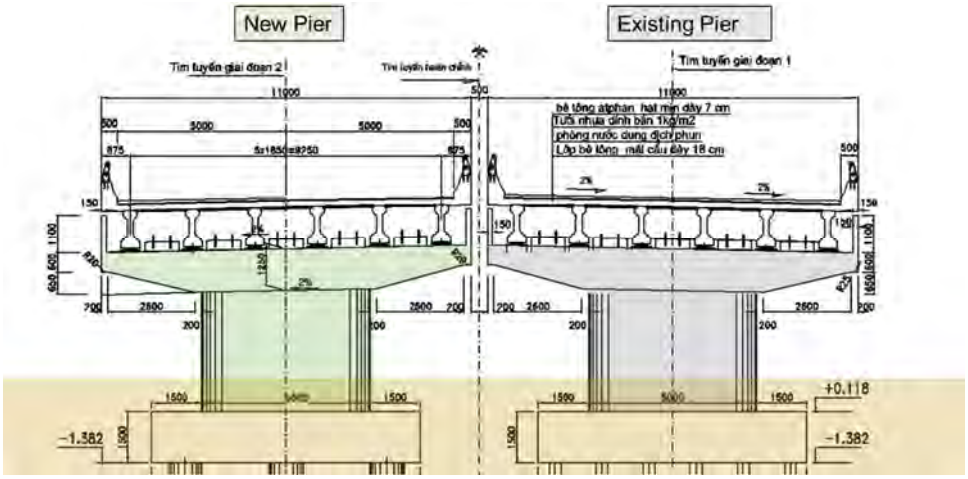
Source: The Study Team

**Figure 6.2.6 Issues on Combined PC-box Girder between New and Existing**

### b) Substructure

As a pre-condition, the “separated widening method” of superstructure is assumed.

There is nothing special to be considered for the new “pier” on the widening side since sufficient distance can be secured between the existing and new structures. Basically, there is no reason to be connected between old and new piers because the footing of pier is wider than pier width.



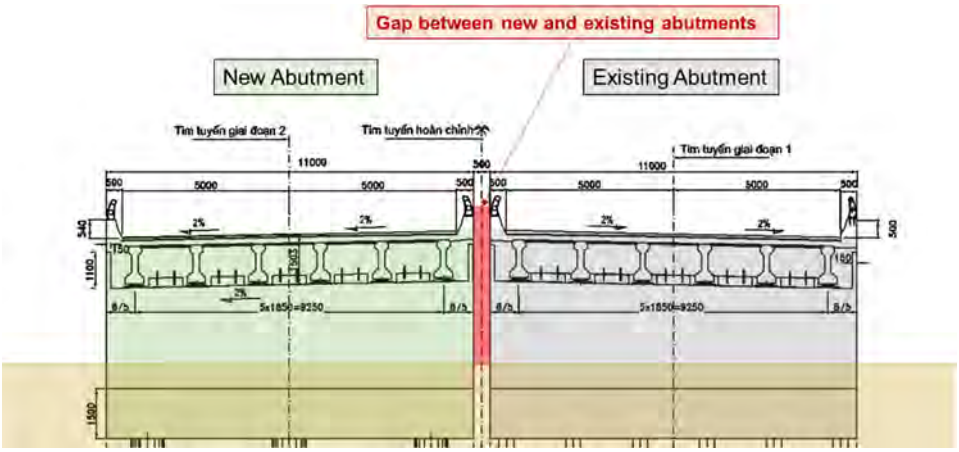

Source: The Study Team edited on Draft pre-F/S Report of NH61C upgrading and extending in Hau Giang Province

**Figure 6.2.7 Arrangement of New and Existing Piers**

For the construction of the “abutment,” the existing and new abutments should not be unified by connection of the rebar or PC tendon because the structural behavior of a unified abutment is complicated, especially if the foundation pile type of existing abutment is spun-pile (pre-casted pile) and may have negative effects on each abutment.

If there is a gap/distance, new concreting works need formwork and scaffolding between existing and new structures. Since abutments require the same width as the superstructure width from the top to the pile cap of abutment (see Figure 6.2.8), it is difficult to keep the distance for construction between the new and existing structures as same as the pier case (see Figure 6.2.7). On the conditions, the idea of utilizing an existing abutment as a form of new concreting work seems reasonable (excellent constructability). Therefore, a comparison was carried out between the following alternatives (see Table 6.2.10):

- Alternative 1: The existing and new abutments are “in contact.” (Positive point: workability)
- Alternative 2: The existing and new abutments are “separated.” (Positive point: to minimize the structure width)




Source: The Study Team edited on Draft pre-F/S Report of NH61C upgrading and extending in Hau Giang province

**Figure 6.2.8 Arrangement of New and Existing Abutments**

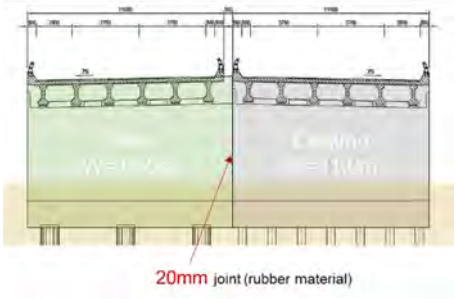
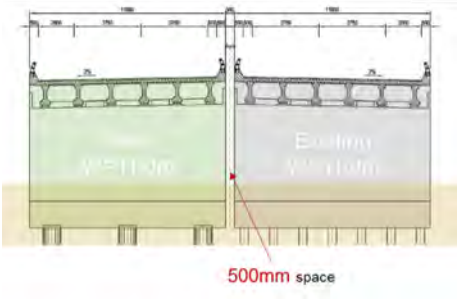
As an additional explanation of Alternative 1, “in contact” means “contacting each other, but structurally separated.” Alternative 1 is a plan to construct the existing and new abutments in contact with each other through a 20 mm joint rather than unifying these.

Alternative 2 keeps a 500 mm space between abutments and seems to be of slightly less concrete volume compared to Alternative 1. However, as explained earlier, this case needs form and scaffolding for concreting between abutments.

As a result of the comparison, “Alternative 1: Contacted to the existing abutment,” which has excellent constructability, is recommended.

Although the necessity of “traffic restrictions” was evaluated in the study of the superstructure widening method, in the case of abutment, vibration caused by existing traffic is almost neglective because of the bearings on abutment and rubber material between abutments. Therefore, traffic restrictions are not comparing factor for abutment structure.

**Table 6.2.10 Comparison of Abutment Type**

| | **Alternative 1:**<br>**Contacted** to Existing Abutment with 20 mm joint | **Alternative 2:**<br>**Separated** from Existing Abutment with 500 mm space |
|---|---|---|
| Cross-section |  |  |
| Width | New Abutment 11.5 m / Total 22.5 m | New Abutment 11.0 m / Total 22.5 m |
| Constructability | **Excellent**<br>- No need side formwork due to existing abutments as formwork. | **Fair**<br>- Need side formwork and fixing in the space between abutments |
| Earth Retaining | **No need** front earth retaining | **Need** front earth retaining between 500 mm |
| Conclusion | **Recommend** | Not recommend |

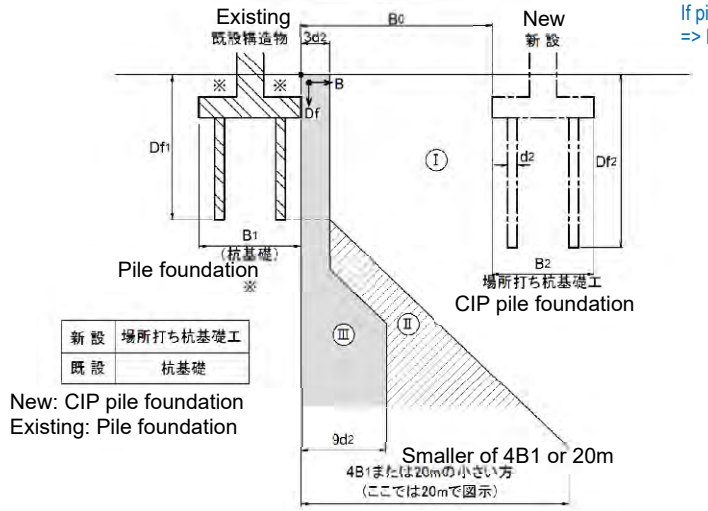
Source: The Study Team

### c) Foundation

Based on the data regarding the existing bridge and the geotechnical conditions, the existing bridge has a pile foundation with a depth of 35-40 m in typical bridge type. For the widening construction, new bridges are expected on similar geotechnical conditions, so expected pile depth is assumed as the existing bridges.

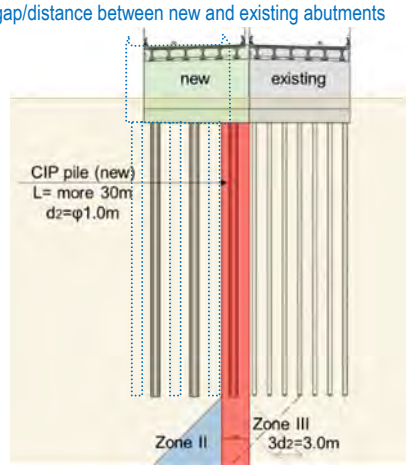
Since the location of the existing and new bridges requires that the new piles be located close to the existing piles, especially in the abutment locations, the construction of the new piles may have a negative impact on the existing structure. New pile construction in close can cause disturbance of the ground around the piles, and this disturbance can reach the existing piles, changing the ground conditions around the existing piles and resulting in reduced bearing capacity and performance of the existing piles.

Because there are no regulations in Vietnam regarding neighboring construction, it is suggested that the impact on the existing structure shall be minimized, referring to the Japanese Metropolitan Expressway standards.




**Impact Zone based on "Japanese Metropolitan Expressway standards"**

If pile is out of zone III, location of abutment would be assumed 3.0m+
=> Big gap/distance between new and existing abutments




**Impact Zone & Pile Arrangement of abutment**

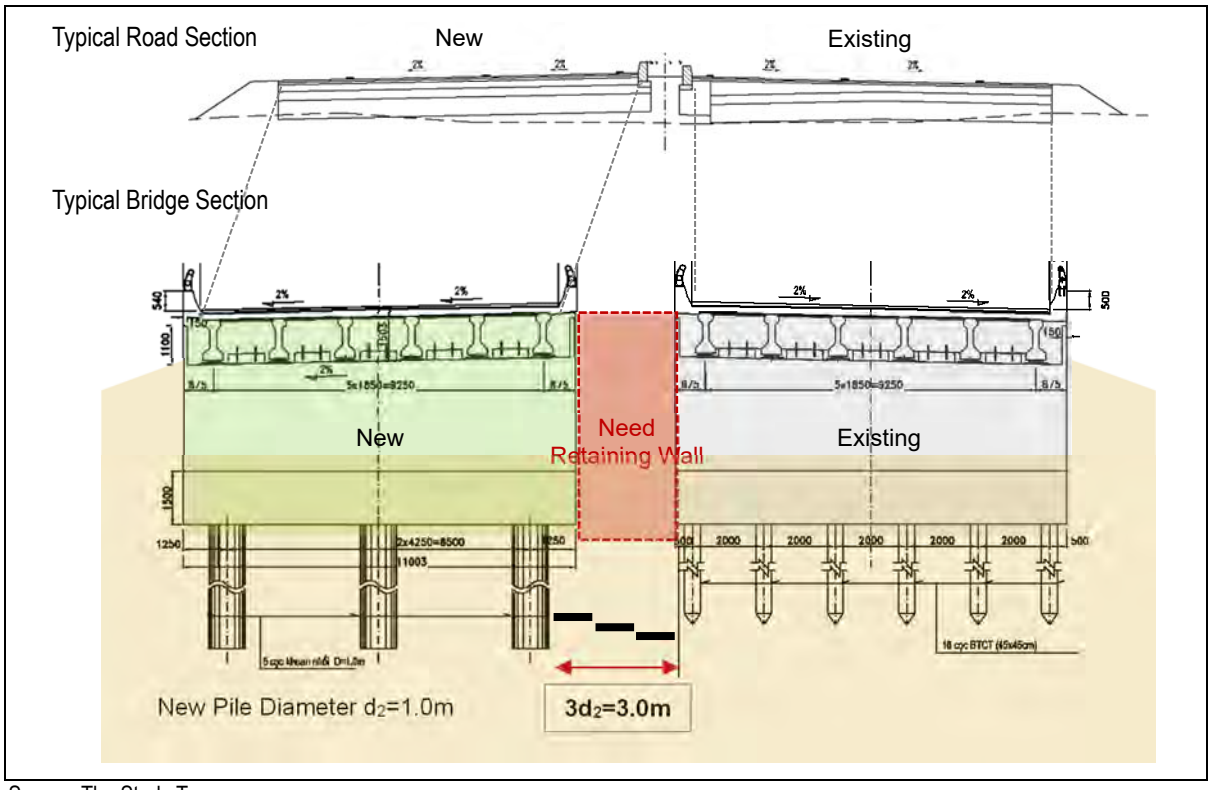
Source: The Study Team

**Figure 6.2.9 Impact Zone of Neighboring Pile Construction**

In order to locate the new piles out of Zone III, it is necessary to ensure a distance of approximately 3.0 m between the existing and new abutments (see Figure 6.2.9). This would require large earth retaining walls between abutments. In addition, since the new road alignment should be S-shaped due to the widening at the bridge section only, it would significantly reduce traffic safety and driving comfort as a national highway with a design speed of 80 km/h (see Figure 6.2.10).

Therefore, for the typical bridges (PC-I and PC slab), the policy is not to enlarge the distance between the existing and new bridges to ensure the pile distance 3d2.

For this reason, the comparison regarding the abutment structure spacing in Table 6.2.10 was based on the assumption that the new piles would be within Zone III for both alternatives.




Source: The Study Team

**Figure 6.2.10 Abutments Arrangement with New Piles Located out of Zone III**

According to this standard, if a new pile is located in Zone III (from the existing pile to three times the diameter of the new pile), the following measures should be taken:

(1) installation of physical protection between new and existing piles, and

(2) monitoring of existing structures during new pile construction.

Physical protection between the existing and new piles is provided by:

(1a) driving steel sheet piles between the piles for at least the length of the pile, and

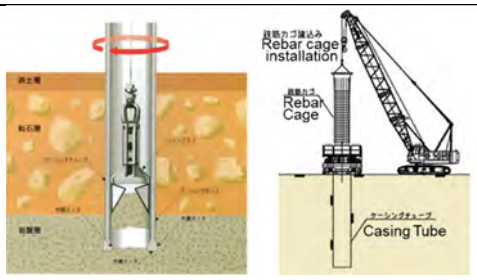
(1b) physically protect the borehole walls of new piles with steel pipes, etc., during construction.

For the typical bridges on NH61C, the existing pile length is almost 35-40m. Since it is difficult to press-in steel sheet piles over 35–40m depth, it deems reasonable to protect the new piles by using steel pipes for the borehole walls of new piles.

Based on the above, a comparison study for the two alternatives below that can protect the borehole walls of new piles.

As a result of comparison (Table 6.2.11), “Alternative 1: Cast-in-Place Pile (Full-casing method)” which has experiences in Vietnam and excellent cost effectiveness is recommended.

**Table 6.2.11 Comparison of Pile Type with Construction Method**

| | **Alternative 1:**<br>**Cast-In-Place RC Pile (Full-casing Method)** | **Alternative 2:**<br>**Steel Pile (Rotary Press-in Method)** |
|---|---|---|
| Summary | Cast-in-Place Pile constructed by full-casing method can physically protect the borehole wall, thus minimizing the impact on neighboring structures. The method of remaining temporary casing tubes in place is also acceptable. | Although the vibrohammer and hammering methods cannot be applied in neighboring construction, the rotary press-in method can be used to drive steel pipe piles with minimizing the impact on neighboring structures. |
| Figure |  |  |
| Experience in Vietnam | - C.I.P piles have many experiences in Vietnam.<br>- Full-casing method is experienced in Vietnam. | Few experienced in Vietnam |
| Cost | The most economical type of foundation in Vietnam. | Not economical and not reasonable because the horizontal bearing capacity of piles is not required in Vietnam, where small seismic intensity |
| Conclusion | **Recommend** | Not recommend |

Source: The Study Team

According to Japanese standards, the applicable depth standards for cast-in-place piles constructed by the full-casing method are up to 40 m as highly applicable, 40–60 m as applicable, and over 60 m as not applicable.

The full-casing method is a process in which steel pipes are rotary pressed into place, and the rebar cage is installed and pulled out while concrete is placed. Since the force (torque) required to pull out a steel pipe is greater at deeper depths of pile, the full-casing method is not applicable at depths of 60 m or more.

Since the MDR has soft soil ground and the intermediate layer consists of clay and silt, the friction between the ground and steel pipes is expected to be small, and the soil properties are considered to be relatively easy to pull out steel pipes. Therefore, application of the full-casing method to depths of up to 60 m is considered feasible.

In case of concern about steel pipe pullout for the pile length of 40 m or more, the following can be applied to improve the constructability.

(1) Use machines sufficient to provide the necessary torque for steel pipe pulling.

(2) Use reduction methods of friction around the circumference of steel pipes, such as the double pipes and the application of lubricant coatings.

(3) Use temporary casing without pullout.

**[Important notice for quality assurance at construction supervision stage]**

Note that applying the full-casing method on soft soil ground may cause tapering of the pile top end regardless of the pile length. Therefore, it is recommended to consider measures to secure the specified pile diameter by laying steel plates, increasing the amount of extra concrete, or adopting double pipes.

**[For the foundation of PC-Box girder (Special Bridge)]**

The pile length of the existing PC-box girder bridge, “Ba Lang Bridge” in Can Tho City, is more than 60 m. Since it is difficult to apply the full-casing method in case the pile length exceeds 60 m, it is recommended that the distance between the existing and new piles be ensured at least 3d2 and the new bridge location be separated from the existing bridge so that countermeasure work (physical protection of the borehole wall) is not required.

According to the meeting with Can Tho City, the Study Team confirmed that it is easy to acquire more land on the widening side and feasible to separate the new bridge from the existing bridge.

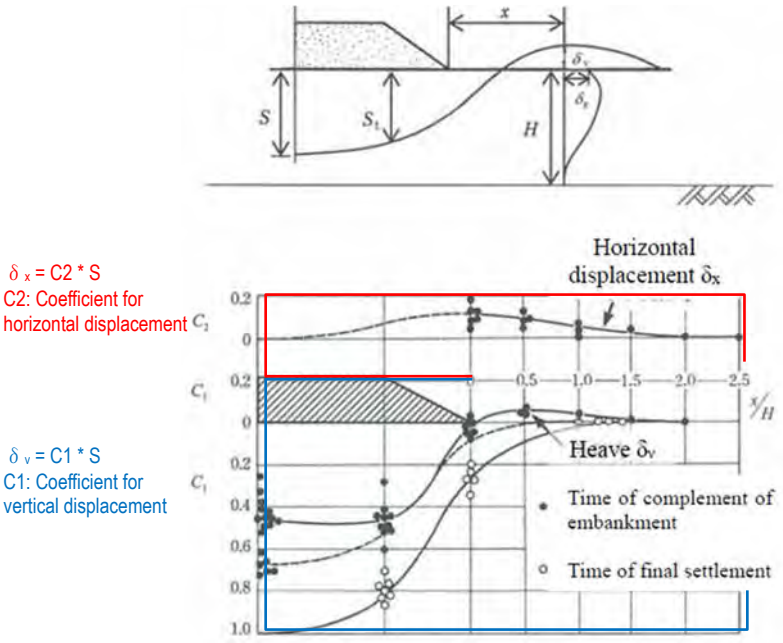
### (d) Widening Method/Structure Type (Embankment Section)

#### (i) Mitigation Measure of Negative Impact to Existing Structure

The geotechnical deformation by embankment construction is assumed, as shown in Figure 6.2.11. This assumption was oriented based on the observation of embankment works in Japan without any soft soil measures. The figure shows that embankment construction on soft soil conditions affects both ways, vertically and horizontally for surrounding, up to 2 times the thickness of soft soil layer. It shows appropriate measures considering impact on the surrounding shall be applied before embankment (settlement shall be accelerated before embankment).

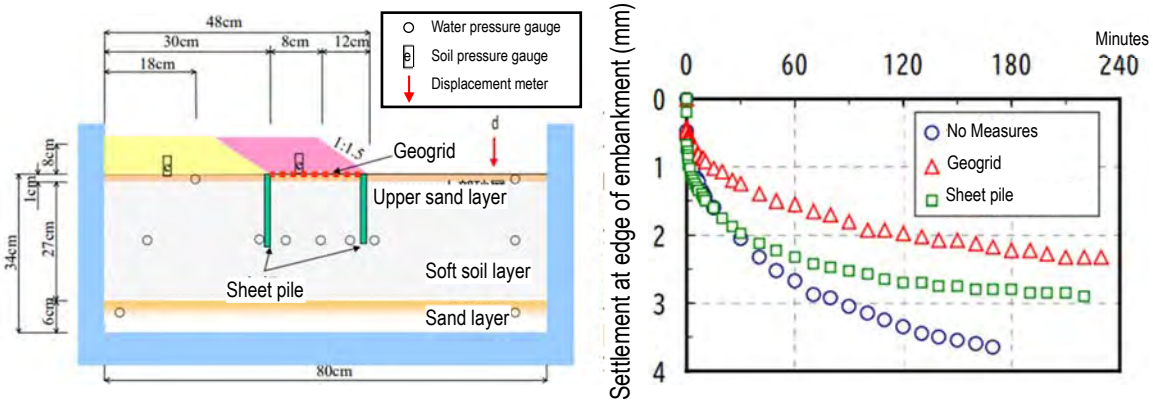
According to a study of a centrifuge model test, the effective method for mitigation of displacement is placing geogrid (geo-textile sheet) on the ground surface (see Figure 6.2.12) in case of widening embankment on existing one.

Therefore, together with appropriate soft soil treatment (as an acceleration of settlement) and “geogrid” (as minimization of displacement) before embankment will be recommended to minimize the negative effect on existing structures. At construction supervision, the speed of the embankment shall be carefully set because high-speed construction affects a lot.




Source: P153, Road Earthwork - Guideline for Road Earthwork of Soft Ground Treatment (Japan Road Association)

**Figure 6.2.11 Assumed Geotechnical Deformation by Embankment Construction**




Source: Edit on Fig.2&11, Ground deformation caused by widening embankment and measures to prevent it, Obayashi Corporation

**Figure 6.2.12 The Image and Result of Centrifuge Model Test**

**(ii) Countermeasure against Difference of Accumulated Settlement**

Accumulated settlement or consolidation is different between existing and newly widened lanes due to the differences in accumulated time-lapse of consolidation. In the future, the elevation difference may happen on the boundary. At the construction of new embankment, no measures to mitigate the gap except for usual soft soil treatment explained above. The only countermeasure of this situation is repair work from time to time with periodic maintenance work.

### (e) O&M Plan and Cost

The O&M plan and cost are important factors for evaluation of a project from the viewpoints of technical and financial aspects, especially by ODA partner side. ODA partner concerns with the sustainability of services quality after operation start. In this subsection, the O&M plan and cost are summarized based on provided information (including actual budget in recent years) from each organization, and the regulations.

**(i) Applicable Standards and Regulations**

- [TCCS 07:2013/TCBVN] Technical standards for regular road maintenance
- [Circular No.37/2018/TT-BGTVT] Regulations on Management, Operation and Maintenance of Road Construction Works [Circular No. 41/2021/TT-BGTVT on Amendments to Circular No. 37/2018/TT-BGTVT

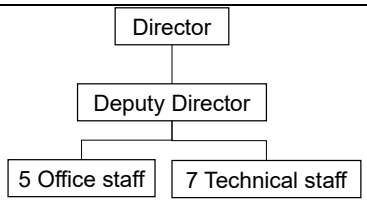
**(ii) Information of Managing Organization**

**a) Can Tho City**

The collected information to evaluate capability of organization are summarized in Table 6.2.12.

Based on the collected information, “Regional Road Management Unit (RRMU) IV.5” was evaluated as sufficient experience (handling similar road structures as same type as target project) and capability from technical and financial viewpoints.

**Table 6.2.12 Collected information about O&M (NH61C Can Tho Section)**

| Item | Description | Remark |
|---|---|---|
| O&M Operator/ Administrator | RRMU IV.5 | RRMU IV.5 is the managing organization for now and future (when NH61C is widened to 4-lanes) |
| Establishment | Established in 1996 | |
| Structure of the Organization | Total personnel of 14 people, including 1 Director, 1 Deputy Director, 5 Office staffs, 7 technical staffs |  |
| Budget | 15.86 billion VND/year | for 10.2 km of NH61C |
| Maintenance Works | Only performing management subcontracted works as follows:<br>● Routine maintenance, Inspection works<br>● Clearing obstacles and regulating traffic<br>● Repair works (periodic and big repair) | No facility for carrying out the maintenance work directly |
| Maintained Infrastructure | ● Bridge, road (in Can Tho city) | ● NH1, NH61C, NH91B, NH80, Lo Te-Rach Soi route (through Can Tho city) |

Source: The Study Team

**b) Hau Giang Province**

The collected information to evaluate the capability of organization are summarized in Table 6.2.13.

Based on the collected information, still information is missing in some parts, but the "Transport infrastructure Management Division" in Hau Giang DOT" was evaluated as a sufficient experience (handling similar road structures as same type as target project) and capability from technical and financial viewpoints, especially the current condition of NH61C on existing lanes was good (settlement due to soft soil was repaired timely according to Study team observation).

**Table 6.2.13 Collected information about O&M (NH61C Hau Giang Section)**

| Item | Description | Remark |
|---|---|---|
| O&M Operator/ Administrator | Direct management unit is "Transport infrastructure Management Division" in Hau Giang DOT | Directorate Roads of Vietnam (DRVN) authorizes "Hau Giang DOT" to manage NH61C<br>Hau Giang DOT is the managing organization for now and future (when NH61C is widened to 4-lanes) |
| Establishment | N/A | |
| Structure of the Organization | N/A | |
| Budget | 31.86 billion VND/year | for 37.2 km of NH61C |
| Maintenance Works | Manage following subcontracted works:<br>● Routine maintenance, Inspection works<br>● Clearing obstacles and regulating traffic<br>● Repair works (periodic and big repair) | No facility for carrying out the maintenance work directly. |
| Maintained Infrastructure | ● Bridge, road of NHs (in Hau Giang province) | |

Source: The Study Team

**(iii) O&M Cost**

O&M cost was estimated for economic analysis, JICA review, and appropriate budget allocation of both management units on NH61C during the project period as follows in

accordance with relevant standards and collected information.

**Table 6.2.14 Cost Estimate of O&M Cost (NH61C Can Tho Section: 10.2km)**

| Item | Applied Value / Rates for 10.2km in Can Tho | Reference |
|---|---|---|
| Project Period | 30 years | Project Proposals |
| Routine Maintenance Work | ● 4-lanes: 168.6 million VND / km * 10.2 km = 1,720 million VND/year | According to norms, each city / province estimated |
| Periodic Repair Work (including repair work due to settlement) | ● 4-lanes: 30,000 million VND/year | Collected recent 3 years actual cost from Can Tho city (15 billion VND/year for NH61C: 10.2km in Can Tho for 2-lanes) |
| Big Repairment Work (Every 15 years, big pavement repairment work is planned as 42 % of original asphalt pavement) | ● 4-lanes: 12,029 million VND / km * 10.2 km = 123,000 million VND | No.37/2018/TT-BGTVT<br>*Unit rate of asphalt pavement: 14,320 million VND / km * 42 % = 6,014.4 million VND / km for 2-lanes |

Source: The Study Team

**Table 6.2.15 Cost Estimate of O&M Cost (NH61C Hau Giang Section)**

| Item | Applied Value / Rates for 37.2km in Hau Giang | Reference |
|---|---|---|
| Project Period | 30 years | Project Proposals |
| Routine Maintenance Work | ● 4-lanes: 100 million VND / km * 37.2 km = 3,715 million VND/year | According to norms, each city / province estimated |
| Periodic Repair Work (including repair work due to settlement) | ● 4-lanes: 60,000 million VND/year | Collected recent 3 years actual cost from Hau Giang (30 billion VND/year for NH61C in Hau Giang for 2-lanes) |
| Big Repairment Work (Every 15 years, big pavement repairment work is planned as 42 % of original asphalt pavement) | ● 4-lanes: 12,029 million VND / km * 37.2 km = 447,000 million VND | No.37/2018/TT-BGTVT<br>*Unit rate of asphalt pavement: 14,320 million VND / km * 42 % = 6,014.4 million VND / km for 2-lanes |

Source: The Study Team

**Table 6.2.16 Estimated O&M Cost (NH61C)**

Can Tho

| | Length(inc.intersections) | 10.2 km | |
|---|---|---|---|
| NH61C | Routine maintenance | Periodic repair work | Big repairment work |
| | 169 mil.VND/km/year | 30000mil. VND for 10.2km | 12029mil. VND/km for 4-lanes |

| | Year | Routine maintenance | Periodic repair work | Big repairment work |
|---|---|---|---|---|
| | 2022 | | | |
| | 2023 | | | |
| | 2024 | | | |
| | 2025 | | | |
| | 2026 | | | |
| | 2027 | | | |
| 1 | 2028 | 1,720 | 30,000 | |
| 2 | 2029 | 1,720 | 30,000 | |
| 3 | 2030 | 1,720 | 30,000 | |
| 4 | 2031 | 1,720 | 30,000 | |
| 5 | 2032 | 1,720 | 30,000 | |
| 6 | 2033 | 1,720 | 30,000 | |
| 7 | 2034 | 1,720 | 30,000 | |
| 8 | 2035 | 1,720 | 30,000 | |
| 9 | 2036 | 1,720 | 30,000 | |
| 10 | 2037 | 1,720 | 30,000 | |
| 11 | 2038 | 1,720 | 30,000 | |
| 12 | 2039 | 1,720 | 30,000 | |
| 13 | 2040 | 1,720 | 30,000 | |
| 14 | 2041 | 1,720 | 30,000 | |
| 15 | 2042 | 1,720 | 30,000 | 123,000 |
| 16 | 2043 | 1,720 | 30,000 | |
| 17 | 2044 | 1,720 | 30,000 | |
| 18 | 2045 | 1,720 | 30,000 | |
| 19 | 2046 | 1,720 | 30,000 | |
| 20 | 2047 | 1,720 | 30,000 | |
| 21 | 2048 | 1,720 | 30,000 | |
| 22 | 2049 | 1,720 | 30,000 | |
| 23 | 2050 | 1,720 | 30,000 | |
| 24 | 2051 | 1,720 | 30,000 | |
| 25 | 2052 | 1,720 | 30,000 | |
| 26 | 2053 | 1,720 | 30,000 | |
| 27 | 2054 | 1,720 | 30,000 | |
| 28 | 2055 | 1,720 | 30,000 | |
| 29 | 2056 | 1,720 | 30,000 | |
| 30 | 2057 | 1,720 | 30,000 | 123,000 |

Hau Giang

| | Length | 37.2 km | |
|---|---|---|---|
| NH61C | Routine maintenance | Periodic repair work | Big repairment work |
| | 100 mil.VND/km/year | 60000mil. VND for 37.2km | 12029mil. VND/km for 4-lanes |

| | Year | Routine maintenance | Periodic repair work | Big repairment work |
|---|---|---|---|---|
| | 2022 | | | |
| | 2023 | | | |
| | 2024 | | | |
| | 2025 | | | |
| | 2026 | | | |
| | 2027 | | | |
| 1 | 2028 | 3,715 | 60,000 | |
| 2 | 2029 | 3,715 | 60,000 | |
| 3 | 2030 | 3,715 | 60,000 | |
| 4 | 2031 | 3,715 | 60,000 | |
| 5 | 2032 | 3,715 | 60,000 | |
| 6 | 2033 | 3,715 | 60,000 | |
| 7 | 2034 | 3,715 | 60,000 | |
| 8 | 2035 | 3,715 | 60,000 | |
| 9 | 2036 | 3,715 | 60,000 | |
| 10 | 2037 | 3,715 | 60,000 | |
| 11 | 2038 | 3,715 | 60,000 | |
| 12 | 2039 | 3,715 | 60,000 | |
| 13 | 2040 | 3,715 | 60,000 | |
| 14 | 2041 | 3,715 | 60,000 | |
| 15 | 2042 | 3,715 | 60,000 | 447,000 |
| 16 | 2043 | 3,715 | 60,000 | |
| 17 | 2044 | 3,715 | 60,000 | |
| 18 | 2045 | 3,715 | 60,000 | |
| 19 | 2046 | 3,715 | 60,000 | |
| 20 | 2047 | 3,715 | 60,000 | |
| 21 | 2048 | 3,715 | 60,000 | |
| 22 | 2049 | 3,715 | 60,000 | |
| 23 | 2050 | 3,715 | 60,000 | |
| 24 | 2051 | 3,715 | 60,000 | |
| 25 | 2052 | 3,715 | 60,000 | |
| 26 | 2053 | 3,715 | 60,000 | |
| 27 | 2054 | 3,715 | 60,000 | |
| 28 | 2055 | 3,715 | 60,000 | |
| 29 | 2056 | 3,715 | 60,000 | |
| 30 | 2057 | 3,715 | 60,000 | 447,000 |

Source: The Study Team based on information from RRMU IV.5 and Hau Giang DOT

### 7) Recommendation for the Next Project Stage (Pre-F/S)

#### (a) Unified Policies/Functions/Specifications for the Whole Route

NH61C passes several cities and provinces. As one route, the same level of service quality of road shall be provided in its entirety. Therefore, important policies, functions, and specifications, including the input points by this study, which directly affect the service quality of road, shall be unified on the entire route. This includes measures against climate change as an all-weather road, road surface height, and cross-sectional lane elements.

#### (b) Other Specific Items

- It is necessary to confirm/agree to the measures against climate change as the road sector in corporation with other sectors' measures, especially flood control systems in the MDR. In this report, the Study Team shows an understanding that "the whole region will not resist inundation by dyke along seas and rivers. The region will admit the inundated area and the important city functions (e.g., transportation system, urban area, and industrial area) will be secured from flood, especially in the road sector, the major road network will be an all-weather road."
- As an all-weather road, the road surface height shall be considered against climate change. In the case of NH61C, the construction cost of raising the road PH of existing lanes shall be included.
- Appropriate road class and design specifications shall be applied as a national highway. In the case of NH61C, historically the planned total width and cross-sectional elements were set as "expressway standard," because this route was originally considered an expressway. However, there is a plan for the "East North–South Expressway" to run in parallel with NH61C. Therefore, the route was degraded to national highway class, but the cross-sectional elements have been kept as expressway standard. On the situation, both Can Tho City and Hau Giang Province decided to set design specifications and cross-sectional elements as "national highway class" (see details in Figure 6.2.6).
- In this study, based on limited information on the as-built drawings of NH61C (specific geotechnical information is available only in the Can Tho section), the general construction method for foundation piles was studied. Some of the new foundation piles for the widened bridge will be near the existing piles, which may negatively impact on the existing bridge. For the purpose of minimizing this impact, the "full-casing method" was recommended to protect the bored-hole wall. However, if in case the pile length is deeper than 60 m, the difficulty of construction will increase with the full-casing method. As a recommendation, geotechnical conditions of all abutments/piers shall be identified, and the appropriate countermeasures (full-casing method and secure sufficient distance) are selected. To apply "secure sufficient clearance," consistency/straightness of road alignment with embankment sections before/after the bridge shall be carefully considered/designed.
- Under the embankment section, it is necessary to select the appropriate soft soil treatment method and procedures when considering the negative impacts on existing structures along the new embankment construction. At first, before embankment construction, the initial settlement shall be accelerated without loading (construction of embankment). Then after finishing the designated settlement, appropriate measures (in this study, placing geogrid is recommended) to mitigate settlement of new construction shall be implemented. The unit rate shall be considered those construction costs.
- Residual consolidation due to soft soil has been expected continuously; thus, periodic

repair work to raise the PH of the embankment section, especially behind the abutment, shall be conducted. Its cost is included in the O&M cost as “periodic work.” For the managing organization, an appropriate budget allocation shall be considered for their O&M works.

- Additional information about operation and maintenance shall be provided if required.

### 6.2.3. Clarification of Currently Prepared Pre-F/S

Both city and the provinces agreed with JICA that the draft pre-F/S was expected to be provided in December 2022 to be reviewed by the Study Team; however, the actual preparation status was different for each city and province. Therefore, the Study Team took different actions as follows:

**[Can Tho City]**

The following situation was confirmed with Can Tho DOT in January 2023:

- The current project proposal has been revised to add 2-intersections, and
- The draft Pre-F/S was still under preparation.

Therefore, these actions were taken by the Study Team instead of reviewing the draft Pre-F/S:

- Clarification of changed contents in draft Pre-F/S under preparation
- Comments on preparing draft Pre-F/S's contents, which the Study Team clarified by referring to the pre-input study even though the project component was changed.

**[Hau Giang Province]**

The draft Pre-F/S was provided in December 2022. The review by the Study Team (including the review of the cost estimate) was conducted as planned with reference to the pre-input study.

#### 1) Can Tho Section

**[The Change in the Current Project Contents: Additional 2-intersections]**

The major change in the current project contents was "additional 2-intersections in Can Tho section" as follows:

- flyover at BP of NH61C with crossing NH1A, and
- interchange with the West Ring Road.


Source: The Presentation Material in the Meeting on January 17th 2023 with Can Tho CIty

**Figure 6.2.13 Additional Intersections**

For this change, the type of intersections shall be considered (replanned/ redesigned) in Pre-F/S with technical reasons. The plan/design shall be scrutinized in the Pre-F/S because the review by JICA will be conducted/ justified based on Pre-F/S.

The policy of the road connection at an interchange/intersection shall be established and clarified or consistent with other roads. In the preliminary study of IPC, the tentative plan of “interchanges and intersections” was proposed with the condition of “initial (2-lanes) and ultimate stage (4-lanes).” It is necessary that technical and financial justification of plan/design (e.g., grade-separated or not, connectivity from the roadside and so on) of interchanges and intersections because it needs to be considered “connectivity as ultimate plan” in case of “initial 4-lanes” comparing to the case of “initial (2-lanes) and ultimate stage (4-lanes),” which still can be reconsidered/redesigned in future with widening.

As another technical justification, the exemption shall be made with technical reasons (e.g., the crossing road will be expected to function as NH based on traffic demand forecast etc.).

**[Clarification of Draft Pre-F/S Contents with Can Tho DOT]**

As the basis of the clarification, the contents/components have been changed from the pre-input study above. The draft Pre-F/S contents (changed points and the application referring to JICA study team inputs) were confirmed before the completion of the draft Pre-F/S instead of a review of Pre-F/S.

The clarified points were separated into two parts:

- Firstly, the changed contents were clarified and commented on from technical viewpoints.
- Apart from the changes, the draft Pre-F/S contents under preparation were confirmed by referring to the study result of the pre-input study.

Two points were clarified to Can Tho DOT:

- Clarification of [Addition and Adjustment of Component and the Reasons]
- Clarification of the Current Status of Draft Pre-F/S with Respect to Pre-input Points by the JICA Study Team

The next tables show the summarized correspondence between Can Tho DOT and the Study Team for the abovementioned clarified two points.

**Table 6.2.17 Clarification of Addition and Adjustment of Component and the Reasons**

| | Item | Addition and Adjustment | Clarification or Important Points to be Noticed | Reply by Can Tho city | Comments by JICA Study Team |
|---|---|---|---|---|---|
| A | Additional Intersections | The first intersection: crossing the National Highway 1 at the end of the approach road to Can Tho bridge on the South bank (intersection IC4).<br>Intersection with the West Ring Road | Policy of Intersection design shall be consistent with other routes.<br>For example, in preliminary study of IPC, the policy of intersection was tentatively set as in Appendix Table & Figure 2.12).<br>In this policy, if crossing road class is equal or more than NH, "grade separated intersections/interchanges" are planned at ultimate stage.<br>However, if crossing road class is lower than NH, type of connection is "at grade" even in ultimate stage, then the priority of drivability will be on IPC or NH61C than crossing lower class roads.<br><br>If this policy is not suitable, the policy of road connection will be newly established, or the exemption shall be made with technical reasons (ex.the crossing road will be expected to be functioned as NH based on traffic demand forecast etc.).<br>To identify the intersection plan/design, generally traffic density for every direction at intersection is a basis. | The project proposal will add 02 grade-separated interchange (01 interchange at the beginning of the route and 01 interchange with the western ring road); These interchanges are currently for connection of important roads of the city with high traffic volume to ensure traffic safety, increase the capacity of traffic circulation through the intersection, it is necessary to arrange the interchange; In the next step, the traffic volume will be added in all directions as the basis for planning the interchange. | This means that still type of intersections will be considered(replanned/redesigned) in Pre-F/S with technical reason? Plan/design shall be scrutinized in the Pre-F/S, because appraisal of loan project will be conducted/ justified based on Pre-F/S.<br><br>As mentioned, the policy of road connection by intersection shall be clarified/consistent.<br>Or the exemption shall be made with technical reasons (e.g., the crossing road will be expected to be functioned as NH based on traffic demand forecast etc.).<br><br>For planning and designing intersections, technically type of intersection shall be justified depending on the traffic demand forecast and planed class of crossing road. |
| B | Crossing road | **Not addition.** | [This is just question from JICA study team]<br>In the JICA study team understanding, it will be difficult to access to the far side carriageways from roadside due to center median barrier, for example eastern side of road side of NH61C to Hau Giang bound. What is the countermeasures? | To change the direction, turning points will be arranged on the route (cutting the hard median), which is similar to the current traffic organization on National Highway 1A. | We understand 'turning points' by cutting at a certain length of the central median on NH61C is practical for the vehicles to change their direction. But, at the same time, such 'turning points' puts the vehicles in danger such as getting rear-ended collision when waiting in the fast lane next to the central median and joining up an opposite traffic flow. Therefore, road safety measures must be carefully provided at and near the 'turning points' such as lane markings and road signs. It is thus important to assign a road safety auditor to design appropriate measures. |

| | Item | Addition and Adjustment | Clarification or Important Points to be Noticed | Reply by Can Tho city | Comments by JICA Study Team |
|---|---|---|---|---|---|
| | | | As same meaning of question, how to change the direction by car (in the following figure), because number of intersections are very few?<br>  <br> | | |
| C | Possibility of change in Pre-F/S | All of items above | These additional points were not technically studied by JICA. The possibility of changes in following stage (in Pre-F/S) after approval of project proposal want to be confirmed. | N/A | As mentioned in item A above, plan/design of some items shall be scrutinized in the Pre-F/S, because appraisal of loan project will be conducted/justified based on Pre-F/S. |

Source: The Study Team

**Table 6.2.18 Clarification of Current Status of Draft Pre-F/S with Respect to Pre-input Points by JICA Study Team**

| | Pre-Input Points | Description | Reply by Can Tho city about Pre-F/S | Comments by JICA Study Team |
|---|---|---|---|---|
| a | Unified Policies/ Functions/ Specifications through the Whole Route (Consistency among provinces) | NH61C is passing 2 city/provinces. As one route, the same level of service quality of road shall be provided on entire route.<br>Therefore, the important policies/ functions/ specifications, which directly affect service quality of road, shall be unified on entire route, such as measures against climate change as all-weather road, road surface height, and cross-sectional lane elements.<br>Items from b-l are unified among provinces? | Unified on the whole route | No objection |
| b | O&M Cost | As O&M cost, budget shall be kept, especially for repairing of road planed height due to settlement by soft soil. | Put in the project cost | Please include into O&M plan. As the policy of road operation, it is important to be included. |
| c | Road grade | National highway Grade III road – plain<br>*Previously, NH61C was planned to be upgraded to “expressway” class, but the study team confirmed that the road class will be kept as “national highway” class | Grade III Road- plain in accordance with TCVN 4054:2005 | No objection |
| d | Design speed | V=80 km/h | V=80 km/h | No objection |
| e | Required Road Surface Height | As all-weather road<br>=> Road surface height shall be considered against climate change (as national highway: HWL4%,+ 25 years sea-level rise on RCP4.5 scenario)<br>=> The construction cost of raising road PH of existing lanes shall be included.<br>* Only embankment section will be raised, because difficult to raise PH at bridge section | Road surface height road takes climate change prevention into consideration for embankment section | No objection |
| f | Navigation Clearance | The required navigation clearance of the canal was considered for medium and small bridges, in accordance with standard TCVN 5664:2009. The HWL is assumed to be 5% for all medium and small bridges.<br>* In case of water surface is increased by climate change, the navigation clearance cannot be secured | Navigation clearance shall comply with TCVN 5664:2009 | No objection<br>* In case of water surface is increased by climate change, the navigation clearance can not be secured, because it is technically difficult and dangerous to raise PH of existing bridges. |
| G | Clearance of Roads | The clearance on crossroads were considered for the planning of medium and small bridges in accordance with related standards<br>TCVN 5729:2012, TCVN 4054:2005, and TCVN 10380:2014 | Clearance of roads shall comply with relevant standards TCVN 5729:2012, TCVN 4054:2005 and TCVN 10380:2014 | No objection |
| h | The total width (bridge) and the | Total width of existing lanes shall be same even after widening (keep 10.0m) * in draft Pre-F/S, different | Existing lanes shall be kept the same | No objection |

| | Pre-Input Points | Description | Reply by Can Tho city about Pre-F/S | Comments by JICA Study Team |
|---|---|---|---|---|
| | lane element of existing lanes | | | |
| i | Widening method of Superstructure | Separated | Separated superstructure | No objection |
| j | Clearance between new & old abutment | 20mm | Clearance between new and old abutment is agreed as 20 mm | No objection |
| k | Necessary mitigation measure of neighboring work (Pile foundation) | Need borehole wall protection.<br>CIP RC pile with full-casing method | Distance of pile foundation is designed to meet minimum pile distance | In neighboring construction of piles, there are only two measures that can be taken to mitigate the negative impact due to new pile construction on the existing structure.<br><br>[Method-1]: Method to secure 3 times the diameter of the new pile as the distance between the existing pile and the new pile.<br>[Mtehod-2]: Method of placing a physical protection wall (e.g., steel pipe casing) on the borehole wall during construction of new piles.<br><br>In the case of piles for piers, it is no problem to ensure the above minimum pile distance and to adopt above Method-1.<br><br>In the case of piles for bridge abutments, it is difficult to maintain the pile distance in Method-1 with 20 mm distance between the abutments. Even if the distance between abutments is extended by the required distance (more than 3 m), Method-1 is not recommended for the abutments due to the following disadvantages.<br>-Large earth retaining walls between abutments would be required.<br>-Since the new road alignment should be S-shaped due to the widening at the bridge section only, it would significantly reduce traffic safety and driving comfort as a national highway with a design speed of 80 km/h.<br>For this reason, Method-2 of installing a physical protection wall on the newly constructed pile, namely "Cast in place piles with full casing construction method" is recommended for the piles of piers. |

| | Pre-Input Points | Description | Reply by Can Tho city about Pre-F/S | Comments by JICA Study Team |
|---|---|---|---|---|
| | | | | The full casing construction method for the piles of piers should only be required for the following conditions<br>-Only during construction<br>-Only for new piles located within 3 times the diameter of the new pile from the existing pile |
| l | Soft soil treatment | Assumed soft soil treatment is included into work items and construction cost | The volume of soft soil treatment is estimated based on preliminary calculation | Please consider the measures to mitigate negative impact to existing structure by construction of new embankment.<br>In embankment section, it is necessary to select appropriate soft soil treatment method and procedures in considering negative impact to existing structures along new embankment construction. At first before embankment construction, initial settlement shall be accelerated without loading (construction of embankment). Then after finishing designated settlement, appropriate measures (in this JICA study, placing geogrid is recommended) to mitigate settlement of new construction shall be implemented. The unit rate shall be considered those construction cost. |

Source: The Study Team

**[Project Cost and O&M Cost]**

**[Project Cost]**

In the current project proposal, in accordance with the component change (additional 2-intersections), the investment cost was changed.

In this study, only clarification of changes and throwing comments had been conducted from technical viewpoints based on the revised project contents for NH61C: Can Tho section. Can Tho DOT did not provide drawings and detailed cost estimate sheets with draft Pre-F/S until the end of December 2022, so the review of the cost estimate was not conducted in this study.

**[O&M Cost]**

In accordance with the component change (additional 2-intersections), the O&M cost was changed and updated by the Study Team accordingly. In the updated cost, roughly “1 km” was added to the length of the project for additional 2-intersections.

The unit rate was as same as the pre-input study.

**Table 6.2.19 Cost Estimate of O&M Cost (NH61C Can Tho Section: 11.2km)**

| Item | Applied Value / Rates for **11.2km** in Can Tho | Reference |
|---|---|---|
| Operation Period | 30 years | Project Proposals |
| Routine Maintenance Work | ● 4-lanes: 168.6 million VND / km * **11.2 km** = 1,889 million VND/year | According to norms, each city / province estimated |
| Periodic Repair Work (including repair work due to settlement) | ● 4-lanes: 33,000 million VND/year | Collected recent 3 years actual cost from Can Tho city (15 billion VND/year for NH61C: **11.2 km** in Can Tho for 2-lanes) |
| Big Repairment Work (Every 15 years, big pavement repairment work is planned as 42 % of original asphalt pavement) | ● 4-lanes: 12,029 million VND / km * **11.2 km** = 135,000 million VND | No.37/2018/TT-BGTVT<br>*Unit rate of asphalt pavement: 14,320 million VND / km * 42 % = 6,014.4 million VND / km for 2-lanes |

Source: The Study Team

**Table 6.2.20 Estimated O&M Cost (NH61C Can Tho Section: 11.2km)**

Unit: million VND

| Can Tho | | | |
|---|---|---|---|
| NH61C | Length(inc.intersections) | | 11.2 km |
| | Routine maintenance | Periodic repair work | Big repairment work |
| | 169 mil.VND/km/year | 33000mil. VND for 11.2km | 12029mil. VND/km for 4-lanes |

| | Year | Routine maintenance | Periodic repair work | Big repairment work |
|---|---|---|---|---|
| | 2022 | | | |
| | 2023 | | | |
| | 2024 | | | |
| | 2025 | | | |
| | 2026 | | | |
| | 2027 | | | |
| 1 | 2028 | 1,889 | 33,000 | |
| 2 | 2029 | 1,889 | 33,000 | |
| 3 | 2030 | 1,889 | 33,000 | |
| 4 | 2031 | 1,889 | 33,000 | |
| 5 | 2032 | 1,889 | 33,000 | |
| 6 | 2033 | 1,889 | 33,000 | |
| 7 | 2034 | 1,889 | 33,000 | |
| 8 | 2035 | 1,889 | 33,000 | |
| 9 | 2036 | 1,889 | 33,000 | |
| 10 | 2037 | 1,889 | 33,000 | |
| 11 | 2038 | 1,889 | 33,000 | |
| 12 | 2039 | 1,889 | 33,000 | |
| 13 | 2040 | 1,889 | 33,000 | |
| 14 | 2041 | 1,889 | 33,000 | |
| 15 | 2042 | 1,889 | 33,000 | 135,000 |
| 16 | 2043 | 1,889 | 33,000 | |
| 17 | 2044 | 1,889 | 33,000 | |
| 18 | 2045 | 1,889 | 33,000 | |
| 19 | 2046 | 1,889 | 33,000 | |
| 20 | 2047 | 1,889 | 33,000 | |
| 21 | 2048 | 1,889 | 33,000 | |
| 22 | 2049 | 1,889 | 33,000 | |
| 23 | 2050 | 1,889 | 33,000 | |
| 24 | 2051 | 1,889 | 33,000 | |
| 25 | 2052 | 1,889 | 33,000 | |
| 26 | 2053 | 1,889 | 33,000 | |
| 27 | 2054 | 1,889 | 33,000 | |
| 28 | 2055 | 1,889 | 33,000 | |
| 29 | 2056 | 1,889 | 33,000 | |
| 30 | 2057 | 1,889 | 33,000 | 135,000 |

Source: The Study Team based on information from Can Tho DOT

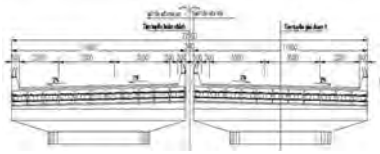
### 2) Hau Giang Section

The draft Pre-F/S was provided from Hau Giang Province in December 2022. The review by the Study Team was conducted as planned with reference to the pre-input study items from a) to m) in Table 6.2.21.

**Table 6.2.21 Review of Provided Draft Pre-F/S with Respect to Pre-input Points by JICA Study Team**

| No | Pre-Input Points | Pre-input Study Report Prepared by JICA Study Team | | Draft Pre-F/S Provided by Hau Giang Province | | Comments by JICA Study Team |
|---|---|---|---|---|---|---|
| | | Description | Reference | Description | Reference | |
| a | Unified Policies/ Functions/ Specifications through the Whole Route (Consistency among provinces) | NH61C is passing 2 city/province. As one route, the same level of service quality of road shall be provided on entire route. Therefore, the important policies/ functions/ specifications, which directly affect service quality of road, shall be unified on entire route, such as measures against climate change as all-weather road, road surface height, and cross-sectional lane elements. Items from b-i are unified among provinces. | 6.2.2.1) (g) (1) Unified Policies/ Functions/ Specifications for the Whole Route | N/A | N/A | It needs coordinate/cooperate well with Can Tho city to unify the important policies/ functions/ specifications through whole route. |
| b | The Role of NH61C (Policies of Plan / Design) | Both Can Tho city / Hau Giang province identified NH61C as: "All-weather road against climate change". Therefore, the appropriate PH of road shall be set as the condition | 6.2.2.1) (e) (1) The Role of NH61C (Policies of Plan/Design) | "in order to meet the needs of socio-economic development of localities, the Ministry of Transport issued a document supporting the policy of assigning the People's Committees of Can Tho city and Hau Giang province as the management agencies to invest in upgrading and widening NH 61C (2 lanes to 4 lanes). It is funded by loan for promoting sustainable development of the Mekong Delta in the direction of effectively adapting to climate change." | 1.1.Project introduction | The policy that "NH61C will be adapting climate change" is confirmed.<br>Further description is refer to "item f". |
| c | O&M Cost | As O&M cost, budget shall be kept, especially for repairing of road planed height due to settlement by soft soil. | 6.2.2.1) (f) (5) Operation and Maintenance Plan and Cost | N/A | N/A | Include into O&M plan. As the policy of road operation, it is important to be included. |
| d | Road grade | National highway Grade III road – plain<br>*Previously, NH61C was planned to be upgraded to "expressway" class, but the study team | 6.2.2.1) (e) (3) Road Classification and Design Specifications | Grade III plain road according to TCVN 4054-2005 | 1.6. Construction scope of work: | No objection |

| No | Pre-Input Points | Pre-input Study Report Prepared by JICA Study Team | | Draft Pre-F/S Provided by Hau Giang Province | | Comments by JICA Study Team |
|---|---|---|---|---|---|---|
| | | Description | Reference | Description | Reference | |
| | | confirmed that the road class will be kept as “national highway” class | | | | |
| e | Design speed | V=80 km/h | Ditto | design speed of 80km/h | 6.6.2.1. Current status of the road connecting Can Tho - Hau Giang (NH 61C)<br>10.1.2.Technical standards | No objection |
| f | Road Surface Height &<br>The measure against climate change | As all-weather road<br>=> Road surface height shall be considered against climate change (as national highway: HWL4%,+ 25 years sea-level rise on RCP4.5 scenario)<br>=> The construction cost of raising road PH of existing lanes shall be included.<br>* Only embankment section will be raised, because difficult to raise PH at bridge section | - 6.2.2.1) (e) (1) The Role of NH61C (Policies of Plan/Design)<br>- 6.2.2.1) (e) (4) Road Surface Height<br>- 6.2.2.1) (f) (1) Study on Measures against Climate Change on Existing Lanes | [in 6.6.1.2.]<br>in order to more accurately assess the impact of sea level rise on Hau Giang province, Scenario RCP4.5 in two coastal areas is (VI) Coastal area from Cape Ke Ga to Cape Ca Mau and (VII) The coastal area from Cape Ca Mau to Kien Giang is used, specifically as follows:<br>[in 10.2.2.]<br>The shoulder elevation is at least 0.5m higher than the calculated water level with a frequency with H=1% (taking into account the effects of climate change and sea level rise), and the bottom of pavement structure is at least 0.5m higher than standing water level. | 6.6.1.2. Building infrastructure systems for climate change adaption<br>10.2.2. Elevations of control points along the route | - The scenario RCP4.5 by MONRE is confirmed<br>- The calculated water level with a frequency with H = 1% for appropriate design level of stage 1 (expressway standard). The water level H1% shall be compared with H4%+25 years sea-level rise on RCP4.5 scenario and existing embankment/pavement level for selection of appropriate water level for design.<br>- Raising PH of existing lanes shall be mentioned as scope of work. |
| g | Navigation Clearance | The required navigation clearance of the canal was considered for medium and small bridges, in accordance with standard TCVN 5664:2009. The HWL is assumed to be 5% for all medium and small bridges.<br>* In case of water surface is increased by climate change, the navigation clearance can not be | 6.2.2.1) (e) (5) Clearance<br>(i) Navigation Clearance (Inland Waterway under Bridges) | TCVN 5664:2009<br>+Navigation clearance under bridge: in line with river grading and clearance of the existing bridge. | 3.1. Applicable standards and regulations<br>7.2.1.3. Bridge<br>10.2.3.2. Bridge | No objection<br>* In case of water surface is increased by climate change, the navigation clearance can not be secured, because it is technically difficult and dangerous to raise PH of existing bridges. |

| No | Pre-Input Points | Pre-input Study Report Prepared by JICA Study Team | | Draft Pre-F/S Provided by Hau Giang Province | | Comments by JICA Study Team |
|---|---|---|---|---|---|---|
| | | Description | Reference | Description | Reference | |
| | | secured | | | | |
| h | Clearance of Roads | The clearance on crossroads were considered for the planning of medium and small bridges in accordance with related standards<br>TCVN 5729:2012, TCVN 4054:2005, and TCVN 10380:2014 | 6.2.2.1) (e) (5) Clearance<br>(ii) Clearance of Roads | -TCVN 4054:2005,<br>-TCVN 10380:2014<br>- +Vertical clearance for road under the bridge: in line with clearance of the existing bridge. | 3.1. Applicable standards and regulations<br>7.2.1.3. Bridge<br>10.2.3.2. Bridge | No objection |
| i | The total width (bridge) and the lane element of existing lanes | Total width of existing lanes shall be same even after widening (keep 10.0m: effective width, total width: 11.0m) | 6.2.2.1) (f) (3) Widening Method/Structure Type (Bridge Section)<br>(ii) Study on Respective Structure Part<br>a) Superstructure | The scale of the cross-section of the bridge section in the complete phase from the intersection with Can Tho at Km10+200 to Ba Lien Canal): Keep the existing bridges of phase 1 with 11m width, build a similar unit and 50cm apart, in which:<br>Carriageway width:<br>Bm = 2 x 2 x 3.50m = 14.0m<br>Safety lane: Bs = 2 x 0.5m = 1.0m<br>Non-motorized lane: Bnm = 2x 2.5m = 5.0m<br>Railing: Br = 2 x 2 x 0.5m = 2.0m<br>  ge | 7.2.1.3. Bridge<br><br>10.2.3.2. Bridge (as same as 7.2.1.3.) | No objection |
| j | Widening method of Superstructure | Separated | Ditto | Cross-section dimension of the twin bridges in the Completion phase: the first of the twin bridges was built in Phase 1 with the width of 11m. Total (complete) cross-section of the twin bridges is according to the planning (Section from the intersection with Can Tho at Km10+200 to Ba Lien canal), B=22.5m. | 10.2.6.1. The scope of work in construction<br><br>(it can be confirmed in 7.2.1.3. and 10.2.3.2. Bridge too) | No objection |
| k | Clearance between new & | 20mm | 6.2.2.1) (f) (3) Widening | N/A | N/A | The clearance/distance between new and old abutments is not mentioned in the draft Pre-F/S. |

| No | Pre-Input Points | Pre-input Study Report Prepared by JICA Study Team | | Draft Pre-F/S Provided by Hau Giang Province | | Comments by JICA Study Team |
|---|---|---|---|---|---|---|
| | | Description | Reference | Description | Reference | |
| | existing abutments | | Method/Structure Type (Bridge Section)<br>(ii) Study on Respective Structure Part<br>b) Substructure | | | "20mm" can be recommended because of following reasons:<br>For construction of "abutment", If there is gap/distance, new concreting works need form work and scaffolding between existing and new structure. Since abutments require the same width as the superstructure width from the top to the pile cap of abutment (see Figure 6.2.8), it is difficult to keep distance for construction between the new and existing structures as same as pier case (see Figure 6.2.7). On the conditions, the idea utilizing existing abutment as form of new concreting work seems reasonable (excellent constructability).<br>Therefore, a comparison was carried out between the following alternatives (see Table 6.2.10):<br>Alternative1: The existing and new abutments are "in contact" (positive point: workability)<br>Alternative2: The existing and new abutments are "separated" (positive point: to minimize the structure width).<br><br>As additional explanation of alternative 1 "in contact" means "contacting each other, but structurally separated". The existing and new abutments should not be unified by connection of rebar or PC tendon, because the structural behavior of a unified abutment of new and existing is complicated and may have negative effects on each abutment. Alternative 1 above is a plan to construct the existing and new abutments in contact with each other through 20 mm joint, rather than unifying these. |
| I | Necessary mitigation measure of | Need borehole wall protection. CIP RC pile with full-casing method | 6.2.2.1) (f) (3) Widening Method/Structure | +Abutment foundation structure: bored piles with diameter from 1.0 m to 1.5 m can be used to limit the influence on existing bridge during | 10.2.6.3. Substructure | In neighboring construction of piles (Abutment Foundation Structure), there are only two measures that can be taken to mitigate the negative impact due to new |

| No | Pre-Input Points | Pre-input Study Report Prepared by JICA Study Team | | Draft Pre-F/S Provided by Hau Giang Province | | Comments by JICA Study Team |
|---|---|---|---|---|---|---|
| | | Description | Reference | Description | Reference | |
| | neighboring work (Pile foundation) | | Type (Bridge Section)<br>(ii) Study on Respective Structure Part<br>c) Foundation | construction.<br><br>[The following is NOT pre-inputted item, but important information]<br>+For bridges with 3 or more spans, it is recommended to build RC pile slab, using square RC piles (30x30cm, 35-35cm) or prestressed RC D400 piles, driven or pressed. | | pile construction on the existing structure.<br><br>[Method-1]: Method to secure 3 times the diameter of the new pile as the distance between the existing pile and the new pile.<br>[Mtehod-2]: Method of placing a physical protection wall (e.g., steel pipe casing) on the borehole wall during construction of new piles.<br><br>In the case of piles for piers, it is no problem to ensure the above minimum pile distance and to adopt above Method-1.<br><br>In the case of piles for bridge abutments, it is difficult to maintain the pile distance in Method-1 with 20 mm distance between the abutments. Even if the distance between abutments is extended by the required distance (more than 3 m), Method-1 is not recommended for the abutments due to the following disadvantages.<br>-Large earth retaining walls between abutments would be required.<br>-Since the new road alignment should be S-shaped due to the widening at the bridge section only, it would significantly reduce traffic safety and driving comfort as a national highway with a design speed of 80 km/h.<br>For this reason, Method-2 of installing a physical protection wall on the newly constructed pile, namely "Cast in place piles with full casing construction method" is recommended for the piles of piers.<br><br>The full casing construction method for the piles of piers should only be required for the following conditions |

| No | Pre-Input Points | Pre-input Study Report Prepared by JICA Study Team | | Draft Pre-F/S Provided by Hau Giang Province | | Comments by JICA Study Team |
|---|---|---|---|---|---|---|
| | | Description | Reference | Description | Reference | |
| | | | | | | -Only during construction<br>-Only for new piles located within 3 times the diameter of the new pile from the existing pile<br><br>[Comments for NOT pre-inputted item]<br>The piled slab structure is an effective means of preventing the settlement of the road on the embankment behind the abutment. However, it is recommended that physical protection, such as steel sheet piles, is installed between the new abutment foundation or existing piled slab and the new piled slab by spun-pile to reduce the negative impact for neighboring structures. |
| m | Soft soil treatment | Assumed soft soil treatment is included into work items and construction cost | 6.2.2.1) (f) (4) Widening Method/Structure Type (Embankment Section) | +The planned road mainly passes through muddy areas, so measures should be taken to reduce settlement of the roadbed, and ensure stability.<br><br>+Commonly used soft soil treatment solutions | 10.2.5.2. Roadbed treatment<br><br>10.3. Technical and quality requirements | Consider the measures to mitigate negative impact to existing structure by construction of new embankment. In embankment section, it is necessary to select appropriate soft soil treatment method and procedures in considering negative impact to existing structures along new embankment construction. At first before embankment construction, initial settlement shall be accelerated without loading (construction of embankment). Then after finishing designated settlement, appropriate measures (in this JICA study, placing geogrid is recommended) to mitigate settlement of new construction shall be implemented. The unit rate shall be considered those construction cost. |

Source: The Study Team

### 3) [Review of Cost Estimate and O&M Cost]

**[Review of Cost Estimate]**

The review of cost estimate in the draft Pre-F/S provided by Hau Giang Province included the following:

- 1. Review of Quantity
- 2. Review of Unit-rates
- 3. Result of Review

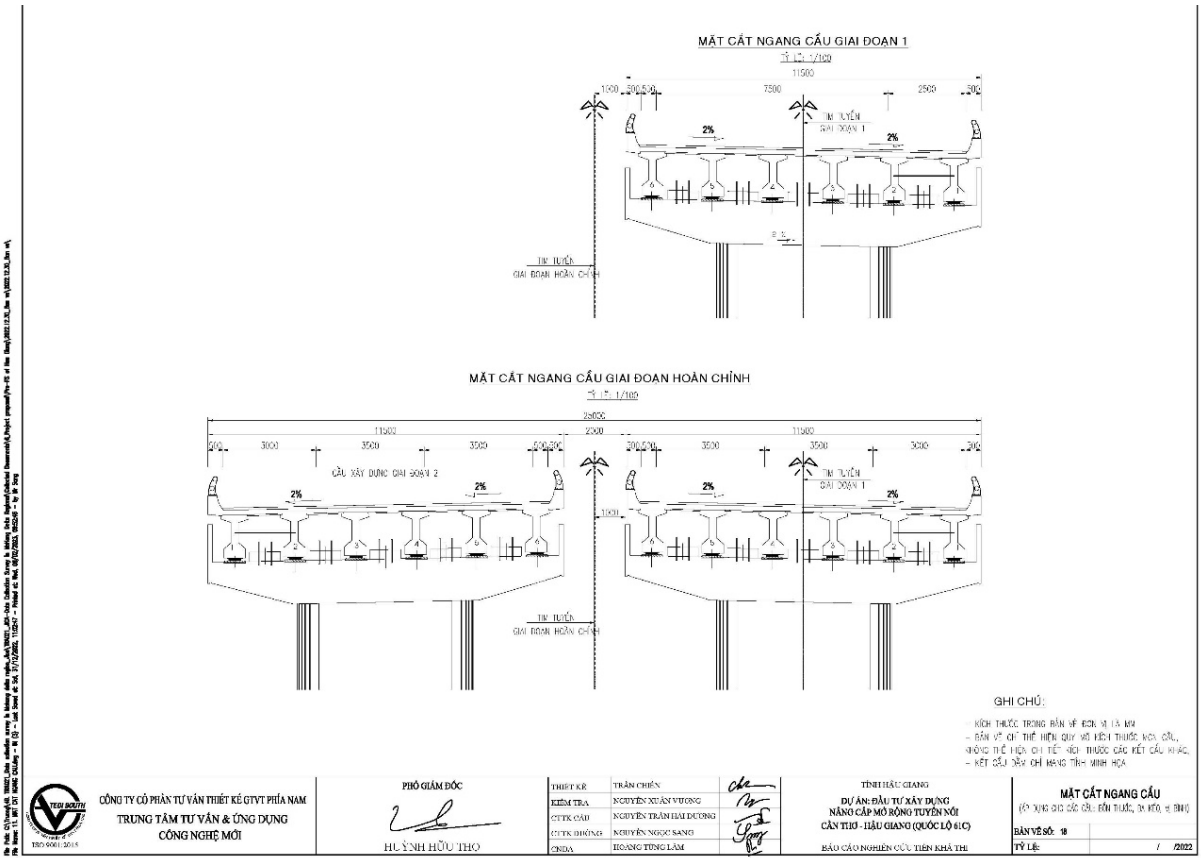
**1. Review of Quantity**

Based on the drawings in the draft Pre-FS, the following three items were detected to be adjusted in terms of quantity for cost estimate:

**1.1. Difference in width of bridges**

A discrepancy between drawings and cost estimates has been found for some bridges.

The width of “Bon Thuoc,” “Ba Keo,” and “Vi Binh” bridges is 11.5 m in the drawings as shown in Figure 6.2.14. On the other hand, the width in cost estimate in draft Pre-F/S is 11.0 m. “11.5 m” was considered an appropriate value for cost estimate by the Study Team. The difference in quantity and cost is shown in Table 6.2.22 as the cost impact.




Source: Draft Pre-F/S provided by Hau Giang Province

**Figure 6.2.14 Cross-section of Bon Thuoc, Ba Keo, and Vi Binh Bridges**

**1.2. Not appropriate taken quantity according to actual situation**

**The work item “Lo Da bridge” shall be removed** from the cost, because this bridge has

been already widened (as built) in past as mentioned in "Sub-Item 7.2.1.3. Bridge" in the draft Pre-FS report. The difference of cost is shown in Table 6.2.22.

### 1.3. Discrepancy with design (number of pile slab is different)

A discrepancy was found between the drawings and cost estimate of pile slab.

In the drawing, 26 bridges are designed with pile slab. However, in the cost estimate, 28 bridges are counted with pile slab. The appropriate number for cost estimate by the Study Team was "26 numbers of bridges with pile slab." The difference in quantity and cost is shown in Table 6.2.22.

Apart from the checking cost estimate, one technical point of plan / design was found, which is the technical judgement / classification of application of pile slab. The total number of bridges in Hau Giang Province is 34, but only 26 are planned with pile slab.

### 1.4. Duplicated Count of Work Contents

The estimated cost of "Section II. 4 Drainage system" and "Section V: Traffic safety" which were separately counted into the total cost should be deleted.

According to Decision No. 610/QD-BXD dated 13 July 2022, the construction investment cost per 1 km of "highway" includes the necessary costs for construction: "embankment, pavement, traffic safety system, ditch, culvert, etc." Therefore, "Section II.4 Drainage system" and "Section V: Traffic safety" shall be deleted in the total cost.

The estimated deducted amount is shown in Table 6.2.22.

**Table 6.2.22 Cost Difference (Result of Review of Quantity)**

| Item | | Unit Rate in the Draft Pre-F/S (1) | Quantity | | Cost (mil. VND) | | Difference (mil. VND) (6) = (5) – (4) |
|---|---|---|---|---|---|---|---|
| | | | Draft Pre-F/S (2) | Revised (3) | Draft Pre-F/S (4) = (1)*(2) | Revised (5) = (1)*(3) | |
| 1.1 Difference of width of bridges | Bon Thuoc Bridge | 31.38 (mil.VND/m2) | 495(m2) | 517 (m2) | 15,746.27 | 16,462.01 | +715.74 |
| | Ba Keo Bridge | 31.38 (mil.VND/m2) | 495(m2) | 517 (m2) | 15,746.27 | 16,462.01 | +715.74 |
| | Vi Binh Bridge | 36.23 (mil.VND/m2) | 803 (m2) | 839 (m2) | 29,649.90 | 30,997.62 | +1,347.72 |
| 1.2 Not appropriate taken quantity according to actual situation | Lo Da Bridge | 31.38 (mil.VND/m2) | 1 (set) | 0 (set) | 17,495.85 | 0 | -17,495.85 |
| 1.3 Discrepancy with design (Number of pile slab) | | 7524.00 (mil. VND / 1 set of pile slab) | 28 (set) | 26 (set) | 210,672.00 | 195,624.00 | -15,048.00 |
| 1.4. Duplicated Count of Work Contents | Drain system | 153,780.00 (mil. VND / LS) | 1 | 0 | 153,780.00 | 0 | -153,780.00 |
| | Traffic safety system | 16,533.99 (mil. VND / LS) | 1 | 0 | 16,533.99 | 0 | -16,533.99 |
| Total | | - | - | - | 459,624.28 | 259,545.64 | -200,078.64 |

Source: The Study Team

## 2. Review of Unit-rates

The unit rates of construction costs in the total investment were determined by the Study Team in accordance with current regulations and unit rates of other similar works for estimation work as follows:

- Decision No. 610/QD-BXD dated 13 July 2022, announcing the construction investment capital rate and the general construction price of structural parts in 2021.
- Investment unit cost of some work items refers to similar works.
- Inquiring quotation for “full-casing method of RC CIP pile.”
- Construction norm, unit price of construction labor, unit price of construction machine shift in Hau Giang province in 2022.
- Notice of price of construction materials in Hau Giang province in 2022.

Checked points and some findings are explained as follows:

### 2.1. Measures against climate change (PH of widened and existing lanes)

**[Widened lanes]**

Unit cost of new embankment section according to construction norm is not classified depending on embankment height. However, basically the unit rate of embankment section contains sufficient volume of works of embankment. JICA study team assumed that the unit rate by norms can will be sufficient because the expected PH considering climate change is approximately 15cm. In future project stage, the height of embankment (considering climate change) shall be designed based on accurate topographic survey result.

**[Existing lanes]**

As the role of NH61C, the cost of “raising up PH of existing lanes” shall be included to perform the all-weather road adopting water level rise due to climate change.

In the cost estimate of the draft Pre-F/S, the cost was considered “by increasing the quantity of aggregate base” on existing lanes. As actual works, 70 cm: aggregate base + 12cm: asphalt concrete was taken into account for raising PH. Therefore, raising 70 cm of PH is planned compared to the assumption of 45 cm by the Study Team (= 15cm for climate change+30cm for repair work of existing settlement).

### 2.2. Soft soil treatment

Generally known, thick soft soil layer is distributed all over MDR. It is necessary to apply soft soil treatment for the embankment section of the road project.

The applied unit cost “24,2 bil. VND/km” for soft soil treatment was evaluated as reasonable compared to the unit rate “26.7 bil. VND/km” in a similar project in MDR. In the case of the other project, Cement Deep Mixing Method (CDM) was applied with the condition “high embankment H>5.5m” and “short construction period”. For NH61C, the condition will not be as same as the referenced project. Actually, in initial stage (existing lanes) of NH61C, only Prefabricated Vertical Drain (PVD), Sand Drain (SD) were applied. In the draft Pre-Fs report, only PVD and SD for soft soil treatment were applied. That is the reason that a slightly lower unit rate can be acceptable compared to the other project unit rate.

However, the Study Team could not identify if it was included or not that “the mitigation measure of negative impact to existing structure by new embankment” into the unit rate

(generally included with measures above, thus it might be included). In the pre-input study by the Study Team, “placing geogrid (geo-textile sheet) on the ground surface” was recommended. To mitigate the negative impact to neighbouring structures, appropriate measure shall be considered and taken into project cost account.

### 2.3. RC CIP piles by full-casing method

To mitigate the negative impacts to existing structures by newly construction of foundation piles, “RC CIP piles by full-casing method” was recommended in the pre-input study by study team.

The Study Team identified that the applied unit rate in the draft Pre-F/S is in accordance with norms. Therefore, the Study Team evaluated that the unit rate of bridges shall include / apply “full-casing method” into the cost. To determine the cost for “full-casing method,” the Study Team inquired quotation from a contractor.

Based on the quotation, the additional cost of applying full-casing method is estimated at 1,650 million VND/bridge. In total, 54,450 million VND shall be added for the 33 bridges in Hau Giang section.

The conditions to get a quotation were as follows:

- Number of bridges: 40 bridges (7 in Can Tho, 33 in Hau Giang)
- Foundation: average 50 m of RC CIP, 6 piles on one abutment
- Application of full-casing method:
  - two piles among six piles for an abutment, and
  - two abutments for one bridge.

For one abutment, at least the nearest new two piles (among six piles) to existing piles (within 3D) shall be constructed with some protection/countermeasures to protect the bore-hole wall of CIP piles.

The cost of countermeasures shall be included in the construction cost for safety construction and mitigation of negative impact on the existing structure as an ODA project.

### 2.4. Possibility of cost deduction for asphalt concrete

In the draft Pre-FS, asphalt concrete cost was calculated according to the asphalt concrete price in the notice of Hau Giang Province.

However, asphalt concrete cost is basically reasonable if mass production is expected at site. Practically, in some projects in the Hau Giang Province, asphalt concrete cost is determined on the basis of mixing plant at the construction site (with investigation and survey of the project's construction material).

The comparison of unit rates “notice of Hau Giang Province” and “other project reference unit rate as production by own batching plant at site” is shown in Table 6.2.23. Based on the comparison, if the volume of asphalt concrete is more than 700 tons, the total cost of asphalt concrete is estimated more economical (considering the installation cost (roughly 500 mil VND] of batching plant at site).

In the Hau Giang section, 112,000 tons of asphalt concrete will be required. Therefore, it is recommended to install its batching plant at site for such mass production of asphalt concrete. The difference between unit rate and the cost is shown in Table 6.2.24.

**Table 6.2.23 Comparison of Asphalt Concrete Unit Rate**

| Item | Unit price of asphalt concrete (mil.VND/ton) | |
|---|---|---|
| | Concrete C12.5 | Concrete C19 |
| Unit Rate (Notice of Hau Giang province) | 1.770 | 1.750 |
| Reference Unit Rate according to Hau Giang-Ca Mau expressway project (Oct.2022) (Production by Own Batching Plan at site) | 1.090 | 1.052 |

Source: The Study Team

**Table 6.2.24 Cost Difference (Result of Review of Unit Rate)**

| Item | Unit Rate | | Quantity | Cost (mil. VND) | | Difference (mil. VND) (6) = (5) – (4) |
|---|---|---|---|---|---|---|
| | Draft Pre-F/S (1) | Revised (2) | Draft Pre-F/S (3) | Draft Pre-F/S (4) = (1) * (3) | Revised (5) = (2) * (3) | |
| 2.3. RC CIP piles by full-casing method | - | 1,650 (mil. VND / bridge) | 33 (bridges) | - | 54,450.00 | + 54,450.00 |
| 2.5 Possibility of cost deduction for asphalt concrete | 1.770 (mil. VND / ton) | 1.090 (mil. VND / ton) | 47,391.62 (ton) | 83,883.17 | 51,656.87 | - 32,226.30 |
| | 1.750 (mil. VND / ton) | 1.052 (mil. VND / ton) | 64,984.20 (ton) | 113,722.4 | 68,363.38 | - 45,358.97 |
| Total | - | - | - | 197,605.5 | 174,470.20 | -23,135.27 |

Source: The Study Team

### 3. Result of Review

The result of review of the cost estimate is shown in Table 6.2.25. Even though the total cost was evaluated lower than draft Pre-F/S, every item, especially added in this review, shall be taken into consideration as the work items for safety and smooth construction as the ODA project.

**Table 6.2.25 The Result of Review of Cost Estimate**

Unit: billion VND

| Item | Draft Pre-FS (1) | Reviewed Cost by JICA Study Team (2) | Difference: (2) - (1) |
|---|---|---|---|
| 1.Land acquisition and re-settlement | 573.85 | 573.85 | 0 |
| 2. Construction cost | 3,093.56 | 2,849.32 | - 244.24 |
| 3.Project management cost, Consultancy cost, Others | 333.81 | 308.13 | - 25.68 |
| 4.Contingencies | 600.18 | 559.70 | - 40.48 |
| **Total investment cost** | **4601.40** | **4291.00** | **- 310.40** |

Source: The Study Team

# 7. Implementation Considerations on the Target Projects

## 7.1. Economic Analysis and Evaluation Indicators

### 7.1.1. Economic Analysis

This section analyzes the validity of the project. The economic internal rate of return (EIRR) is calculated and analyzed to determine the validity of the project in terms of economic benefits relative to the investment costs. A comparison of the benefits and costs of the cases with and without project is carried out for the analysis of the target project. The economic analysis will be completed by calculating EIRR, net present value (NPV), and benefit cost ratio (B/C).

**1) Basic Assumption**

a) IPC and NH61C (Can Tho section and Hau Giang Province section) were analyzed as one project.

b) Initial investment costs were referred to as follows. Initial investment costs include land acquisition, resettlement and compensation, and consulting fees.

Can Tho City: The Project Proposal (Ref. 3192/TTr-SGTVT) submitted on 9 November 2022, by DOT

Hau Giang Province: The draft pre-F/S was prepared by the province, and then shared with JICA on 28 December 2022. The initial investment costs from the Study Team's review in the table 6.2.25 "The Result of Review of Cost Estimate" of this report were used.

c) The Study Team estimated the O&M cost and verified it with Can Tho City and Hau Giang Province.

d) Inflation is not considered in cost and benefit.

e) Social discount rate of 10% is applied. The Study Team verified it with the city and province.

**2) Initial Investment and O&M Costs**

Project cost is shown in the figure below, and O&M costs are detailed in Chapter 6.

**Table 7.1.1 Approximate Project Cost**

(Unit: billion VND)

| Item | IPC *1 | NH61C (Can Tho) *1 | NH61C (Hau Gaing) *2 |
|---|---|---|---|
| 1. Preparation cost (land, resettlement, etc.) | 845.21 | 123.7 | 573.85 |
| 2. Construction cost | 2,851.51 | 1,210.2 | 2,849.32 |
| 3. Project management (consulting service, etc.) | 427.73 | 145.7 | 308.13 |
| 4. Contingency (physical contingency) | 412.45 | 203.4 | 559.70 |
| Total investment cost | **4,536.9** | **1,683.0** | **4,291.0** |

Source: *1 Submission Letter Ref.: 3192 /TTr-SGTVT. Proposal on Project for Mekong Delta Transport Network Development to adapt to Climate Change in Can Tho City – Project 1 (Upgrading and expanding National Highway 61C, section passing Can Tho city and Road connecting O Mon district, Thoi Lai district, Can Tho city with Giong Rieng district, Kien Giang province (section through Can Tho city) under the DPO program. Can Tho City DOT. November 9, 2022.
*2 Table 6.2.25 "The Result of Review of Cost Estimate" in Chapter 6 of this report.

**Table 7.1.2 O&M Cost**

(Unit: million VND)

| Item | IPC *1 | NH61C (Can Tho) *2 | NH61C (Hau Gaing) *1 |
|---|---|---|---|
| O&M Cost for the project life | 3,193,600 | 1,316,659 | 2,805,456 |

Source: The Study Team

### 3) Methodology of Economic Analysis

The economic benefit is calculated from the reduction in vehicle operating cost (VOC) and travel time cost (TTC). The impact of the project on the transportation network was calculated for 2030 and 2050 as a result of the traffic demand forecast. The economic benefit other than the forecast years was estimated using the interpolation method.

The project is set to begin construction in 2025 and be completed and placed in service in 2027, with a project life of 30 years and a residual value of zero.

The traffic demand forecast for the years 2030 and 2050 is detailed in Chapter 5.

**Table 7.1.3 Traffic Demand Forecast for IPC Project**

| Year | | 2030 | 2050 |
|---|---|---|---|
| Length (km) | | | 27.2 |
| Traffic Volume (PCU / day) | Private | 23,800 | 26,500 |
| | Public | 2,900 | 4,700 |
| | Freight | 18,200 | 12,600 |
| | **Total** | **44,900** | **43,800** |

Source: The Study Team

**Table 7.1.4 Traffic Demand Forecast for NH61C Project**

| Year | | 2030 | 2050 |
|---|---|---|---|
| Length (km) | | | 48.4 |
| Traffic Volume (PCU / day) | Private | 20,900 | 33,000 |
| | Public | 1,800 | 2,800 |
| | Freight | 800 | 8,700 |
| | Total | 23,500 | 44,500 |

Source: The Study Team

**Table 7.1.5 Economic Benefit (VOC & TTC)**

(Unit: USD)

| VOC/TTC per day | 2030 | 2050 |
|---|---|---|
| Total VOC | 672,320.5 | 397,476.7 |
| Total TTC | 1,066,452.8 | 891,882.4 |

Source: The Study Team

The daily benefit was multiplied by 365 days and converted at 25,128 dong per dollar to calculate the economic benefit per year for the years 2030 and 2050.

### 4) Result of Economic Analysis

Based on the estimated costs and economic benefits, the cost benefit analysis was made and the calculation results are summarized in Table 7.1.6. The details of cash flow of the cost benefit analysis are shown in Table 7.1.7.

If the EIRR is greater than the social discount rate, the investment in the project is usually considered reasonable, and the project is approved from an economic evaluation perspective. The benefit cost ratio (B/C) is the ratio of total benefits to total project costs. The benefit cost ratio, like the EIRR, is an indicator of the economic efficiency of the project, and if the benefit cost ratio is greater than the value of one, the project is assumed to be feasible.

As Table 7.1.6 shows, EIRR is higher than the 10% social discount rate in Vietnam. B/C is over the value of one and NPV is also positive. The NPV calculated in the same way also shows a positive value, indicating the appropriateness of the project. As a result of the economic analysis, all of the evaluation indicators indicate the appropriateness of the project.

**Table 7.1.6 Summary Result of Cost Benefit Analysis**

| Indicator | Value |
|---|---|
| EIRR | 13.8% |
| B/C (at 10% discount rate) | 1.2 |
| NPV (million VND at 10% discount rate) | 25,789,317 |

Source: The Study Team

**Table 7.1.7 Cash Flow of the Economic Analysis**

(Unit: million VND)

| | Cost | | | Benefit | | | Benefit-Cost |
|---|---|---|---|---|---|---|---|
| Year | Construction Cost | O&M | Subtotal | TTC | VOC | Subtotal | |
| 2025 | 31,532,370 | 0 | 31,532,370 | 0 | 0 | 0 | -31,532,370.0 |
| 2026 | 31,532,370 | 0 | 31,532,370 | 0 | 0 | 0 | -28,379,133.0 |
| 2027 | 31,532,370 | 0 | 31,532,370 | 0 | 0 | 0 | -25,541,219.7 |
| 2028 | 10,510,790 | 183,190 | 10,693,980 | 6,499,106 | 10,309,056 | 16,808,162 | 9,012,250.0 |
| 2029 | 0 | 183,190 | 183,190 | 6,330,534 | 10,041,663 | 16,372,198 | 16,189,007.4 |
| 2030 | 0 | 183,190 | 183,190 | 6,166,335 | 9,781,206 | 15,947,542 | 15,764,351.4 |
| 2031 | 0 | 183,190 | 183,190 | 6,006,395 | 9,694,172 | 15,700,567 | 15,517,376.8 |
| 2032 | 0 | 183,190 | 183,190 | 5,850,604 | 9,607,912 | 15,458,516 | 15,275,325.2 |
| 2033 | 0 | 183,190 | 183,190 | 9,522,420 | 5,698,853 | 15,221,273 | 15,038,082.0 |
| 2034 | 0 | 183,190 | 183,190 | 9,437,688 | 5,551,038 | 14,988,726 | 14,805,535.6 |
| 2035 | 0 | 183,190 | 183,190 | 9,353,710 | 5,407,057 | 14,760,768 | 14,577,577.1 |
| 2036 | 0 | 183,190 | 183,190 | 9,270,480 | 5,266,811 | 14,537,291 | 14,354,100.4 |
| 2037 | 0 | 183,190 | 183,190 | 9,187,990 | 5,130,202 | 14,318,192 | 14,135,001.9 |
| 2038 | 0 | 183,190 | 183,190 | 9,106,234 | 4,997,137 | 14,103,371 | 13,920,180.7 |
| 2039 | 0 | 183,190 | 183,190 | 9,025,206 | 4,867,523 | 13,892,729 | 13,709,538.4 |
| 2040 | 0 | 183,190 | 183,190 | 8,944,898 | 4,741,271 | 13,686,169 | 13,502,979.0 |
| 2041 | 0 | 183,190 | 183,190 | 8,865,305 | 4,618,294 | 13,483,599 | 13,300,408.8 |
| 2042 | 0 | 1,093,190 | 1,093,190 | 8,786,421 | 4,498,506 | 13,284,927 | 12,191,736.6 |
| 2043 | 0 | 183,190 | 183,190 | 8,708,238 | 4,381,826 | 13,090,064 | 12,906,873.4 |
| 2044 | 0 | 183,190 | 183,190 | 8,630,751 | 4,268,172 | 12,898,923 | 12,715,732.2 |
| 2045 | 0 | 183,190 | 183,190 | 8,553,954 | 4,157,465 | 12,711,419 | 12,528,228.5 |
| 2046 | 0 | 183,190 | 183,190 | 8,477,840 | 4,049,631 | 12,527,470 | 12,344,279.5 |
| 2047 | 0 | 183,190 | 183,190 | 8,402,403 | 3,944,593 | 12,346,995 | 12,163,804.8 |
| 2048 | 0 | 183,190 | 183,190 | 8,327,637 | 3,842,279 | 12,169,916 | 11,986,725.8 |
| 2049 | 0 | 183,190 | 183,190 | 8,253,537 | 3,742,620 | 11,996,156 | 11,812,965.8 |
| 2050 | 0 | 183,190 | 183,190 | 8,180,096 | 3,645,545 | 11,825,641 | 11,642,450.2 |
| 2051 | 0 | 183,190 | 183,190 | 8,107,308 | 3,550,988 | 11,658,296 | 11,475,105.8 |
| 2052 | 0 | 183,190 | 183,190 | 8,035,168 | 3,458,884 | 11,494,052 | 11,310,861.8 |
| 2053 | 0 | 183,190 | 183,190 | 7,963,670 | 3,369,169 | 11,332,839 | 11,149,648.6 |
| 2054 | 0 | 183,190 | 183,190 | 7,892,809 | 3,281,780 | 11,174,589 | 10,991,398.6 |
| 2055 | 0 | 183,190 | 183,190 | 7,822,577 | 3,196,659 | 11,019,236 | 10,836,045.8 |
| 2056 | 0 | 183,190 | 183,190 | 7,752,971 | 3,113,745 | 10,866,716 | 10,683,525.8 |
| 2057 | 0 | 1,093,190 | 1,093,190 | 7,683,984 | 3,032,982 | 10,716,966 | 9,623,775.7 |
| Total | 105,107,900.0 | 7,315,714.8 | 112,423,614.8 | 245,146,269.1 | 155,247,040.7 | 400,393,309.8 | 300,012,151.0 |
| NPV | | | 87,095,662.7 | | | 103,798,339.0 | 25,789,317.2 |

| | |
|---|---|
| EIRR | **13.75%** |
| NPV | 25,789,317 |
| B/C | 1.2 |

Source: The Study Team

#### 5) Sensitivity Analysis

The estimation of benefit for this project is based on the assumed 30 years project life. Although future forecast is made on the premises presumed most suitable at the time of estimation, the actual benefit could still be either larger or smaller than estimated. Costs may also increase or decrease from the estimated costs, such as project preparation costs, exchange rate fluctuations, etc. If these unpredicted cases happen, figures in the previous result should change. For these unpredicted cases, sensitivity study is made when the demand (benefit) and the project cost vary between -20% and +20%. As the results of the sensitivity analysis in Table 7.1.8 show, even when costs increased by 20% and benefits decreased by 20%, the EIRR was slightly above tant the social discount rate, but the benefit cost ratio became 0.98.

**Table 7.1.8 Sensitivity of Economic Analysis**

| (Unit: %) | | Cost | | | | |
|---|---|---|---|---|---|---|
| | | 20% Decrease | 10% Decrease | Base Case | 10% Increase | 20% Increase |
| Benefit | 20% Increase | 17.8 | 15.8 | 14.2 | 12.8 | 12.0 |
| | 10% Increase | 17.5 | 15.6 | 14.0 | 12.6 | 11.4 |
| | Base Case | 17.2 | 15.3 | 13.8 | 12.4 | 11.3 |
| | 10% Decrease | 16.9 | 15.1 | 13.6 | 12.3 | 11.1 |
| | 20% Decrease | 16.7 | 14.9 | 13.4 | 12.1 | 11.0 |

Source: The Study Team

### 7.1.2. Evaluation Indicators (Operation and Effect Indicator)

#### 1) Outline of the Operation and Effect Indicators

Operation and effect indicators were selected after consulting with relevant organizations and JICA to quantitatively evaluate the target projects, and then the available data with the target province and city and the local consultants.

- Operation indicator: Indicator to quantitatively measure the operation of the project
- Effect Indicator: Indicator to quantitatively measure the effects of the project

Operation Indicator

- Annual average daily traffic volume (PCU/day)

  Passenger Car Unit (PCU): A unit that can express traffic volume in a passenger car unit. Vehicles of different sizes, such as large trucks and motorcycles are adjusted by multiplying by a predetermined ratio.

Effect Indicator

- Average travel time (hours)
- Number of passengers (persons/year) and volume of cargo (tons/year), but conditional

#### 2) The Process of Examining Operation and Effect Indicators

#### (a) JICA's Past Projects

In considering operation and effect indicators, the Study Team referred to the JICA Operation Indicator and Effect Indicator Reference in ODA Loan Projects (Evaluation Department, April 2022). It was considered whether the indicator values were available at the time of the

baseline, monitoring, and ex-post evaluation. The study team also confirmed through hearings with the implementing agencies whether it was possible to collect those indicator values from them.

The target projects fall under the transportation (roads, bridges, railroads, airlines, ports, and land transportation) category of the reference document. Since this study indicates that the transportation network contributes to regional economic development, the Study Team reviewed whether there are any indicators related to regional economic development as well. It was confirmed that there are no indicators in the example indicators for the financial cooperation projects but for the technical cooperation projects.

Since the target projects are IPC and NH61C at the national road level, they correspond to the intermediate goal “Improvement of road transport” under the transportation and transport sector, and the infrastructure type is trunk roads and bridges (domestic)..

In the reference, the “average annual daily traffic volume” and “passenger and freight volume” (cross-sectional traffic volume) are given as examples of operation and effect indicators. In addition, “reduction in travel time (hours)” is given as an effect indicator as well as several other subsidiary indicators are given as well. Among the subsidiary indicators, the indicator related to heavy vehicle traffic was excluded because the target projects are planned on the assumption that heavy vehicle traffic will be allowed since they are planned as national highway. “Reduction of vehicle operation costs” was not set because it is one of the benefits of the economic analysis. Since “increase in average travel speed” is synonymous with “average travel time,” the latter was selected as the indicator. “Reduction in the number of days of inaccessibility due to natural disasters per year” was not included due to the interviews with related local governments, as described later in this report. As baseline data is not available for “improvement of roadside environment (population of beneficiary areas),” the “economic and social development through land use change” is proposed as an indicator, as also described later in this report.

The Study Team reviewed the operation and effect Indicators for land transportation projects from the JICA website’s ex-ante project evaluation documents for the past five years from FY2018 to FY2022. The Study Team also conducted searches using road and bridge, regional development, road network development, and sector loan in Vietnam as keywords, and reviewed those ex-ante project evaluation documents. Among the road projects in Vietnam, highway and intra-city road projects were excluded from the review because their project objectives and components are different from the target projects. As a result, 23 projects were selected and reviewed for operation and effect indicators.

All the past road and bridge projects had“"average annual daily traffi”" and“"average travel tim”" as operation and effect indicator, except for one project. In the Vietnam projects, one project set“"number of days of impassable traffic per year”"“"reduction of vehicle operation costs”"“"reduction of transportation time compared to ferry service”" and“"increase in local land prices as indicators. (National Highway 1 Bypass Road Improvement Project (II)).

In addition to“"average daily traffic volum”" and“"average travel time”" the number of passengers (per year”" and“"cargo volume (per year”" were used as indicators in several projects.

In the case of regional development, suggested operation and effect indicator in “JICA Operation Indicator and Effect Indicator Reference for Technical Cooperation Projects” are an increase in GRDP in the region, improvement of residents’ income, and job creation. Since

the target projects of this study do not directly invest or intervene in the development of the local economy but rather aim to reduce road congestion, promote logistics, and improve the local road network, it is considered a leap in logic to use increased GRDP and job creation as operation and effect indicators.

### (b) Local Budget Projects in Vietnam

The Guidelines on Pre-F/S and F/S for PPP Projects[2] of the MOT stipulate the calculation of NPV, BCR, and EIRR in the economic and social efficiency clause. Examples of quantitative indicators include VOC savings and TTC savings. Qualitative indicators, which can be quantified but are difficult to evaluate in monetary terms, include the effect of environmental improvement through reductions in air pollution, dust, noise, vibration, and other environmental impacts, economic growth promotion, job creation, logistics, and traffic accident reduction. In addition, there are qualitative benefits such as improved connectivity between regions and improved living standards for residents in the project vicinity. The Guidelines allow for the inclusion of the above indicators in the F/S report, but they must be appropriate to the characteristics of the project and in compliance with the relevant laws. According to the guidelines, above indicators are only for economic analysis and are not operation and effect indicators for ex-post evaluation.

It was confirmed through interviews with the target local governments and local consulting firms that operation and effect indicators are not set for local projects, since no ex-post evaluation is conducted. It was also confirmed with the consulting firms to which Can Tho city and Hau Giang province commissioned the pre-F/S study of the target project that they have never set operation and effect indicators for local projects. Therefore, the Study Team has discussed with them about the appropriate operation and effect indicators and agreed on that“"annual average daily traffic volum”" and“"average travel tim”" since baseline data are available during the F/S phase. The consulting firms also confirmed that the“"number of passenger”" and“"volume of freigh”" are not generally surveyed during the F/S stage, although possible, if instructed to do so, given the need to conduct an OD survey.

Thus, the effect indicators“"number of passenger”" and“"volume of freigh”" are subject to the decision of the local governments, If they collect the data for the F/S report, those indicators can be used as effect indicators. Can Tho city and Hau Giang province conduct traffic surveys yearly as part of their operations but not“"passenger volum”" and“"cargo volum”" surveys, including OD surveys. Therefore, prior agreement with the local governments is needed in order to use them as effect indicators for ex-post evaluation.

### (c) World Bank

Effect Indicators are set as Performance Indicators for World Bank-funded projects in line with the project objectives during the project appraisal process. Guidelines for performance indicators were not found on the World Ban''s website, so a review of effect indicators for road projects implemented in Vietnam was conducted. For example, in the Road Network Improvement Project, the following indicators were set: 1) travel time reduction (%), 2) annual average daily traffic increase (%), and 3) improvement of the average road surface condition (%). In most cases, indicators 1) and 2) were set as effect indicators in road projects in Vietnam.

[2] Circular No. 22/2022/TT-BGTVT – Guidelines on Some Contents of Pre-Feasibility Study Report and Feasibility Study Report of Investment Project in the form of Public-Private Partnership, Build-Operate-Transfer Contracts in Transport Sector. Ministry of Transportation. 31 August 2022.

### (d) ADB

In ADB, similar to the World Bank, project performance targets are set at the time of project assessment. The project performance evaluation is described in the completion report, and the effect indicators are explained in the effectiveness of OECD-DAC evaluation criteria, while the benefits and impact are described separately. For example, the project objective of the "Greater Mekong Subregion Ben Luc-Long Thanh Expressway Project–- Tranche 1," is the efficient and safe transportation of people and goods in and around Ho Chi Minh City. The effect indicators were: 1) an 80% reduction in""travel time and cost"" 2) a 30% reduction in the number of trucks on HCM City roads and highways, 3) a 10% reduction in traffic accident rates, and 4) tripling the number of international cargo vehicles traveling to and from Cambodia. It should be noted, however, that no numerical values are provided for baseline and ex-post evaluations, and some indicators are based on desk research or calculations only.

It was verified that the method of setting effect indicators is the same for ADB as for the World Bank and JICA, in line with the project objectives. In addition, the economic analysis is recalculated in AD''s project evaluation. A review of project completion reports for road and bridge-related projects in Vietnam over the past five years showed that the main effect indicators set were""annual average daily traffic volum"" and""average travel time." In addition, indicators such as""traffic accident rate""""cargo volume"" and""annual number of days available for vehicle traffi"" were also set according to the project's objectives.

### (e) The Study Team's Discussion

In addition to""average travel tim"" and""passenger and freight volume"" the following effect indicators were considered: 1) number of days of traffic interruption/restriction due to flooding, 2) number of intercity buses in operation (NH61C), 3) land use change along the roads, 4) number and amount of private investment registrations, and 5) number of traffic accidents. The indicators were examined from three perspectives: a) relevance as an indicator, b) availability of the necessary data, and c) whether expected impact can be seen at the time of ex-post evaluation, two years after project completion.

**Table 7.1.9 Consideration of Effect Indicators**

| Indicator | Relevance | Availability of Data | Expected Impact |
|---|---|---|---|
| 1) Number of days of traffic interruption/restriction due to flooding | ✓ | ✓✓ | ✓✓ |
| 2) Number of intercity buses in operation (NH61C) | ✓ | ✓ | ✓ |
| 3) Land use change along the roads | ✓✓✓ | ✓✓✓ | ✓✓ |
| 4) Number and amount of private investment registrations | ✓✓ | ✓✓✓ | ✓ |
| 5) Number of traffic accidents | ✓✓ | ✓✓✓ | ✓✓ |

Source: The Study Team

1) Number of days of traffic interruption/restriction due to flooding
2) The IPC will be built according to the design standards of the Vietnamese governmen''s climate change policy. When the Study Team inquired with the target local governments about the number of days that NH61C has been impassable and restricted in the past due to natural disasters, they responded that NH61C has never been impassable. Since there have been no days of impassable or restricted traffic on NH61C, it is not suitable as an indicator. Number of intercity buses in operation (NH61C)
3) According to the long-distance bus company, it is unlikely that the widening of NH61C will increase the number of intercity buses due to the reduced travel time. If there is an increase in demand for travelers on this route, it will be considered in light of the bus network in the region. Thus, it is unlikely that the number of intercity buses will increase as a result of the implementation of NH61C project, and thus, it is concluded that the indicator is not suitable to set. Land use change along the roads

The Study Team considered the use of satellite images to compare current and post-project land use as an effective way to see change because satellite images would provide a visible comparison. Figure 7.1.1 shows a satellite image of the proposed IPC area. Each cell encircled by red line is 50 m wide and 500m long (100 m x 500 m mesh). Table 7.1.10 shows an example of land use distribution in each cell. It is expected that satellite images after project implementation will provide a measure of land use distribution and confirm the contribution of the project to the local economy. However, if this were to be used as an effect indicator, it would be necessary to set a numerical target after project implementation, so this indicator was not adopted. On the other hand, when evaluating the contribution to the local economy through qualitative evaluation, it is considered useful to have data on the status before the project implementation as a baseline in order to confirm changes in land use of residential, commercial, and industrial facilities during the ex-post evaluation.


Source: Made from Google Earth satellite image by the Study Team

**Figure 7.1.1 Satellite Image of Proposed IPC Area**

**Table 7.1.10 Land Use Distribution**

(Unit: ha)

| Cell No. | Structures | Field Open Space | Roads | River & Water |
|---|---|---|---|---|
| IPC-001 | 0 | 0 | 0 | 5 |
| IPC-002 | 0.153 | 4.098 | 0.039 | 0.71 |
| IPC-003 | 0.93 | 4.049 | 0.021 | 0 |
| IPC-004 | 1.452 | 3.329 | 0.219 | 0 |
| IPC-005 | 0.153 | 4.766 | 0.081 | |

Source: The Study Team

1) Number and amount of private investment registrations

In the provincial statistical yearbook, the data on the number and amount of private investment registrations are available. The Study Team assumed the possibility that investors may plan to invest along or near the target roads if they knew about the target project. The study team, however, determined that this indicator was not appropriate due to the difficulty of setting targets and predicting whether investors would prioritize new or widened roads in determining their investment behavior.

5) Number of traffic accidents

The World Bank and ADB projects have projects that include reducing in the number of traffic accidents as an effect indicator. The Study Team also considered including the number of traffic accidents as an effect indicator. However, when the Study Team reviewed the current situation, it found that the number of traffic accidents on NH61C in Hau Giang province has averaged only four cases per year for the past 4 years. Given the low number of traffic accidents and the difficulty in setting targets, it was decided not to adopt this indicator.

Based on the above considerations, the operation and effect indicators are as proposed at the top of this section.

## 7.2. Funding Arrangement

### 7.2.1. ODA Loan provided by Donor Agencies

#### 1) Overall Retrospective and Perspective

Before the COVID-19 pandemic and since the early 2010s, Vietnam adopted a more cautious attitude toward ODA, putting forward the need to control the public debt. ODA was sometimes blamed for over cost of investments and high credit costs. In 2018, the Chinese ODA was even openly criticized by the MPI and the MOF for its cost, and various scandals were pinned up by the media. Its new status as a low medium-income country impacted the price of credit for Vietnam. In the last decade, Vietnam praised its economic performance and became self-confident in its capacity to reduce the role of ODA in its development.

Decision 2109/QD-TTg (2021) [3] reports, between 2016 and 2020, ODA loan agreements to Vietnam amounted to USD13 billion, 51% of the amount signed between 2011 and 2015. All socio-economic regions (SER) were concerned (except Northern Midlands and Mountains), particularly the Red River Delta (from USD4,557.57 to USD670.93 million[4]). From 2016 to 2020, ODA loan agreements for projects in MDR amounted to USD940.96 million (against USD2,238.54 million from 2011 to 2015)[5]. Aside from inter-regional loans, the region was ranked before Red River Delta but far behind Southeast (USD1,492.14 million)[6] and North Central and Central Coastal Areas (USD1,400.56 million).

Decision 2109/QD-TTg (2021) estimated the total ODA financing need by 2025 at VND452.9 trillion up to VND527.1 trillion; or USD19.4 billion and USD22.7 billion). In June 2022,[7] the major donors committed to finance USD2.2 billion in MDR. This commitment would represent 3.8% of the total investments needed in MDR by 2030 (USD57 billion), as estimated in the Masterplan for the Development of Mekong Delta Region, the first comprehensive regional masterplan in Vietnam, approved in 2022.

The commitment of donors is encouraged by the recent high-level political initiatives taken, since Resolution 120/NQ-CP (see Table 7.2.1), to accelerate the definition of projects to support the region development.

[3] The Prime Minister's Decision No.2109/QD-TTg on the Approval of Scheme to Attract, Manage and Use ODA and Preferential Loans from Foreign Sponsors for the period 2021 - 2025

[4] Source: MPI, quoted by 2109/QD-TTg, dated December 2021.

[5] These amounts do not include the part of ODA loans classified as "inter-regional" in Decision 2109

[6] Source: Ibid.

[7] Conference on Promulgation of the Mekong Delta Master Plan and Investment Promotion for 2021–2030, held on June 21st in Can Tho. The total investment needed by 2030 is estimated at USD 73 billion.

**Table 7.2.1 Recent Political Initiatives to Support Development Projects in MDR**

| Regulations and Official Resolutions and Decisions |
|---|
| 2017 Nov: Resolution (Government) 120/NQ-CP on Sustainable Development of the Mekong Delta in Response to Climate Change |
| 2019 Apr: Decision (Prime Minister) 417 /QD-TTg on Issuance of the General Action Plan for Implementation of Resolution No. 120/NQ-CP of november 17, 2017 of the Government on Sustainable Development of the Mekong Delta to Adapt to Climate Change |
| 2019 Sept: Directive No. 23/CT-TTg (Prime Minister) on Accelerating the Implementation of Resolution No. 120/NQ-CP of the Government on Sustainable Development of the Mekong Delta to Adapt to Climate Change |
| 2020 June: Decision (prime Minister) 825/QD-TTg on the Establishment and Promulgation of the Regulation on Operation of the Coordinating Council of the Mekong Delta in the Period of 2020–2025 |
| 2021 April: Resolution 41/NQ-CP on the Government's regular meeting in March 2021 |
| 2021 Dec.: Decision (Prime Minister) 2109/QD-TTg Attraction, Management and Use of ODA and Concessional Loans in 2021-2025 |
| 2022 Feb.: Decision (Prime Minister) 287/QD-TTg Approving the Masterplan for the Development of Mekong Delta Region |
| 2022 April: Resolution (Politburo)13-NQ/TW on the Direction of Socio-economic Development and Assurance of National Defense and Security in the Mekong Delta Until 2030 |
| 2022 June: Resolution (Government) 78/NQ-CP Promulgating the Government's Action Plan to Implement the Resolution 13-NQ/TW of the Politburo on the Direction of Socio-economic Development and Assurance of National Defense and Security in the Mekong Delta Until 2030 with a Vision to 2045 |

Source: The Study Team

### 2) Donors

The main donors in Vietnam are the World Bank (WB), the JICA, the ADB, the KEXIM (Korea), the AFD (France) and the KfW (Germany).[8] Under MPI coordination, these organizations meet regularly to try harmonizing their initiatives and to discuss issues of a common interest. In addition, foreign countries provide 1) concessionary loans directly or through State-owned banks (Exim Bank of China, KEXIM), and 2) grants directly or through specific trust funds managed by multilateral. Foreign public technical cooperation agencies use grants: in the MDR region, GIZ, AusAID, KOICA, and SDC (Switzerland) are particularly active. The EU provides funds directly or through facilities managed by bilateral agencies, such as the EUR20 million WARM[9] (AFD). The UN agencies are also active (through UN-Habitat, UNDP, or UNEP). Several countries have almost stopped their support to infrastructure development in Vietnam after 2010 (e.g., Scandinavian countries, United Kingdom, Canada).

One significant trend over the last 20 years is the rapid development of ODA from Korea and China. Chinese financing however is very difficult to trace because related data are not publicly disclosed. According to Study Team's inquiries, transportation sector projects in the MDR region are not supported by Chinese ODA.

Lending conditions vary much among donors. All propose a panel of financial instruments

[8] The Asian Infrastructure Investment Bank remains a marginal donor in Vietnam, currently essentially active in the energy sector. The EBRD and the EIB are not active. Note: AFD: Agence Française de Dévelopment and KfW: Kreditanstalt für Wiederaufbau.

[9] WAter and natural Resources Management

with interest rates more or less close to market rates (the LIBOR for WB and ADB) sometimes blended to minimize the borrowing cost. Lending conditions vary regularly. JICA loans for infrastructure projects are attractive, for instance, in the previous sector loan.[10] KEXIM proposes also attracting conditions, for instance for the Vam Cong bridge project, 1.5% interest rate, 40-year loan period and 10 years grace period. These conditions fit with long construction periods and limited financial return of many roads and bridge projects. The upgraded status of low medium income country (granted by the WB in 2009), makes Vietnam less eligible to the cheapest resources of Multilaterals (IDA for the WB and ADF for the ADB). In general, AFD loans are considered as less attractive but this agency was pioneer in new financial mechanisms: non-sovereign loans (four in total, all in the energy sector), local development investment funds (Can Tho, Danang) or, together with JICA in 2009, budgetary support to the MONRE (Support Program to Respond to Climate Change [SP-RCC]).

In the context of decreasing the need for an ODA, the competition between donors aroused. Although projects disbursement is noticeably low, Vietnam remains a reliable borrower and many projects there fit with donors' regional strategy (such as the GMS for the ADB). The MPI and the MOF also strongly encourage donors to coordinate. Joint-financing – or more exactly parallel financing – enabled to mobilize larger amount of funds and streamline their use. For instance, in the region:

- The ADB, KEXIMn and AusAID jointly financed the GMS Southern Coastal Corridor project in the 2000s (USD82 million ADB loan, USD50 million KEXIM loan and USD33.5 million Australian grant), and the Central Mekong Delta Region Connectivity Project,[11] which began in the early 2010s-up and is currently ending (USD410 million ADB loan, USD250 million KEXIM loan, and USD134 million Australian government grant.
- The WB and Australian government jointly financed the Mekong Delta Transport Infrastructure Development Project (2007–2016) with USD207.7 million and USD25 million, respectively.

Project financing by the six agencies mentioned cannot be disconnected from bilateral cooperation policies and technical assistance initiatives. Since they provided a better understanding of current climate impacts in MRD, several technical assistance (usually financed by grants) have helped to link infrastructure project objectives to the region's overall adaptation to climate change. For instance:

- Through grants from ministries, Japan could support projects in the region (such as the WB-financed Natural Disaster Risk Management Project [Japan grant of USD4.5 million in 2010]). Japan also generously contributes to trust funds managed by multilateral agencies. Australia and the ADB also signed a Partnership Framework for Development 2021–2025.
- The WB developed a strong partnership with Australia through the Australia-WB Group Strategic Partnership in Vietnam. One of its six themes is the Mekong Delta, another one is transport. Currently, the WB mobilizes the Korea-World Bank Partnership Facility for its project in Vinh Long (USD2 million).

[10] The interest rate was 1.3% for the Transport Sector Loan for National Road Network Improvement.

[11] The project also targeted Cambodia.

- Multilaterals mobilize their trust funds (the Global Environment Fund [GEF] managed by the WB, the Japan Fund for Prosperous and Resilient Asia and the Pacific or the Australian Climate Finance Partnership managed by the ADB) to finance their technical assistance / consulting services. In the region, from 2019 to 2021, the WB used its Netherlands trust fund to finance the MDIRP project.[12] This project included the preparation of the Masterplan for the Development of Mekong Delta Region (budget of around USD1 million).
- Several countries developed joint initiatives such as the Integrated Coastal Management Programme (Germany/Australia, from 2011 to 2018) and Mekong Delta Climate Resilience Programme (Germany/Switzerland) from 2019 to 2025.

Few donors regularly published documents on their strategy in Vietnam. The last WB document is the Country Partnership Framework for Vietnam 2018–2022. The ADB published Country Operation Business Plans (currently 2021–2023), and in 2022, its Country Strategic Partnership 2023-2026. The AFD published a Strategy 2021–2025 for Vietnam and signed with the MOC a five-year Action and Cooperation Program (2022–2027).

### 3) Donors' Priorities and the MDR

Donors support transport projects in the MDR as long as they fit with their overall strategies (to make projects acceptable to their boards). With Mekong Delta being simultaneously a key area in terms of resources (demography, agriculture, marine economy, connectivity with other ASEAN countries) and extremely prone to climate change impacts, the projects are particularly relevant for most donors. Table 7.2.2 lists 24 identified infrastructure projects (excluding energy) financed by donors in the region.

The WB considers productivity growth as a central concept of its commitment. In its approach to the transformation of the Vietnamese economic model, supporting adaptation to climate change challenges is essential. For the WB, the MDR is a key area for projects. Technical assistance performed and economic studies conducted under its sponsorship help the Vietnamese authorities and other donors to define outcomes and impacts expected from projects. Transport projects are regarded as critical to improve productivity and increase value chain. Eventually, the WB coordinates with other donors in specific areas, for instance the AFD in Vinh Long. In the past, the WB financed important infrastructure projects in the region, but no real sector loan: except the National-wide Local Road Assets Management Program (USD385 million). In general, WB-financed projects covered multiple aspects, and connectivity/roads were commonly considered but not as main component; for instance, the Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods Project (USD310 million) or the Mekong Delta Water Resources for Rural Development Project (USD147.6 million USD). Importantly, the WB records on its website a project to come in Can Tho (with a loan amounting USD250 million), essentially river embankment, connections to bridges and sanitation. Another "piped" project would relates to inland water transport (and bridges rehabilitation) in both the Southeast and Mekong Delta regions[13] (loan expected: USD252 million).

The ADB insists (2023–2026) on the transition to a green economy, the national private sector strengthening, social equity promotion, gender equality, governance, digital

[12] Mekong Delta Integrated Regional Plan. This USD310 million project has followed the Mekong Delta plan prepared in 2013, with the support of the Dutch government.
[13] Mekong Provinces: Long An, Tien Giang, Ben Tre, Vinh Long.

transformation, and regional cooperation and integration. Concepts of inclusive development and resilience to climate change have become central in ADB projects, making investments in transport infrastructure primary. For urban projects, it promotes new action plans to improve projects pipelining (e.g., Action Plans[14]). ADB finances often urban infrastructure (noticeably in medium-sized cities) and tries to strengthen local governments capacities. In the 2010s, ADB became a major donor to support regional development through the Central Mekong Delta Region Connectivity Project (USD410 million, and almost USD800 million by including Australian and Korean financing[15]. The ADB is now conducting a technical assistance possibly first stage of a coastal provinces' road loan project in the region.[16]

JICA, the first bilateral donor in Vietnam, complies with the policy of the Ministry of Foreign Affairs of Japan. Overall, it prioritizes support for economic growth, the remediation of the negative impacts of this growth, and governance improvement. The particularity of JICA is it abundantly finances (grants) master plans preparation, data collection (not necessarily linked to a project) and capacity development. JICA provided a huge support to maintenance of existing assets, in particular bridges (57 replaced or improved in MDR region during the two phases 1 and 2 of the Transport Sector Loan for National Road Network Improvement project from 2004 to 2015). Yet, during the 2010–2020 period, JICA developed less transport projects in MDR compared with the previous decade. Can Tho City holds two project proposals, namely, project [1]) NH61C expansion and upgrading and new road construction at O Mon district and project [2] Investment in construction of O Mon Bridge. The city expects that JICA might agree the proposals in principle. The total amount is about USD475 million USD, a very high amount compared with most projects listed in Table 7.2.2.

The AFD developed a strategy for Vietnam 2021–2025, much green growth and climate-oriented. This agency targets specific infrastructure (flood management, coastal erosion, saltwater intrusion, land subsidence, and limitation of impacts of droughts), which are all much relevant to MDR's needs. Renewable energy and low carbon emission-oriented projects are also priorities. AFD's commitment to the transportation sector remains comparatively limited (e.g., road dykes). It has been active in the MDR since its water supply projects in six provincial capitals in the 2010s, particularly in Can Tho (local development investment fund), and currently, riverbank surfacing. AFD is considering financing projects in Vinh Long (flood, saline intrusion, and river erosion protection; a EUR60 million loan is requested) and Can Tho (river embankment with a loan amounting to EUR20 million) and a green city project in Nga Bay.

The KEXIM/EDCF priorities, according to Korea's Partnership Strategy 2016–2020 with Vietnam, are transport, water management and healthcare, governance (public administration) and education. Korean ODA also complements Korean economic initiatives in Vietnam. KEXIM has developed classic-type project financing for roads, highways, and bridges twice in partnership with the ADB. The MDR is a major recipient area of Korean ODA loans. In terms of resources allocated, transport has represented the lion's share, for instance, through the Vam Cong Bridge Project (USD250 million) and the Lo Te-Rach Soi Highway Project (Can Tho–Kien Giang).

[14] Competitive A.P., Green City A.P., Clean Air A.P., Sustainable Tourism A.P., etc.

[15] A similar project should be financed in Central Highlands region in the 2020s

[16] TA 10026-VIE Paris Agreement Alignment of Mekong Delta Region Master Plan Transport Project.

In Vietnam, the KfW focuses mainly on renewable energy sources, climate change mitigation, and biodiversity protection. It particularly targets the health sector and the protection of natural areas. Historically, KfW is not significantly involved in transport infrastructure outside cities (and in large cities focuses on public transport [e.g., in Danang]). So far, it is not significantly active in the region. Yet, the KfW is the development bank of the German cooperation, itself very active in the MDR: Logically, KfW could finance projects in the vein of GIZ assistance already and currently provided (water resources protection, resilience to climate change).

**Table 7.2.2 ODA Infrastructure Projects (Excluding Energy) in the MDR**

| No | Donors | Project and Locations in Mekong River Delta (Acronyms of Provinces) | Sectors | Estimated Implementation Period* | Estimated ODA Amount** |
|---|---|---|---|---|---|
| 1 | WB<br>(Loan, IDA)<br>[P171700] | Vinh Long City Urban Development Enhanced and Climate Resilience Project in Vinh Long Province [VL] | Drainage flood protection, waste water (DBO), transport management | 2020–2025 | USD126.9 million (+ USD 19.5 million Dutch grant) |
| 2 | WB<br>(Loan, IDA+IBRD)<br>[P 155086] | Local Road Assets Management Program.<br>National, partially in MDR | Roads and bridges (rural) (MOT) | 2016–2023 | USD385 million |
| 3 | WB (Loan IDA +IBRD)<br>[P152851] | Can Tho Urban Development and Resilience<br>[CT] | Flood risks, sanitation, roads and links to bridges | 2016–2024 | USD250 million (+ USD10 million Swiss grant) |
| 4 | WB<br>(Loan, IDA)<br>[P153544] | Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods Project<br>[AG; DT; BT; TV; VL; ST; CM; BL; KG] | Climate smart planning and improvement of Climate resilience of land and water management | 2016–2024 | USD310 million (+ USD 6.09 million from GEF) |
| 5 | WB (Loan IDA + IBRD [1]), IDA [2])<br>[P073361]<br>[P119684] | Natural Disaster Risk Management Project [1] + [2]<br>[MDR] + Red River Delta | Water supply, sanitation, solid waste, transportation, etc. | 2006–2013 [1]<br>2010–N/A [2] | [1] USD86 million (+ USD4.5 million from Japan) [2] USD75 million |
| 6 | WB<br>[P113949] | Mekong Delta Water Resources for Rural Development Project | Irrigation, drainage, flood control, agriculture and water resources | 1999–2005 | USD147.6 million |
| 7 | ADB<br>(Loan, OCR)<br>[40255-033] | Central Mekong Delta Region Connectivity Project<br>[AG; DT; CT] | Roads and bridges | 2013– Ending soon | USD410 million |
| 8 | Australia (Grant) | | Cao Lanh Bridge | 2012–2018 | USD 134 million |
| 9 | KEXIM/EDCF (Loan) | | Vam Cong Bridge | 2012–2019 | USD250 million |
| 10 | ADB<br>(Loan, ADF)<br>[36353-013] | GMS Southern Coastal Corridor<br>[Vietnam and Cambodia.<br>[MDR: KG; CM] | Transport Infrastructure Bridges rehabilitation | 2007 Completed (2014) | USD82 million |
| 11 | KEXIM (Loan) | | Bridges rehabilitation? | 2007 Completed (2014) | USD50 million |
| 12 | Australia (Grant) | | My Thuan Bridge | 2007 Completed (2014) | USD33.5 million (AUSaid) |
| 13 | ADB (Loan) | Rach Gia Bypass Project [KG] | Road construction | Started 2007–2008? | USD25 million |
| 14 | KEXIM (Loan) | | | Started 2007–2008? | USD83 million |
| 15 | JICA (Loan) | Ben Tre Water Management [BT] | Urban water supply, saline intrusion control | 2019–2023 | JPY24,257 million |
| 16 | JICA (Loan) | Can Tho Bridge [CT] | Can Tho Bridge | 2000–2010 | JPY6,051 million |
| 17 | JICA (Loan) | Second Transport Sector Loan for National Road Network Improvement<br>[National, BT VL in MDR] | Bridges rehabilitation/replacement | 2013–2018 | JPY24,771 million (total) |
| 18 | JICA (Loan) | Transport Sector Loan for National Road Network Improvement Phase 2<br>[National, MDR] | 77 bridges rehabilitated/replaced during phase 1 and 68 in Phase 2. 57 bridges of the total 145 | 2009–2015 | JPY17,842 million |

| | | | | | |
|---|---|---|---|---|---|
| 19 | JICA (Loan) | Transport Sector Loan for National Road Network Improvement Phase 1 [National, MDR] | bridges (phases 1 and 2) were located in MDR | 2004–2012 | JPY7,614 million |
| 20 | JICA (Loan) | Sector Project Loans for Rural Infrastructure (road, electricity, irrigation, water supply) (SPL) | Basic rural infrastructure, including roads | 1996–2010 | JPY66.300 million |
| 21 | AFD (Loan) [CVN 192] | Controlling Rising Water Levels in the Provinces of Ninh Binh, Ha Tinh and Can Tho [CT] | Surfacing river banks (in Can Tho only) | 2016–Ongoing | EUR53.5 million in total, est. EUR20 million for CT |
| 22 | AFD (CVN 1277) | Flood, Salt Intrusion and River Erosion Protection Project VL | Salinity control gates, road dykes, river embankment (urban rural) | 2024–? | EUR60 million |
| 23 | AFD (Loan) | Mekong Delta Water Supply [BT; TV; V; AG; DT; CT] | Urban water supply (Can Tho sub-project finally excluded) | 2009–2016? | EUR32 million (+EUR3 million EU) |
| 24 | KEXIM/EDCF (Loan) | Lo Te-Rach Soi Highway Project [CT; KG] | Roads | 2016–2021 | USD285.7 million |

Source: The Study Team *Tentative estimate: Start or end of completion ** Also estimate, essentially from donors' websites

The Third Mekong Delta conference in March 2021 was of great significance as it confirmed the Government's coherent commitment. MPI expressed extensive fund mobilization for the period 2021–2025, reaching VND 266 trillion. As for ODA, the MPI coordinated with the WB to develop the masterplan with a budget of USD1.05 billion (VND25 trillion) or only 10% of the total investment.

Vietnam tries to finance most transportation projects in the MDR, in particular roads and bridges, by mobilizing domestic public (and private) funds rather than ODA. MOT 2022's decision relating to Dai Ngai bridge project (Tra Vinh and Soc Trang provinces) is illustrative.

It is thus remarkable that the MPI initiative covering 16 projects in which all 13 special city and provinces in the MDR and 6 international donor agencies participate as reported Section 3.5 of this report.

### 7.2.2. On-lending Mechanism of ODA Loan to Local Governments

#### 1) Importance of On-lending and Scope and General Comments

According to Prime Minister Decision 2109/QD-TTg (December 2021), on-lending should represent almost 42% of the total amount of ODA from 2021 to 2025 (VND275,000 billion on-lent against VND527,000 billion for the total). Decision 2109/QD-TTg supports on-lending but also highlights its weaknesses.

The Vietnamese regulation differentiates ODA loans and concessional loans. In ODA loans, the grant component should be at least 25% for untied loans (WB, ADB) and 35% if the loan is partially tied (generally the case for bilateral loans). Concessionary loans have a grant component (compared with market loans) but do not comply with ODA loan criteria. According to Decree 114/2021/ND-CP, ODA loans should preferably be for projects with limited direct return on investments and concessional loans for other projects or programs. However, decrees and circulars relating to on-lending (prepared by the MOF) do not detail much of the difference between these two types of projects. In any case, the on-lending regulation is similar, whatever ODA or concessional loans.

On-lending concern primarily provincial people's committees and centrally-run cities, but also non-business units, state-owned enterprises and joint-ventures. In this section, provincial capitals (having the status of city) will not be considered. It does not seem that

on-lending concern them directly, as contracting parties with the MOF. Moreover, connectivity-related projects in the region concern essentially provincial governments or ministries.

Through on-lending, the national government (through the MOF and the Bank of Vietnam) on-lends the money borrowed from ODA sources to sub-national or other entity. Part of the ODA loan remains channeled to the project through the central budget (except in the cases of Hanoi and HCM City; see Table 7.2.5).

The advantage for provinces is access to a further source of financing for their project, in principle cheaper than loans proposed by commercial banks. Importantly, local governments must finance their own compensation/resettlement costs of projects anyway, and these later are generally substantial for road projects.

The centrally-regulated on-lending rate (see below) makes easier the mobilization of on-lending for the “richest” provinces. Through on-lending, the MOF keeps some control over financing of local projects but also transfers part of the ODA credit risk to the end borrower. This end-borrower has to bear the extra costs pertaining to the on-lending mechanism, as defined by national regulation.

The position of local government on ODA loans varies. Overall, the interest has apparently cooled down due to the additional constraints represented by ODA financing (to get familiarized with their procedures) and due to its costs (through on-lending, local governments also bear the foreign-exchange rate risk).

### 2) Regulatory Framework of On-lending Mechanism

On-lending is not a new mechanism. The regulation has changed several times and is likely to change further to adapt to policy and financial contexts.

The current on-lending regulatory framework is based on four main laws: i) Organization of the Government (No. 76/2015/QH13), ii) Public Debt Management (No. 20/2017/QH14), iii) State Budget (No. 83/2015/QH13), and iv) Public Investments (No. 39/2019/QH14). Financial legal obligations are provided by Resolution 20/2017/QH14, prepared by the MOF.[17] The main subsequent regulations are Decrees 97/2018/ND-CP and 79/2021/ND-CP. Table 7.2.3 lists chronologically the main ODA and on-lending regulations and the main relevant major political decisions. The MOF issues circulars specifying aspects of on-lending related decrees. The main units concerned are the Department of Debt Management and External Finance and the Department of the State Budget.

[17] These regulations are prepared by the MOF. The regulation of ODA management, such as Decree 114 (2021), is prepared by the MPI.

**Table 7.2.3 Chronology of the Recent Regulation on On-lending**

| Dates | Regulations and Official Resolution and Decisions |
|---|---|
| 2015 June 15 | Law (National Assembly). 83/2015/QH13 on State Budget |
| 2016 June 30 | Circular (MOF). 111/2016/TT-BTC Regulations on Financial Management for Programs and Projects Using Official Development Support Capital (ODA) and Concessional Loans of Foreign Countries |
| 2017 Nov.17 | Resolution (Government). 120/NQ-CP on Sustainable Development of the Mekong River Delta |
| 2017 Nov. 23 | Law (National Assembly). 20/2017/QH14 On Public Debt Management |
| 2017 April 28 | Decree (Government). 52/2017/ND-CP on On-lending of Government's Foreign Loans to People's Committees of Provinces and Centrally-run Cities |
| 2019 April 13 | Decision (Prime Minister) on Issuance of the General Action Plan for Implementation of Resolution No. 120/NQ-CP of November 17, 2017 of the Government on Sustainable Development of the Mekong River Delta |
| 2018 June 30 | Decree (Government). 97/2018/ND-CP On-lending for ODA and Concessionary Loans |
| 2019 June 13 | Law (National Assembly). 39/2019/QH14 On Public Investments |
| 2020 May 25 | Decree (Government). 56/2020/ND-CP On Management and Use of Official Development Assistance (ODA) and Concessional Loans from Foreign Donors |
| 2020 June 12 | Decision (Prime Minister) 825 /QD-TTg on the Establishment and Promulgation of the Operational Regulations of the Coordinating Council of the Mekong River Delta, Period of 2020 - 2025 |
| 2020 July 8 | Resolution (National Assembly; Standing Committee) 973/2020/UBTVQH14 on Regulations on Principles, Criteria, and Level of Allocation of Public Investment Capital Sources of State Budget Period of 2021-2025 |
| 2020 Sept. 14 | Decision (Prime Minister) 26/2020/QD-TTg on Details Implementation of Some Articles of Resolution no. 973/2020/UBTVQH14 |
| 2021 April 1 | Resolution (Government). 41/NQ-CP Annual Government Meeting March 2021 |
| 2021 Aug. 16 | Decree (Government). 79/2021/NĐ-CP on Amendments and Supplements of some Articles of 97/2018/ND-CP On-lending for ODA and Concessional Loans |
| 2021 Oct.8 | Decision (MOF). 1972 /QD-BTC on the Announcement of the Rate of Loans of ODA for provinces and Centrally-run Cities |
| 2021 Dec. 16 | Decree (Government). 114/2021/ND-CP on the management and use of official development assistance capital (ODA) and Concessional Loans from Foreign Donors |
| 2022 July 6 | Decision (MOF). 990/QĐ-BTC About the Announcement of On-lending Rates for ODA and Concessionary Loans for provinces and Centrally-run Cities |

Source: The Study Team

The sequence above reflects a pragmatic approach. The policy aims at making local governments more responsible and, overall, to keep control over the national public debt evolution and to streamline the ODA responses to the needs of 63 provinces and centrally-run cities.

Provincial governments submit yearly on-lending plans to the MOF (and then to the Government of Vietnam for approval). They must also comply with 5-year on-lending limits as part of their 5-year loan and repayment plan. Importantly, provincial people's committees must repay ODA or concessional loans in priority and before other debts.

On-lending conditions vary according to the type of end-borrower. For instance, for people's committees, debt payment term and grace period are the same in the on-lending contract and the loan agreement (between Vietnam and the donor). For non-business units and other entities, they are aligned on the project payback period and completion, as defined in the approved feasibility study. The on-lending interests and provisions required are also lower for provincial and city people's committees.

The on-lending procedure requires that an on-lending agency (authorized by the MOF) signs the on-lending agreement with the end-borrower, which then becomes fully responsible for the repayment of on-lent amount. The MOF is the authorized agency for provincial governments. For non-business units or enterprises, the regulation defines two categories of authorized agencies: those which do not bear credit risk (namely the VDB and the Social Policy Bank) and those which bear this risk.

The Law on Public Debt Management (2017) defines the components of the on-lending interest rate: interests paid (through the MOF) to the ODA lender, plus fees prescribed in the

loan agreement, management fees for on-lending and project budget hedge against re-lending risks. Thus, the MOF cannot on-lend at a lower interest rate than as specified in the loan agreement. Decree 97/2018/ND-CP sets management fees for local governments at 0.25% per year, and the provision required for lending risk at 0% (1% for non-business public entities and 1.5% for enterprises). In addition, the end-borrower must pay its part of the various fees specified by the donor in the loan agreement. In case of late repayment of the on-lent money, the MOF penalizes the end-borrower (for provincial governments: interest rate set at 150% of the government's foreign loan interest rate).

Because assets owned by local governments are inalienable State properties, provincial people's committees are not required to provide collaterals (Decree 79/2021/ND-CP).

### 3) Access to ODA Loans: On-lending Rates

For a given project, the proportion of ODA loan subject to on-lending is regulated regularly by the MOF and for each province. This proportion, the on-lending rate, varies. Provinces structurally more supported financially by the central budget are required to a lower on-lending rate (in other words reimbursement capacities), and conversely, provinces contributing to the central budget are required to a higher rate. On-lending rates by provinces were defined by Decree 97/2018, clarified by Circular 1972/QĐ-BTC dated Oct. 2021, and revised in 2022 by Circular 990/QD-BTC (following Decree 79/2021). Rates are currently 10%, 30%, 50%, 70%, and 100%. According to the last regulation available (Circular 990/QD-BTC), the 10% rate is only applicable to the nine provinces of the Northern Midlands and Mountains Region (eight in 2021).

**Table 7.2.4 On-lending Rates in 2018 and 2021**

| Decree 97 (2018) | | Decree 79 (2021) | |
|---|---|---|---|
| Share of Central Budget Funding | On-lending Rate | Share of Central Budget Funding | On-lending Rate |
| 70% or more | 30% | 70% or more | 10% |
| From 50% to less than 70% | 40% | From 50% to less than 70% | 30% |
| Below 50% | 50% | Below 50% | 50% |
| Local revenues contribute to the central budget | 70% | Local revenues contribute to the central budget | 70% |
| Hanoi and HCMC | 100% | Hanoi and HCMC | 100% |

Source: The Study Team

### 4) Case of the Mekong Delta Region

Table 7.2.5 compares the on-lending rates for provinces in the MDR and Southeast Region in 2021 and 2022. Rates remained overall the same but increased for Tra Vinh Province and decreased for Dong Thap and Ca Mau Provinces. Only Hanoi and HCM City are granted a rate of 100%. Not surprisingly, Can Tho, a centrally-run city, has the highest rate in the region.

**Table 7.2.5 On-lending Rates in Mekong Delta Region in 2021 and 2022**

| Regions | Provinces | Rates Aug.2021 1972/QĐ-BTC | Rates June 2022 990 /QD-BTC | Provinces | Rates Aug.2021 1972/QĐ-BTC | Rates June 2022 990 /QD-BTC |
|---|---|---|---|---|---|---|
| Mekong River Delta | Long An | 50% | 50% | Soc Trang | 30% | 30% |
| | Tien Giang | 50% | 50% | An Giang | 30% | 30% |
| | Ben Tre | 30% | 30% | Dong Thap | 50% | 30% |
| | Tra Vinh | 30% | 50% | Kien Giang | 50% | 50% |
| | Vinh Long | 50% | 50% | Bac Lieu | 50% | 30% |
| | Can Tho | 70% | 70% | Ca Mau | 50% | 30% |
| | Hau Giang | 50% | 50% | - | - | - |
| Southeast | HCMC | 100% | 100% | Binh Phuoc | 50% | 50% |
| | Dong Nai | 70% | 70% | Tay Ninh | 50% | 50% |
| | Binh Duong | 70% | 70% | Baria-Vung Tau | 70% | 70% |

Source: The Study Team

Can Tho is the only province of Mekong Delta region which contributes to the central budget. Yet, this contribution remains limited, far behind Baria-Vung Tau or Binh Duong and almost the last of all contributing provinces with 9% of its revenues transferred in 2021 (against 64% for Binh Duong, 53% Dong Nai, and 36% for Baria Vung-Tau)[18]

Importantly, Decree 79/2021/ND-CP states that on-lending rate for projects relating to sustainable development adapted to climate change in Mekong River Delta can be lower. This was justified by Resolution 41/NQ-CP (Annual Government Meeting March 2021). The rate cannot be lower than 10%. Moreover, this derogatory rate should be approved by the central government. In accordance with the Decree, Can Tho City required an on-lending rate of 10% (the minimum permitted) in its submission letters to the MPI (2022) for two projects[19]: [1] NH61C Expansion and Upgrading Project and New Road Construction at O Mon District and [2] Investment in Construction of O Mon Bridge. Justifications provided to benefit of this 10% rate (adaptation to climate change) were essentially the location of the project in the region and the impact on traffic congestion (lower GHG emission) – and, for NH61C upgrading project, the degradation of the existing sections due to climatic impacts. Since this submission letter followed exchanges with MPI and the MOT, one can presume that both ministries support the request of Can Tho provincial government. This would represent for this later an on-lent amount of USD29.6 million for project [1] and USD17.8 million for project [2], therefore a total of USD47.4 million.

The final position of the central government regarding on-lending for these two projects is not known but, seemingly, the 14 province-owned road/bridges projects (as presented in Table 7.2~~3~~) can be applied a 10% on-lending rate.

The newly established Coordinating Council of the Mekong Delta Region (Decision 825 /QD-TTg dated June 2020) will assume an advisory role to the Prime Minister. It should play a growing role in the mobilization of resources to ensure regional development. For the time being, there is no evidence that the council will be directly involved in the on-lending process.

[18] Source: Statistics of the Ministry of Finance

[19] 3192 /TTr-SGTVT and 3193 /TTr-SGTVT (Nov. 2022)

## 7.3. Environmental and Social Considerations

### 7.3.1. Regulations, Standards, and Requirements to be Applied

#### 1) Viet Nam Regulation for Environmental and Social Consideration

#### (a) Environment Consideration

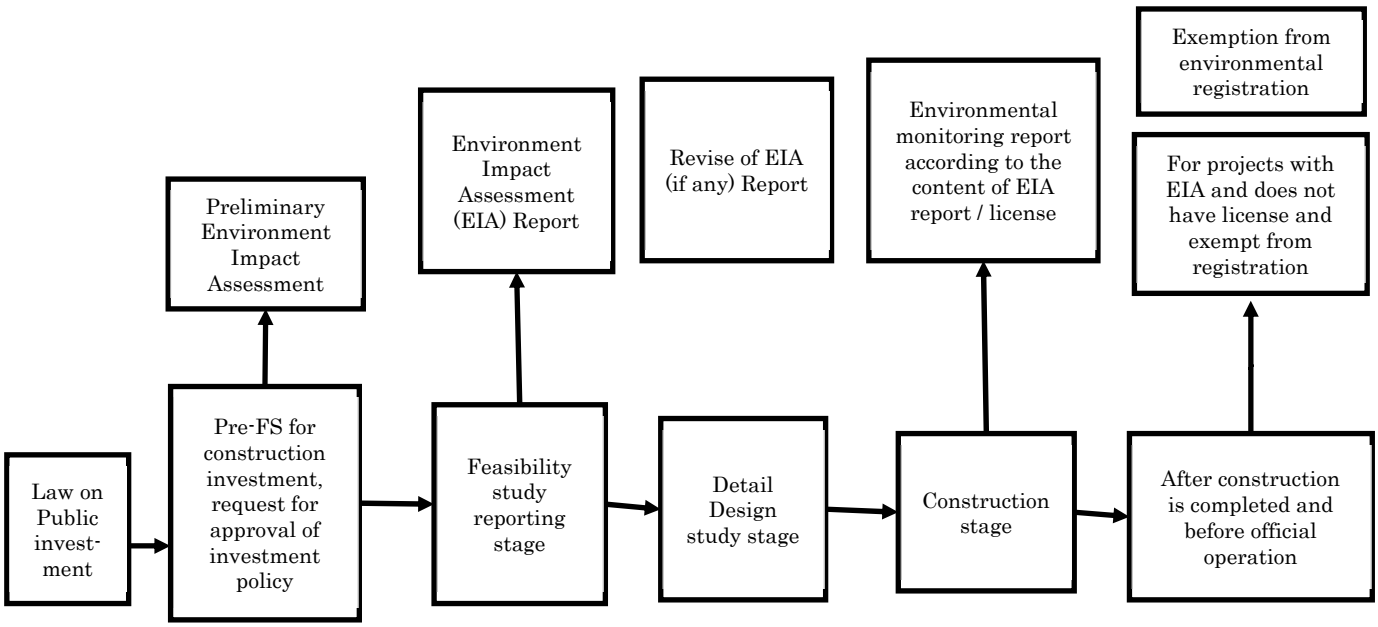
According to the Public Investment Law 2019, transport projects, including bridges, seaports, river ports, airports, railways, and national highways with a total investment of over VND 2,300 billion, will be classified as projects category A.

From the classification mentioned above, both projects, the "Inter-provincial corridor (IPC) passing through from Sa Dec (Dong Thap) – O Mon (Can Tho) – Giong Rieng (Kien Giang)," Can Tho part (Project 1) and the "Widening of NH61C", Can Thơ – Hau Giang provinces (Project 2) will be settle as group A Projects.

The new Law of Environment Protection 2020 requires the project owners to consider putting their investment projects into group I or group II. The criteria for the classification of groups are pointed out in Decree No. 08/ND-CP, 2022, as follows:

Category A projects are all of investment projects, with construction components, which investment policies shall be decided and approved by the National Assembly and the Prime Minister. The construction components are classified according to the criteria prescribed by the law on public investment and construction and belong to the type of production, business and service with risks of causing environmental pollution.

In parallel with above definition and requirement of the Law of Environment Protection, both projects will be classified as Group I and shall follow the requirement mentioned in Law of Environment Protection for Project Group I, in which the following steps should be followed strictly:




Source: The Study Team

**Figure 7.3.1 Flow of Environmental Consideration of Projects 1 and 2**

### (b) Social Consideration

Land acquisition and site clearance will be required for the project implementation. The compensation and allowances policies of the central government and provincial policies will be applied, which follow the compensation policies described in the Land Law 2013. The Provincial People's Committee promulgates provincial policies.

**[a. Central government]**

- The Land Law 2013 which has been effective since July 1, 2014.
- Decree No.43/2014/ND-CP on detailing several articles of the Land Law 2013
- Decree No.44/2014/ND-CP on regulations on land prices
- Decree No. 47/2014/ND-CP on regulations on compensation, support and resettlement upon land expropriation by the State
- Decree No. 01/2017/ND-CP dated January 06, 2017, on amendments to the decrees on the implementation of the Land Law

**[b. Can Tho PPC]**

- Decision N015/2014/QD-UBND of the People's Committee of Can Tho city, dated November 13, 2014 on compensation, support and resettlement
- Decision N0 19/2016/QD-UBND dated July 11, 2016 about Amending and supplementing a number of articles of Decision No. 15/2014/QD-UBND dated November 13, 2014 of the Can Tho City People's Committee
- Decision 1710/QD-UBND of Can Tho City People's Committee, dated August 09, 2021 on Promulgate regulations on the unit price of compensation for damage to crops on the Can Tho city area.

**[c. Hau Giang PPC]**

- Decision N03/2020/QD-UBND of the People's Committee of Hau Giang Province, dated 21 February 2020 on regulation of the unit prices of houses and construction works to calculate compensation damage in Hau Giang Province
- Decision N001/2020/QD-UBND of the People's Committee of Hau Giang Province, dated 12 February 2020 on Amending and supplementing several articles of Decision N0. 26/2018/QD-UBND dated 28 December 2018 of the Hau Giang Province People's Committee
- Decision N014/2019/QD-UBND of the People's Committee of Hau Giang Province, dated 19 September 2019 on Promulgate regulations on unit prices of aquatic plants and animals to determine the value of compensation and support in Hau Giang Province
- Decision N026/2018/QD-UBND of the People's Committee of Hau Giang Province, dated 28 December 2018 on compensation, support, and resettlement

## 2) JICA Requirement for Environmental and Social Consideration

### (a) Environment Consideration

The JICA environment and social guidelines, version January 2022, classify the investment projects into four categories based on the extent of environmental and social impacts,

considering the Project's characteristics, scale, site condition, etc.

Both the target projects, based on JICA's definition, belong to the sensitive sectors ((8) Road, railways and bridges), mentioned in Appendix 3, List of Sensitive Sectors, Characteristics, and Areas, JICA Environment and Social Guidelines, 2022. Thus, even though the decision of categorization will be made by JICA later, it is recommended that the owner consider both the projects under Category A.

Vietnam already has the system for the EIA report; therefore, both projects shall finish all the procedures and have approval for local EIA from Authorities.

In addition, the following points shall be added to the local EIA:

- Secondary and Cumulative Impacts: Environmental and social consideration confirmation shall cover the cumulative impacts and derivative and secondary impacts.
- Analysis of alternatives: The alternative study should be made by setting the several cases of the conceivable development scenarios, including zero option (without-project scenario). Then, every scenario should be assessed from the viewpoints of environmental and social considerations. Feasible alternatives should be systematically compared on the location, technology, design, operation, and environmental and social considerations of the project, including the "without project" situations.

The PMU will be responsible for conducting and fulfilling all steps to achieve the approval of JICA.

### (b) Social Consideration

Both the target projects should be adequately coordinated to be socially accepted in the countries and areas where the projects are planned. For the projects with potentially significant environmental and social impacts, sufficient consultations with local stakeholders, such as local residents, should be conducted via disclosure of information at an early stage when alternatives for project plans are examined. The outcome of such consultations should be incorporated into the project plans.

Appropriate consideration should be given to vulnerable social groups, such as women, children, elderly people, people in poverty, indigenous peoples, persons with disabilities, refugees, internally displaced persons, and minorities. Such vulnerable social groups are susceptible to environmental and social impacts and may have little access to societal decision-making processes.

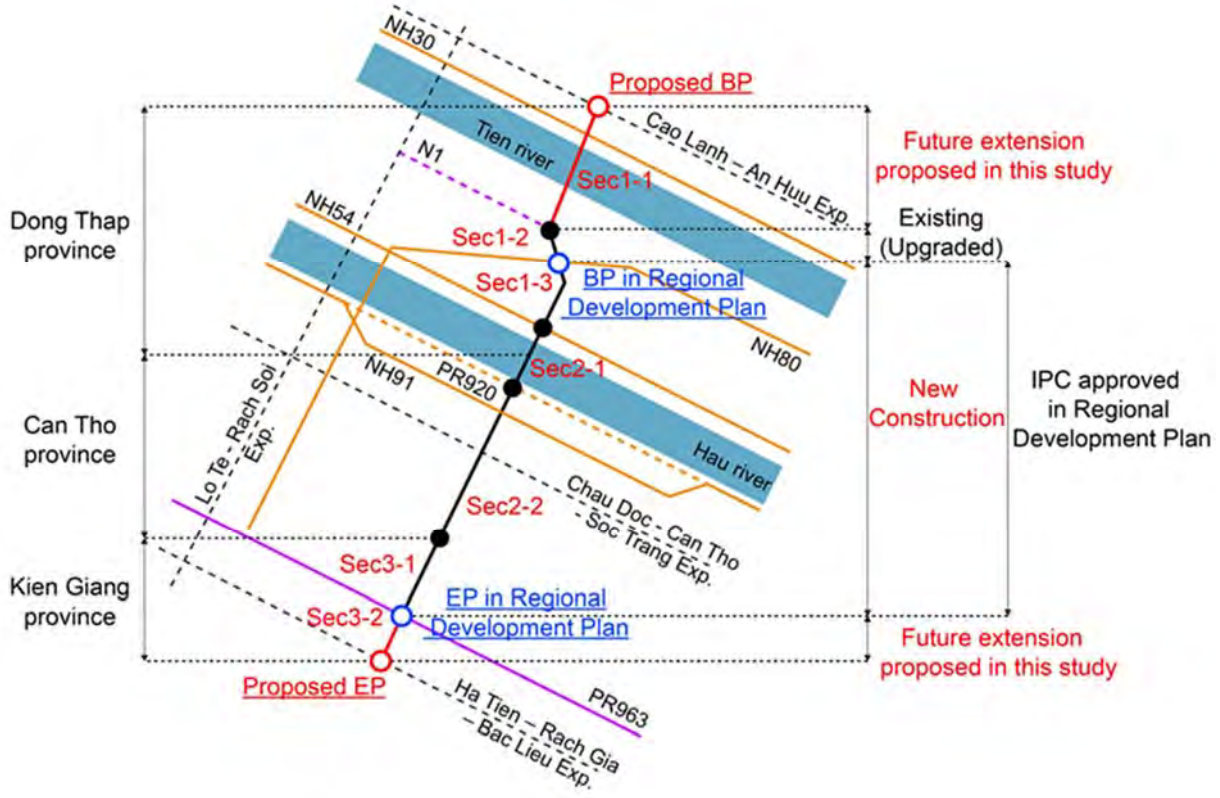
For projects that result in large-scale involuntary resettlement, a Resettlement Action Plans (RAP) is required and made available to the public before the resettlement and provision of compensation and support. In preparing the RAP, consultations should be held with the project-affected people and communities based on sufficient information made available to them in advance.

When consultations are held, explanations should be given in languages and forms that are understandable to the project-affected people. The RAP should include elements laid out in the Environmental and Social Standard (ESS) 5 of the World Bank's environmental and social policies.

## 7.3.2. Site Description

### 1) IPC

The IPC passes through three cities/provinces; thus, the road grade will be a national highway grade. However, since an individual province/city will develop the IPC from the preparation stage, the corridor is divided into several projects by each province/city. In the scope of this evaluation, only the part within Can Tho Province starts from NH91 to the provincial boundary zone of Can Tho-Kien Giang Province.




Source: The Study Team

**Figure 7.3.2 Section arrangement of IPC**

The studied section is in the O Mon and Thoi Lai Districts. Thus, the Study Team has reviewed the natural condition of the above-mentioned areas.

### (c) Pollution Control

**[a. Air quality]**

The results of air environment periodical monitoring in Can Tho City from 2015 to 2019 and automatic monitoring data show that the pollution trend improves better. In recent years, the management of environmental protection work has been more strictly controlled for those generating emissions. Post-EIA assessment at enterprises has been tightened. In addition, investment in urban embellishment and infrastructure improvement has been carried out.

- **O Mon** is a suburban district of Can Tho City. O Mon district consists of nine wards and includes the Tra Noc II Industrial Park. The industrial park is on Highway 91, and the waterway is the Hau River. Pollutants can be generated and accumulated in this area during the construction and operation of the IPC (about 10 km from the proposed location of IPC starting point). The industrial facilities in Tra Noc II Industrial Park generate emissions, specifically using fuel to serve boilers in production activities. This

is also one of the sources of emissions for suspended dust and other emissions.

The monitoring point for air quality in O Mon district is located at the junction of the O Mon District Committee, the intersection between National Highway 91 and Provincial Road 922, going to Co Do and Thoi Lai districts, so the traffic density is high. This is the main point source of NO2 and SO2 diffusion in the air, similar to other districts of the city. In general, NO2 and SO2 concentrations in the district tends to increase gradually in the last months of every year. The monitoring results show that the TSP, NO2 and SO2 values of O Mon district are not exceeding the standard requirement.

- **Thoi Lai** is a district with inter-provincial highways and provincial roads, so the traffic density at these monitoring nodes is high. It is a suburban district, and the objects of production and business are often concentrated, such as milling, scrap, by-products, fertilizer, cement, etc. However, according to the monitoring results, the dust concentration in the Thoi Lai district at the monitoring locations does not have a big change during the year quarters. All the observed values at the peak hours of each quarter are still lower than the values specified by QCVN. 05:2013/BTNMT (1-hour average).

**Table 7.3.1 Statistical Value of Annual Total Suspended Particulate in Can Tho, 2015 to 2020**

| Location in Can Tho | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|
| O Mon district | 231.63 | 252.75 | 243.65 | 249.47 | 239.75 | 206.83 |
| Thoi Lai District | 224.76 | 224.76 | 224.76 | 224.76 | 224.76 | 224.76 |
| Unit | | | **µg/m3** | | | |
| QCVN 05:2013 | | | **300** | | | |

Source: Can Tho city environmental thematic report 2021_Air environment in 2020

**[b. Water quality]**

**Surface water quality** in Can Tho City is recorded by automatic and continuous surface water monitoring. There are two stations set up to monitor the surface water quality of Hau River, which are directly related to the project area. One station is in the pumping station of the Tra Noc Water Plant in the O Mon district, which aims to monitor the surface water quality on Hau River, and the station is in the industrial zone. The next station is on the premises of the Thot Not Water Supply Plant on National Highway 91, Thot Not District, Can Tho. The station is arranged to measure surface water quality on Hau River and service and commercial activities around the station. Monitoring results from automatic surface water stations show that the water quality at the stations has COD, TSS and DO concentrations exceeding the allowed standards. However, the excess value is not much. The measured mean value of Tra Noc station parameters is the highest. It shows that in recent years, surface water quality at automatic and continuous monitoring locations has generally shown signs of organic pollution (increased COD, low DO) and high levels of suspended solids distributed over time in the year's flood season.

Besides automatic water quality monitoring stations, Can Tho City also periodically monitor surface water quality in Hau River, tributaries, and in-field canals.

Although the results of seasonal monitoring conducted periodically will be affected by weather factors, the monitoring results are generally not good. The COD, DO, BOD5 and Coliform indexes are all very high, exceeding the allowable standards many times.

According to the Provincial People's Committee's Thematic report on the surface water environment, the above indicators increase yearly and strongly affect surface water quality in the Hau River, tributaries, and inland canals.

For the **underground water quality**, Can Tho granted a total of 185 licenses to exploit groundwater with a total exploitation volume of 66,621 $m^3$/day-night. Groundwater is used mainly for domestic and industrial water supply. According to the monitoring results, there were signs of microbiological pollution underground in residential areas in recent years; the average coliform content was 1.66 to 4.6 times higher than that of QCVN 09-MT:2015/BTNMT.

**[c. Waste Management]**

Solid waste in the Can Tho is generated from many different sources, such as: residential areas, commercial areas, offices, constructions, public areas, public production activities, and agriculture... However, depending on the characteristics, properties, composition, etc., solid waste is monitored in three main groups: domestic solid, industrial, and medical waste.

According to the report on solid waste management in Can Tho city by DONRE, the total volume of domestic waste collected and treated in the city reached about 605 tons/day in 2020. Ninh Kieu, Thot Not, and O Mon are the localities with a high average rate of domestic solid waste generated. In which the rate of biodegradable waste is the highest and the toxic component in domestic waste is the lowest (ranging from 0.4% to 0.6%) of total volume.

The results of monitoring the amount of industrial waste generated depend on the industry and the business performance of each year. Based on waste monitoring at enterprises, the rate of hazardous waste is low, ranging from 1.3% to 1.5% of the total volume of the collection.

**[d. Noise and Vibration]**

The value of noise and vibration in O Mon and Thoi Lai districts, where the site area directly passes through, will be focused on for studying within this Project.

According to the results of noise intensity monitoring in the O Mon district, all values at the monitoring location in Tra Noc 2 Industrial Park are lower than the value specified in the current QCVN. The highest value measured at this location during the 3rd quarter monitoring is 72.2dBA, and at the same location, the lowest value recorded in the 1st quarter monitoring is 68.6dBA. In general, the noise value tends to increase and decrease irregularly, and there are no significant fluctuations in 2020.

The value of noise intensity in the districts of Thoi Lai and O Mon fluctuates depending on the traffic volume at the time of measurement. Still, there is no significant fluctuation beyond the norm. The measured values are within the regulations of Vietnam.

**[e. Soil Contamination]**

Soil monitoring has been carried out in the districts in Can Tho City since 2015.

The results of agricultural land monitoring from 2015 to early 2020 show that most of the heavy metal parameters (As, Pb, Cd, Zn, Cu) are within limits for permitted heavy metals in the soil of QCVN 03-MT:2015/BTNMT.

The results of industrial land monitoring in Can Tho period 2015–2020 have not been polluted with heavy metals (compare QCVN 03-MT:2015/BTNMT); however, there has been an increase in the value of heavy metals in the soil over time.

The results from monitoring residential land from 2015 to the beginning of 2020, including the

period of 2011–2015, at all locations on all parameters of heavy metal observed in residential land have values within the allowable limits of heavy metals in the soil of QCVN 03-MT:2015/BTNMT.

Thus, the report of environmental conditions over five years (2015–2020) of DONRE states that commercial activities have not caused pollution of heavy metal parameters in the soil in Can Tho.

**[f. Subsidence]**

From 2015 to 2020, Can Tho City has no reports of land subsidence in the area.

**[g. Odor]**

Odors in Can Tho City mainly come from garbage collection and waste treatment areas. No toxic odors have been detected in the research project area and have not been derived in industrial zones.

### (d) Natural condition

**[a. Protected area]**

Recently, there has been no research data on biodiversity in Can Tho. From the information provided by DONRE, Can Tho does not have a protected area.

**[b. Ecosystem and Biota]**

Flora:

According to a 2015 survey of biodiversity, Can Tho City has 620 species of higher plants, of which angiosperms are the most numerous with 581 species (293 monophyletic species and 288 species of dicotyledon), 11 species of gymnosperms and 28 species of ferns. Areas with a relatively high number of species (from 249 to 439) are Phong Dien, O Mon, Thot Not, Thoi Lai, and Con Au districts.

Fauna:

Wild animals are recorded in Can Tho City. The city has cobras, iguanas, geckos, salamanders, sparrows, and cuckoos, mostly reptiles and birds. Regarding the typical natural ecosystem in Can Tho, the Bang Lang stork garden is a natural ecological area that recorded the appearance of 16 species (belonging to 5 families) of water birds here, of which three species are the Swallow stork (Anastomus oscitant), Coc De (Phalacrocorax carbo Sinensis), and Dien Dien (Anhinga melanogaster) are now listed in the Vietnam Red Book. However, this area is far from the construction side, about 35-40 km up north.

About 76 species of fish are recorded in rivers in Can Tho City. In canals recorded 68 species, 55 species in the rice field, 46 in the field garden and 30 in ponds and lakes. There have been 32 species of fish that people have not seen for a long time (over five years), and the number of species has decreased significantly.

Specifically, in Thoi Thanh commune, Thoi Lai district, in 2000, the number of aquatic species in each community ranged from 47 to 52. However, according to a survey in 2016, Thoi Thanh commune, Thoi Lai district is located in the O Mon - Xa No irrigation system with a closed dike system and Rach Tra sluice to prevent water and natural aquatic resources. In this locality, there has been a severe decline (decrease 17 species of fish and 11 species of snake frogs).

In recent years, Can Tho has been degraded of the natural environment for many reasons. Some are water pollution, population increase, changes in land use structure (reduction of agricultural land), transport and irrigation infrastructure development and construction of industrial parks and residential areas for the city. Can Tho no longer have an ecosystem of the conservation area.

**[c. Hydrology]**

**Hau River** is the main source of freshwater supply for the Mekong Delta and Can Tho and is both the natural boundary of Can Tho with provinces Dong Thap and Vinh Long. Hau River is also an international waterway for ships going to Cambodia. Hau River is the largest river in the region with a total length of 55 km flowing through Can Tho City. The total volume of Hau River's water flowing into the sea is approximately 200 billion $m^3$/year (accounting for 41% of the total water volume of the Mekong River), and the average water flow of Can Tho River (a river originates from the inland area, west of Hau River) is 14,800 $m^3$/s. The total alluvium of the Hau River is 35 million $m^3$/year (accounting for nearly half of the total alluvium in the Mekong River).

**System of small canals**: Can Tho River has a length of about 16 km and a width of 280–350 m. It passes through O Mon, Phong Dien and Cai Rang districts, and Ninh Kieu district and empties into the Hau River at Ninh Kieu wharf. The Can Tho River has fresh water all year round, both for irrigation in the dry season and for drainage in the flood season and has great significance for traffic.

**[Topography and Geology]**

Can Tho has a flat topography slightly inclined in all directions. The height from the Northeast is lower than the Southwest, and the height from the banks of the Hau River is lower to the inland field, which is very typical for the local topography. This land is with an interlaced system of rivers and canals, and the common ground elevation is from 0.8–1.0 m above sea level at Hon Dau national landmark. Can Tho has three main geomorphological regions:

- The main flow area is limited by two banks of the Hau River, forming a highland strip and islets in the middle of the river.
- The floodplain area of the Long Xuyen Quadrangle, including Thot Not district, Vinh Thanh district, part of Co Do district and part of O Mon district, is affected by annual floods.
- The delta region affected by tides and late-season floods includes Ninh Kieu, Binh Thuy, Cai Rang districts, the southern part of the O Mon district, and the Phong Dien district.

Located in the annual alluvial deposition area of the Mekong River, on the land surface to a depth of 50 m, there are two groups of new alluvial deposits (Holocene) and ancient alluvium (Pleistocene).

### (e) Social Condition

**[a. Resettlement:]**

The IPC road is expected to be built across the rice field area. The estimated land acquisition area is about 33 ha of mainly paddy land (accounting for more than 70%). Other land types, such as traffic land, irrigation land, perennial cropland, aquaculture land, and residential land,

will be acquired. Major intersections with roads and residential areas between IPC road and provincial roads DT919, DT922, and National Highway 91 will greatly affect the residents. Relocations will be needed for households within this area. At the beginning of the route, near the construction site of the O Mon bridge, in Thoi An commune, there are several aquaculture areas.

Normally, the process of information disclosure, detailed measurement survey, and plan for compensation and support will be conducted after the approval of the technical design document. Currently, the Detailed Measurement Survey and policies related to land acquisition, compensation, and site clearance have not been prepared. The Project is deployed with a large acquisition area. The new construction of the IPC will affect about 85 houses (partially or entirely). According to the current policy of Can Tho City, households whose houses have been acquired will be compensated in cash or with new residential land in resettlement areas in the respective districts.

**[b. Living and livelihood]**

During the construction process, the main roads for transporting materials are DT922, National Highway 91, and DT919. These are large roads, the density of vehicles is quite crowded, and the transportation of materials and construction vehicles will affect the movement of people.

In addition, when implementing construction work, a large amount of labor will be concentrated in the project area. The risk of transmission of infectious diseases might be caused by large gatherings, unsanitary camps or social relations between workers and local people. However, these are not high risks because the recruitment of local workers will be encouraged to maximize. Besides, the risk of overloading health care will not be high because the construction area is about 5–15 km from the center of O Mon and Thoi Lai districts, where many healthcare centers are available.

**[c. Heritage and landscape]**

According to preliminary survey results, the route mainly passes through agricultural, traffic, irrigation, and residential land. There are no local archaeological, historical, cultural, landscape, or religious heritage sites on the route.

**[d. Ethnic minorities and indigenous people]**

The Project is implemented in Thoi Lai and O Mon districts where the ethnic minority communities, such as Khmer and Chinese, are living. The proportion of ethnic minorities accounts for about 3–4%. Although the ethnic minority community in Can Tho has lived with the Kinh for many years, they maintain their own cultural identity. The Khmer community often has their annual festival activities, and major festival activities are held at the temples.

### 2) Widening of NH61C

The Project of widening the NH61C will be implemented across the districts of Cai Rang and Phong Dien (Can Tho City), Vi Thuy, Chau Thanh A, and Vi Thanh (Hau Giang).

Although the natural and environmental features in the Can Tho City area have many similarities with the general characteristics of the IPC, there are also some minor differences, as outlined below.

#### (a) Pollution Control

**[a. Air quality]**

**Can Tho area**: Cai Rang is a suburban district of Can Tho City and in Cai Rang district. It has three industrial parks, namely Hung Phu 1 Industrial Park, Hung Phu 2A Industrial Park, and Hung Phu 2B Industrial Park. There are two monitoring points for air quality. One is in the Hung Phu 1 IP, and the other is at the junction of NH1 and NH91B (this location is named CR point).

According to the results of the TSP concentration monitoring at the CR point, the TSP concentration at this location has an irregular increase and decrease. Still, there is no big change in the measured value during the monitoring periods. Generally, the observed values at peak hours of each quarter are still lower than the value specified by QCVN 05:2013/BTNMT (1-hour average).

The evolution of TSP over the quarters at the monitoring position of the NH1–NH91B–Can Tho Bridge (CR point) junction, the TSP concentration increased steadily because this is an inter-provincial intersection of Can Tho, Hau Giang, and Soc Trang, so the traffic density the throughput is always high and gives a value close to the upper threshold of the Vietnamese Standard.

Phong Dien district is a suburban district of Can Tho City and has an area of 125.26 $km^2$ and a population of 98,454 people. The district is a large area of agricultural land with the smallest land area. According to the monitoring results, Phong Dien is the district with the lowest average TSP concentration.

**Table 7.3.2 Statistical Value of Annual Total Suspended Particulate in Can Tho part, NH61C from 2015 to 2020**

| Location in Can Tho | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|
| Cai Rang district | 230.11 | 248.32 | 244.33 | 232.85 | 210.70 | 220.50 |
| Phong Dien District | 204.08 | 221.81 | 207.76 | 210.71 | 189.65 | 153.26 |
| Unit | | | **µg/m3** | | | |
| QCVN 05:2013 | | | **300** | | | |

Source: Can Tho City environmental thematic report 2021_Air environment in 2020

In general, the $NO_2$ concentration tends to increase gradually at Cai Rang (CR). However, all observed values at peak hours during every quarter of the year are still lower than the value specified by QCVN 05. :2013/BTNMT (1-hour average). Similarly, the $SO_2$ value is many times lower than the value specified by QCVN 05:2013/BTNMT (1-hour average). In the Phong Dien district, all the monitoring values show a very low concentration of $NO_2$ and $SO_2$.

**Hau Giang area**: The specific data at monitoring points and the location of each point has not been collected yet. According to the five-year environmental status report of 2020 provided by Hau Giang DONRE, the general data was picked up for review.

The monitoring results show that the TSP values were within the specified threshold (300 µg/m3). Regarding regions, the order of decreasing TSP values is Chau Thanh A (248 µg/$m^3$), Vi Thuy (168 µg/$m^3$), Vi Thanh (160 µg/$m^3$). All values are under the requirement of the QCVN 05:2013/BTNMT

The monitoring results show that the value of $SO_2$ parameter shows that $SO_2$ content at all locations is lower than the regulation (350 µg/$m^3$). In terms of regions, the order of decreasing SO2 content is Chau Thanh A (178 µg/$m^3$), Vi Thanh (126 µg/$m^3$), and Vi Thuy (118 µg/$m^3$).

The NO2 monitoring results showed that the observed value exceeded the threshold (200 µg/m3). In terms of region, the order of decreasing $NO_2$ content is Chau Thanh A (201 µg/m3),

Vi Thanh (133 µg/m3), Vi Thuy (126 µg/$m^3$).

**[b. Water Quality]**

**Can Tho area**: The automatic water quality monitoring locations are listed in the abovementioned part of the IPC evaluation. There is no automatic monitoring point close to NH61C.

**Hau Giang area**: The province has conducted water monitoring in many locations. Within the project area, the following points will be considered: NM01, NM06, NM12, NM13, and NM14.

The results of monitoring the continental surface water environment show that the surface water quality at most of the monitoring locations during the reporting period shows signs of pollution by parameters such as Coliform, Fe, DO, COD, BOD5, Ammonium, Phosphate, Nitrite, TSS. The parameters that have decreased in pollution (DO, Ammonium, Phosphate, Nitrite, TSS), such as Coliform, Fe, COD, and BOD5, have increased pollution content. Therefore, surface water quality was identified as having outstanding problems in coliform, Fe, COD, and BOD5 parameters with different pollution sources. In fact, the population in the area is concentrated in riverside and canal areas along with activities of daily life, cultivation, husbandry, aquaculture, etc. Most waste generated from these activities has not been treated but is not up to standard and all have the final receiving source is the hydrological system.

**[c. Waste Management]**

Waste Management in Can Tho Province is basically similar for the whole province and was mentioned in the above part of IPC.

In Hau Giang province, there are 04 landfills, which Tan Tien landfill and Long My landfill are invested with technical burial cells, leachate collection and treatment systems and have been closed as planned. 2012. However, because the province has not built a sanitary solid waste treatment area at the planned location, these two landfills continue to receive garbage, leading to overloading and environmental pollution problems. Particularly Kinh Cung landfill, has temporarily stopped receiving garbage and is investing in renovating and overcoming environmental pollution. Currently, the province is building Hoa An landfill as a focus point for waste treatment of the province and is building a waste power plant (burning waste to recover energy, generate electricity).

Normal and hazardous industrial solid waste from industrial activities in the province is managed quite well. This generated amount is collected, stored by enterprises for normal solid waste, and contracted with functional units to handle according to regulations. Industrial hazardous waste management has received more attention by the Authorities in recent years. Because at present, the Hau Giang Province does not have a functional unit in the transport and treatment of hazardous wastes, the enterprises generating less hazardous waste is now temporarily storing it at the facility until the amount is enough. Then, like the enterprises with a large amount of hazardous waste, they contract with functional units in neighboring provinces to carry out transportation and treatment according to regulations.

**[d. Noise and Vibration]**

In general, noise and vibration issues in Hau Giang province is similar to Can Tho City. The noise value measured in the junction and National highway is always higher than in other locations. However, the monitoring result shows noise values do not exceed Vietnamese regulation requirements.

**[e. Soil Contamination]**

The quality of the surface soil environment in the province is monitored annually.

- Pollution caused using chemicals in farming and agricultural production:

Currently, most of the land in the province is used for agricultural production, concentrated in Vi Thuy and Chau Thanh A districts. Improper application of fertilizers and techniques and over-fertilizing some elements causes an imbalance of nutrients in the soil. In addition, excessive amounts of pesticides damage plants and leave residues in the soil.

- Pollution due to chemical degradation:

Acidification: Acid sulfate occurs on low-lying terrain surfaces, concentrated in the west-southwest region of the province in the districts of Vi Thuy and Vi Thanh and scattered a part of the area in Chau Thanh A district. The toxins in alkaline soil are Al3+, Fe2+, Fe3+, H+, and SO42-. The alum produced might be caused by the potential oxidation of alum (FeS) in situ to form H2SO4 acid, which contains many toxic substances Al3+, Fe2+, SO42-, or it could be caused by alum water from other places, which results in alum contamination for the soil.

**[f. Subsidence]**

In **Can Tho**, there is no report of subsidence, as well as in **Hau Giang**.

**[g. Odor]**

Besides the evaluation in Can Tho Province, Hau Giang area also faced some odor issues.

The rate of urban garbage collection in the Hau Giang province currently reaches more than 80%, and the rest cannot be collected in residential areas without convenient roads to organize the collection. And the residents are littering in the river, especially in the market area and households living along the river. Domestic waste is directly discharged into rivers and canals; in addition to being unsightly and causing odor, it also pollutes the surface water environment for the entire area.

In addition, an issue of air quality that should be noted is the bad odor from concentrated landfills, spontaneous garbage collection areas along national highways, and concentrated solid waste treatment areas but have not thoroughly implemented measures to ensure environmental sanitation.

### (b) Natural condition

**[a. Protected area]**

In Hau Giang Province, high biodiversity areas include Lung Ngoc Hoang Nature Reserve, Mua Xuan Agriculture Center, Viet Uc eco-tourism area, and the forestry area belonging to Can Tho Sugar Joint Stock Company and Hoa An Experimental Zone. However, Lung Ngoc Hoang Nature Reserve, Mua Xuan Agriculture Center, and Hoa An Experimental Zone are more than 30 km from the construction work and will not be affected.

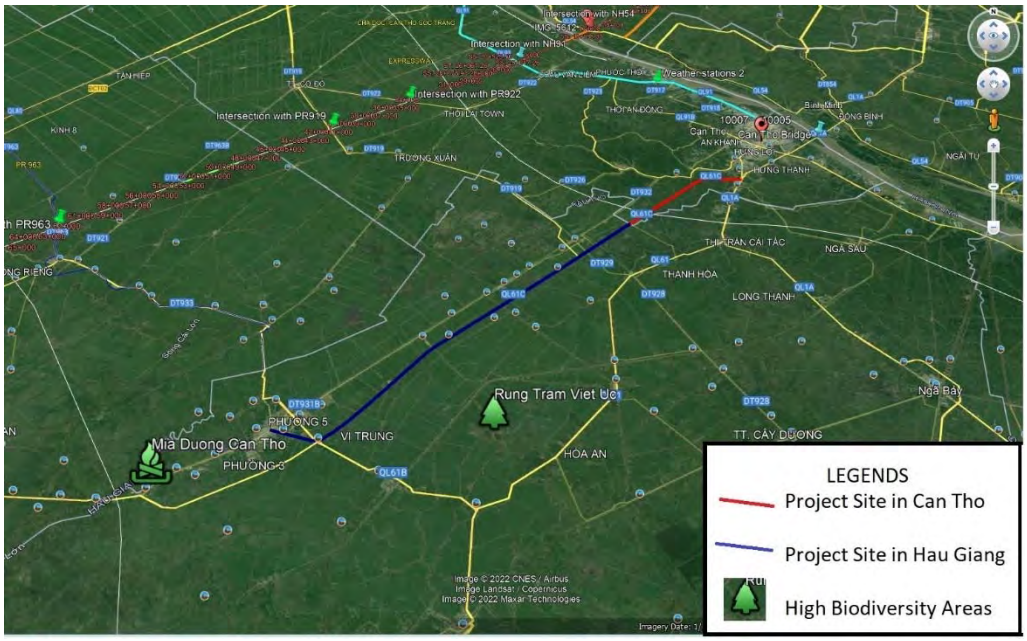
Therefore, only two areas shall be considered:

**Viet Uc eco-tourism area**

Viet Uc eco-tourism area is in Vinh Tuong commune, Vi Thuy district, about 9 km to the Southeast of Vi Thanh. The terrain here is quite flat. The forest area is divided into management plots according to the canal system. Overall, the terrain is divided into two plots to perform management.

**The forestry area belongs to Can Tho Sugar Joint Stock Company**

Forestry and fishery area Can Tho Sugar Joint Stock Company is in Luong Tam Commune, Long My District. This location is about 3 km from the junction of NH61C and NH61 and about 9 km from the site. The forestry area has two sides bordering the Nuoc Trong River, and canals surround the other two sides. There is a system of interlaced canals in the middle of the agricultural area that has created conditions for the diverse flora and fauna.




Sources: Study Team

**Figure 7.3.3 Location of high biodiversity areas (Viet Uc eco tourism and Can Tho Sugar JSC.)**

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**[b. Ecosystem and Biota]**

At the Viet Uc Ecotourism Area, 16 species of mammals, 98 species of birds, 13 species of reptiles, 7 species of amphibians, and 14 species of fish were recorded.

The invertebrate fauna recorded 31 species belonging to 6 families and 2 orders of which 4 species of dragonflies (Odonata, Anisoptera) are listed in the IUCN Red List with LC (Least Concern) level: Brachythemis contaminate, Neurothemis tullia, Neurothemis fluctuans.

The aquatic fauna recorded a total of 120 species, wherein there are 34 species of phytoplankton, 19 species of Silic algae, 42 species of zooplankton, 5 species of benthic, and 20 species of nematodes.

At Forestry Fisheries Area, 16 species of mammals, 7 species of amphibians, 12 species of reptiles, 73 species of birds, and 7 species of fish were recorded.

The invertebrate fauna recorded 20 species, wherein there are two species of dragonflies (Odonata, Anisoptera) listed in the 2015 IUCN World Red List with least concern (LC) level: Crocothemis servilia, Orthetrum sabina.

The aquatic fauna recorded a total of 159 species, wherein there are 65 species of phytoplankton, 20 species of siliceous algae, 52 species of zooplankton, 5 species of benthic, and 17 species of nematodes.

**Table 7.3.3 Biodiversity in 2 areas of Hau Giang province**

| Areas | Vertebrates | | | | | | Invertebrates | Aquatic creatures | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fishes | Amphibians | Reptile | Bird | Mammal | Vietnam Red Book | | Phytoplankton | Silic algae cling | Adventure animals | Benthic animals | Nematode |
| Vietnam Uc Ecotourism Area | 14 | 7 | 13 | 98 | 16 | 0 | 31 | 34 | 19 | 42 | 5 | 20 |
| Forestry Fisheries Area - belongs to Can Tho Sugar Joint Stock Company | 7 | 7 | 12 | 73 | 16 | 0 | 20 | 65 | 20 | 52 | 5 | 17 |

Source: Report on environmental status in 5 years 2016-2020, Hau Giang Province

**[c. Hydrology]**

The water regime of the Hau River influences the hydrological regime of both the Can Tho and Hau Giang Provinces, and there is also the tidal regime of the East Sea, the West Sea, and the intra-provincial rainfall regime.

In Hau Giang, the major canals include the Dong Loi canal, Soc Trang Canal, My Thuan Canal, Xa No Canal, Xang Canal, Lo Da Canal, Nang Mau Canal, Bun Tau Canal, and Cai Con Canal. Hau river, with a length of about 14–15 km, flows through Chau Thanh district. It goes northeast of the province and has many natural branches flowing into the province. In the southwest of the province, there are rivers, such as Cai Lon, Ba Voi, Nuoc Duc, and Nuoc Trong rivers, which provide water for daily life and production and serve as important transport routes going everywhere within the region.

- Surface water

The Hau River has an average annual flow of 2,440 $m^3/s$, the maximum flow is 18,000 $m^3/s$ (October) and the minimum is 800 $m^3/s$ (May). The flow of the Hau River is irregular throughout the year; in the flood season, the flow volume accounts for 70-85% of the annual flow. September, October, and November have the largest flow, accounting for about 50% of the total flow. Due to the low and flat terrain, the drainage capacity is slow. Under the impact of climate change, the water flow on the Hau River will change, and the water volume in the rainy season will increase, causing inundation deep into the field. In the dry season, the flow will decrease and not be enough for domestic water supply for agriculture, forestry, and aquaculture. As a province located downstream of the Hau River, Hau Giang is strongly influenced by tides.

- Groundwater

Groundwater in Can Tho was mentioned during the introduction of the IPC above.

Previously, Hau Giang province always had enough fresh surface water to serve people, but since 2016, the province has had to drill 11 new groundwater wells in all areas at risk of water shortage. The situation of saltwater intrusion and drought in the area is taking place sharply, which has never happened in the past 100 years in this province, this is the first time the province has drilled underground water wells to "relieve thirst" for people.

According to the climate change scenarios, groundwater reserves will decrease due to seawater intrusion when the sea level rises.

**[Topography and Geology]**

Hau Giang province's topography is relatively flat, descending from north to south and east to west with the common average elevation of 0.6 to 0.8 m and can be divided into three regions.

- The tidal zone is the area adjacent to the Hau River to the northwest, including Chau Thanh, Chau Thanh A, and Nga Bay and a part of Phung Hiep district have an area of 19,200 ha, strongly developing the garden economy, agro-forestry, and fisheries economy.
- The intertidal zone adjacent to the Northeast of Phung Hiep district has an area of 16,800 ha. This area was mainly developed by agriculture with a fairly diverse farming system and potential for industrial and service development.
- Flooded areas include the city of Vi Thanh, Long My district, Vi Thuy district and the southeast part of Phung Hiep District, located deeply in the field, with an area of 124,000 ha. This area is an important economic region of Hau Giang Province. The main source of agriculture is planting rice interlaced with sugarcane, grain and crops, and garden trees. In addition, trade, services, and industry-handicrafts businesses have the potential for rapid development.
- In recent years, due to the influence of humans, weather, and climate change, landslides have occurred frequently and complicatedly, causing damage to many properties, fruit trees, and crops and loss of valuable land, especially at the beginning of the rainy season.
- Due to the impact of climate change and sea level rise, the riverbank and canal erosion situation in Hau Giang Province is also very complicated and unpredictable. The phenomenon of riverbank and canal bank erosion is increasing, both in extent and scope. Bank erosion often occurs along rivers and canals, which are the main waterways, with a high density of boats, at river confluences and estuaries. The damage caused by bank erosion is huge. Many culverts, dams, and embankments have been damaged, causing many gardens and rice fields to be flooded and saline and hundreds of people's houses damaged. Thousands of households must be relocated to other places. Bank erosion also increases the amount of mud and sand in the flow and causes sedimentation of the channel in some other areas, thereby hindering navigation.
- The phenomenon of landslides occurs on rivers and canals of Hau Giang Province. According to statistics from 2016–2020, the number of eroded points has increased and decreased year by year, but in general, there is an increasing trend for more expansion. Regarding riverbank erosion, the strongest occurrence is in the upstream districts of the Hau River, such as Chau Thanh A and gradually decreases to the west, Vi Thanh City. In 2016–2020, the length of the riverbank was eroded by about 4.7 km, the total area of eroded land was 20,921 $m^2$ due to water washing it away, and the damage caused by soil erosion and houses was estimated at 12 billion VND.

**(c) Social Condition**

**[a. Resettlement:]**

The route is planned to be built along the existing NH61C route, crossing the fruit and paddy field area. The estimated occupied land area is about 75 ha (12 ha in Can Tho and 6.3 ha in Hau Giang), mainly for paddy field land (accounting for more than 70%), other types of land, such as land for traffic and irrigation, land for planting perennial crops, land for aquaculture,

and residential land will be acquired.

The land acquisition procedures in the Can Tho section were completed since the implementation of NH61C national road phase 1 (2007–2012), covering all land acquisition requirements for the ongoing phase. The land acquisition and site clearance in this period are only implemented in Hau Giang Province. Normally, the process of information disclosure, detailed measurement survey, and plan for compensation and support will be carried out after the approval of the technical design document. The Detailed Measurement Survey and policies related to land acquisition, compensation, and site clearance have not been prepared.

The road widening construction will partially or entirely affect about 130 houses (50 in Vi Thanh city, 30 in Vi Thuy district, and 50 in Chau Thanh A). Most affected households mainly live at the proposed location of the bridge abutment along the route. According to the current policy in Hau Giang Province, affected households will be compensated in cash or by new residential land in the resettlement areas in respective districts. In October and November 2022, the DPC of the districts Chau Thanh A, Vi Thuy, and Vi Thanh City had already sent to Hau Giang PMU on Transport and Agricultural Works their official letter on the proposal for the resettlement area for the project. Compensation shall be arranged for the acquired houses. Compensation costs will follow unit price stipulated by province.

**[b. Living and livelihood]**

During construction, the main roads for transporting materials are National Highway 1A, Pham Hung Street, and National Highway NH61C on the Can Tho side. The main transportation routes in Hau Giang province include National Highway 61C, NH61B, Vo Nguyen Giap, and National Highway 61. These are large roads with relatively high vehicle density. The transportation of raw materials and construction vehicles will affect the movement of people.

In addition, when implementing construction work, a large amount of labor will be concentrated in the project area. The risk of transmission of infectious diseases might be caused by large gatherings, unsanitary camps or social relations between workers and local people. However, these are not high risks because the recruitment of local workers will be encouraged to maximize. Besides, the risk of overloading in health care is not high because the construction area is about 20 km from the center of Cai Rang, Phong Dien district, Vi Thanh City, Chau Thanh A, Vi Thuy district, and inner districts of Can Tho City where many health care centers are available.

**[c. Heritage and landscape]**

According to preliminary survey results, the route mainly passes through agricultural, traffic, irrigation, and residential land. There are no local archeological, historical, cultural, landscape, and religious heritage sites on the route.

**[d. Ethnic minorities and indigenous people]**

The Project is implemented in the Cai Rang and Phong Dien districts of Can Tho, Chau Thanh A, Vi Thuy districts, and Vi Thanh City of Hau Giang province. The project area is inhabited by ethnic minorities such as Khmer, Chinese, and San Diu. The proportion of ethnic minorities accounts for about 3-4%, mainly concentrated in Chau Thanh A and Vi Thuy districts, Hau Giang province. Although the ethnic minority communities in Can Tho and Hau Giang have lived with the Kinh people for many years, they keep their cultural identity. The Khmer communities often have their annual festival activities, and major festival activities are held at the temples.

### 7.3.3. Preliminary Examination

#### 1) Key Description of the Target Projects

General site description on environment and social conditions related to the target projects (IPC and NH61C), as well as the preliminary examination of likely impacts brought about by the target projects, are depicted in the following section and tables. However, the analysis hereinafter in the section has been made based on the data and information of the target projects defined in Pre-FS Input Study Report prepared in November 2022. On the other hand, the descriptions of the target projects are being updated/revised as of this reporting time, for example, (i) development schedule of IPC has been changed from "the first development of 2 lanes and the second development of 4 lanes by widening in future" to "full development of 4 lanes from the first without phasing," (ii) the existing two intersections of NH61C are planned to be upgraded to interchanges, and so on. It is expected that the further change/ revision of the description of the target projects would be made more during subsequent studies including F/S afterward. Therefore, it should be noted that the analysis for environment and social considerations hereinafter be also updated according to the final description of the target projects.

**(a) IPC: Road Section in Can Tho City (description as of November 2022)[20]**

- Technical grade: Plain grade III road according to TCVN 4054-2005
- Design speed: 80 km/h
- Newly construction of 2-lanes in initial stage (4-lanes completed in ultimate) in 27.2 km
- Two motorized vehicle lanes and two non-motorized lanes vehicles (effective total width: 11.0 m) *Initial stage
- 41 bridges

**(b) NH61C (description as of November 2022)**

- Technical grade: Plain grade III road according to TCVN 4054-2005
- Design speed: 80 km/h
- Newly construction of widening 2-lanes additional to existing 2-lanes in 47.352km
- Upgrading existing 2-lanes as all-weather road (raising planed height of existing lanes)
- Four motorized vehicle lanes and two non-motorized lanes vehicles (effective total width:10.0 m*2)
- Forty-one bridges (7 bridges in Can Tho City and 34 bridges in Hau Giang Province)

#### 2) Key Findings on Environmental and Social Aspects for the Target Projects

The following are summarized findings on environmental and social aspects for developing the IPC and NK61C:

- Environmental pollution such as the impacts on the air quality and noise will be brought about during the construction stage and operation stage. Although the proposed

[20] After this preliminary examination, the Project proposal has been updated as "Document No. 13/ TT dated 20/02/2023". In the updated document, the number of bridges has been updated to "30 works crossing rivers including 25 bridges, 5 viaducts". Therefore, it shall be noted that this preliminary examination was conducted based on the JICA study team's preliminary study. For furthermore study after this preliminary study, all of project features shall be referred to the updated Project Proposal.

alignment of both the target projects are not planned to pass through the high-dense residential areas, some considerations for environmental pollution are suggestive to be studied in the further stage, including the likely impact on the sensitive receptors such as schools and healthcare clinic.

- Neither nature conservation areas nor the protected area/forests will not be located on the proposed alignments of IPC and NH61C. However, endangered species are reported in the existing information around both the project sites. it is advisable to, in further stage, confirm if the impact on such species would be caused by the projects.
- The proposed alignment of both the target projects are not planned to pass through the high-dense residential areas, However, land acquisition for agricultural/paddy fields will be required to some extent, as well as house structures in RoWs of the proposed alignments will be removed/resettled to some extent. Further study to identify the magnitude of such likely impacts as well as to figure out the necessary social considerations are to be elaborated.
- Existence of ethnic minorities are reported around the project sites of IPC and NH61C. Although their daily life are considered to be merged together with the major group, it is advisable to, in further stage, confirm if the likely impact would be brought about to life style and culture of ethnic minorities due to the project implementation.

### 3) Results of The Preliminary Examination

The checklist of JICA Guidelines is applied for identifying the project impacts preliminarily. In this stage, checklists containing the environmental and social indices were extensively used, and the detailed description are compiled.

The checklists include not only the list of environmental aspects but also rank of the impacts. The evaluation ranks indicate relative importance of individual environmental aspects as well as total ranking assumed for all stages of the project.

### Table 7.3.4 The Preliminary Examination Results (IPC)

| Category | | Activities to be performed | Finding of Environmental and Social Considerations | Rating |
|---|---|---|---|---|
| 1 Permits and Explanation | (1) EIA and Environmental Permits | - This Project is classified as group I of Investment Project by The Vietnam LEP 2020. Thus, it is required to obtain the Preliminary EIA in Pre-FS stage, EIA in FS stage and obtain Environment Permit in Operation Stage;<br><br>- EIA shall be approved by the MONRE | - Preliminary EIA and EIA reports are not completed. | N/A |
| | (2) Explanation to the Local Stakeholders | - Stakeholders meeting shall be conducted during the preparation of EIA and RAP | - Stakeholders meetings are not conducted yet. | N/A |
| | (3) Examination of Alternatives | - Study and analyze of Alternatives regarding the environment and social consideration; | - Study and analyze of alternatives are not done. | N/A |
| 2 Pollution Control | (1) Air Quality (including Green House Gas) | PCS/CS:<br>- Transportation of equipment used for survey;<br>- Demolition of house, structures;<br>- Transportation of construction waste;<br>- Transportation of furniture for resettlement;<br>- Transportation of construction materials, equipment and workers;<br>- Excavation of land and foundation;<br><br>OS<br>Traffic service operation. Transportation of raw materials, fuel, products, and workers during the maintenance of road | PCS/CS:<br>- Emission gas generated from construction equipment and vehicles;<br>- Dust formed owing to demolition and transportation activities;<br><br>OS<br>Dust and emission generated from vehicle operation | A - |
| | (2) Water Quality | PCS/CS:<br>- Demolition of houses and structures<br>- Excavation of land and foundation;<br>- Living of workers in/around project sites<br><br>OS<br>Wastewater from road cleaning, road maintenance and storm water. | PCS/CS<br>- Muddy water inflows to environment from bare land of construction and demolition site and uncovered storage of materials and waste;<br>- Domestic wastewater generated from lodging of workers;<br><br>OS<br>- Storm water and inflow from road cleaning and maintenance to the bare land and surrounding nature water area. | A - |

| Category | | Activities to be performed | Finding of Environmental and Social Considerations | Rating |
|---|---|---|---|---|
| | (3) Wastes | PCS/CS:<br>- Demolition of houses and structures<br>- Excavation of land and foundation;<br>- Living of workers in/around project sites<br><br>OS<br>- Maintenance of roads, drainage and sewerage system;<br>- Maintenance of greening area; | PCS/CS:<br>- Solid waste from demolition of houses and structures and land excavation;<br>- Construction waste: soil, sand, concrete, brick, etc. from construction and land excavation<br>- Domestic waste from living of workers;<br>- Hazardous waste from maintenance of vehicles and equipment<br><br>OS<br>- Sludge from maintenance and dredging of drainage and sewerage system;<br>- Organic waste from maintenance of greening area;<br>- Construction waste: soil, sand, concrete, brick, etc. from road maintenance and construction (if any); | A - |
| | (4) Noise and Vibration | PCS/CS:<br>- Transportation activities and<br>- Demolition of houses and structures<br>- Construction of facilities.<br><br>OS<br>- Traffic service operation.<br>- Transportation of construction materials, equipment and workers for road maintenance;<br>- Transportation of waste including construction waste; | PCS/CS:<br>Increase of noise & vibration levels due to construction vehicles and machines;<br><br>OS<br>- Increase of noise and vibration level due to construction vehicles and machines during the maintenance of road;<br>- Increase of traffic noise level due to vehicles on roads; | A - |
| 3 Natural Environment | (1) Protected Areas | No protected area within the site boundary | No protected area within the site boundary and nearby. | C |
| | (2) Ecosystem | PCS<br>Agricultural flora, mainly rice, and trees growing beside of IPC alignment are expected to be removed. Removal of such flora also causes impact slightly on local ecology and biodiversity negatively<br><br>CS<br>Mobilization of heavy equipment and temporary storage of material | PCS<br>- Vegetation cover is removed;<br><br>CS<br>- Negative impact to fauna and ecosystem/biodiversity during construction.<br>- Endangered species, listed in Vietnamese Red Book, of fauna (three species are: Swallow stork (Anastomus oscitant), Coc De (Phalacrocorax carbo Sinensis), Dien Dien (Anhinga melanogaster) are reported in the existing information. The likely impact should be checked in EIA study. | B- |
| | | OS<br>No effect to Natural Environment | OS<br>No effect | C |

| Category | | Activities to be performed | Finding of Environmental and Social Considerations | Rating |
|---|---|---|---|---|
| | (3) Hydrology | PCS/CS<br>During the construction, stormwater overflows the banks of river. | PCS/CS<br>By construction of IPC, hydrological condition may be affected if proper design is not made. | B- |
| | | OS<br>No effect | OS<br>No effect | C |
| | (4) Topography and Geology | PCS/CS/OS<br>The using or natural resources, such as stones, rocks and sand from quarries will affect natural topography. | PCS/CS/OS<br>- The design should be properly prepared to avoid any incidents of land slide, erosion, etc. based on the design and technical standards.<br>- Minor geographical changes at construction site, quarry, and disposal site of earth materials.<br>- Topographical changes by embankment might cause flow and retention of surface water. | B- |
| 4 Social Environment | (1) Resettlement | PCS<br>Resettlement, compensation and relocation of households | PCS<br>- land acquisition area: about 33ha,<br>- affect to the about 85 houses. | A- |
| | | CS/OS<br>No effect | CS/OS<br>No effect | C |
| | (2) Living and Livelihood | PCS/CS<br>People's incomes are affected by loss of jobs, land and fields | PCS/CS<br>- The livelihood of inhabitants will be affected due to disruption of the existing agricultural pattern of project area. However adequate compensation for landowner as well as cultivator is ensured by Resettlement Action Plan (to prepared in the next phase) policy that provides for compensation at full replacement costs, additional assistances to cover transaction and registration costs, additional assistances for vulnerable project affected person and livelihood restoration.<br>- Accidents are expected to increase during construction due to movement of heavy construction vehicle. Contractor will be required to install traffic signals, road mark, zebra mark, guard rail...<br>- There is a possibility that infectious disease would be spread by construction workers. The contractor will be required to develop and carry out HIV/AIDS prevention/awareness raising plan services.<br>- The project is expected to significantly reduce the traffic congestion in the area and hence reduce the occurrence of accidents during operation phase. However, temporary disruption of traffic flow and increased accidents are expected during construction phase. Mitigation measures should be provided in EMP.<br>- The restriction of local people's movement would happen by construction vehicles and construction activities. These impacts will be minimized by the Contractor's traffic management plan (to be prepared by the contractors). The routes should be watered to reduce dust as a mitigation measure. | B- |
| | | OS<br>No effect | OS<br>Due to construction of new road, separation of the existing community might be caused by the project, although such impact would be mitigatable. Countermeasure would be needed to be elaborated in project design stage if necessary. | C |
| | (3) Heritage | In this project area, no heritage sites are at risk of being affected. | N/A | C |

| Category | | Activities to be performed | Finding of Environmental and Social Considerations | Rating |
|---|---|---|---|---|
| | (4) Landscape | Construction works including embankment and cutting. | - There is no valuable landscape in and around the project road to be protected. But some civil works may affect the existing landscape in local area. | B- |
| | (5) Ethnic Minorities and Indigenous Peoples | PCS/CS/OS<br>The project area has several ethnic groups, such as Khmer, Hoa and Cham. However, ethnic minorities have lived in this area for many years and have similar activities as Kinh ethnic group. The construction has almost insignificant negative effects in terms of ethnicity. | PCS/CS/OS<br>- Transport on the existing roads during road upgrading might cause traffic safety risks and hazards for the indigenous peoples living along the road, especially in densely populated areas. Crowded construction sites/worker camps may increase risk of COVID-19 transmission<br>- A health and safety management program will be formulated and implemented in cooperation with local transport and health management authorities.<br>- It is considered that the daily lifestyles of the ethnic minorities in and surround the project areas are almost merged to and similar to the Kinh group (predominant ethnic in Vietnam). Although significant impact is not expected on ethnic minorities, the further study is suggestive in the next phase. | B- |
| | (6) Working Conditions | PCS/CS<br>Many workers from many contractors will be gathered for working | PCS/CS<br>- The project contractors should not violate any law on labour.<br>- The contractor should develop and implement an occupational safety and health plan, and in accordance with the laws of Vietnam government.<br>- Occupation health and safety training program should be provided to workers to educate them not to violate local safety. | B- |
| | | OS<br>High traffic volumn and many vehicles | OS<br>- During the operation phase, the main risk is road traffic accidents | B- |
| 5 Others | (1) Impacts during Construction | PCS/CS/OS<br>- During the construction, trucks transporting construction materials will cause traffic congestion<br>- Construction works contain many risks of site accidents<br>- The mobilization of many workers, people and engineers from outside to local areas will cause social issues; | PCS/CS/OS<br><br>During all phases, the main risk is the risk of road traffic accidents | A- |
| | (2) Monitoring | - | - | - |
| 6 Note | Reference to Checklist of Other Sectors | - | - | - |
| | Note on Using Environmental Checklist | - | - | - |

Note: - PCS: Pre-construction stage, CS: Construction stage, OS: Operation stage

- Rating: A: Significant impact, B: Mid impact, C: Small/ Negligible impact, U: Unknown, NA: Not applicable, +: Positive effect, -: Negative impact

Source: The Study Team

### Table 7.3.5 The Preliminary Examination Results (NH61C)

| Category | | Activities to be performed | Finding of Environmental and Social Considerations | Rating |
|---|---|---|---|---|
| 1 Permits and Explanation | (1) EIA and Environmental Permits | - This Project is classified as group I of Investment Project by The Vietnam LEP 2020. Thus, it is required to obtain the Preliminary EIA in Pre-FS stage, EIA in FS stage and obtain Environment Permit in Operation Stage;<br><br>- EIA shall be approved by the MONRE | - Preliminary EIA and EIA reports are not completed. | N/A |
| | (2) Explanation to the Local Stakeholders | - Stakeholders meeting shall be conducted during the preparation of EIA and RAP | - Stakeholders meetings are not conducted yet. | N/A |
| | (3) Examination of Alternatives | - Study and analyze of Alternatives regarding the environment and social consideration; | - Study and analyze of alternatives are not done. | N/A |
| 2 Pollution Control | (1) Air Quality (including Green House Gas) | PCS/CS:<br>- Transportation of equipment used for survey;<br>- Demolition of house, structures;<br>- Transportation of construction waste;<br>- Transportation of furniture for resettlement;<br>- Transportation of construction materials, equipment, and workers;<br>- Excavation of land and foundation;<br><br>OS<br>Traffic service operation. Transportation of raw materials, fuel, products, and workers during the maintenance of road | PCS/CS:<br>- Emission gas generated from construction equipment and vehicles;<br>- Dust formed owing to demolition and transportation activities;<br><br>OS<br>Dust and emission generated from vehicle operation | A - |

| Category | | Activities to be performed | Finding of Environmental and Social Considerations | Rating |
|---|---|---|---|---|
| | (2) Water Quality | PCS/CS:<br>- Demolition of houses and structures<br>- Excavation of land and foundation;<br>- Living of workers in/around project sites<br><br>OS<br>Wastewater from road cleaning, road maintenance and storm water. | PCS/CS<br>- Muddy water inflows to environment from bare land of construction and demolition site and uncovered storage of materials and waste;<br>- Domestic wastewater generated from lodging of workers;<br><br>OS<br>- Storm water and inflow from road cleaning and maintenance to the bare land and surrounding nature water area. | A - |
| | (3) Wastes | PCS/CS:<br>- Demolition of houses and structures<br>- Excavation of land and foundation;<br>- Living of workers in/around project sites<br><br>OS<br>- Maintenance of roads, drainage, and sewerage system;<br>- Maintenance of greening area; | PCS/CS:<br>- Solid waste from demolition of houses and structures and land excavation;<br>- Construction waste: soil, sand, concrete, brick, etc. from construction and land excavation<br>- Domestic waste from living of workers;<br>- Hazardous waste from maintenance of vehicles and equipment<br><br>OS<br>- Sludge from maintenance and dredging of drainage and sewerage system;<br>- Organic waste from maintenance of greening area;<br>- Construction waste: soil, sand, concrete, brick, etc. from road maintenance and construction (if any); | A - |
| | (4) Noise and Vibration | PCS/CS:<br>- Transportation activities and<br>- Demolition of houses and structures<br>- Construction of facilities.<br><br>OS<br>- Traffic service operation.<br>- Transportation of construction materials, equipment, and workers for road maintenance;<br>- Transportation of waste including construction waste; | PCS/CS:<br>Increase of noise & vibration levels due to construction vehicles and machines;<br><br>OS<br>- Increase of noise and vibration level due to construction vehicles and machines during the maintenance of road;<br>- Increase of traffic noise level due to vehicles on roads; | A - |
| 3 Natural Environment | (1) Protected Areas | No protected area within the site boundary | No protected area within the site boundary<br>However, within the radius of about 9km from the site, there are two high ecology system shall be protected. The Viet Uc Ecotourism and Can Tho Sugar JSC. Although the impact by project to these areas will be negligible, it is recommended that the EIA shall consider these areas. | C |

| Category | | Activities to be performed | Finding of Environmental and Social Considerations | Rating |
|---|---|---|---|---|
| | (2) Ecosystem | PCS<br>Agricultural flora, mainly rice, and trees growing beside of NH61C alignment are expected to be removed. Removal of such flora also causes impact slightly on local ecology and biodiversity negatively<br><br>CS<br>Mobilization of heavy equipment and temporary storage of material | PCS<br>- Vegetation cover is removed;<br><br>CS<br>- Negative impact to fauna and ecosystem/biodiversity during construction<br>- Endangered species listed in Vietnamese Red Book are reported in the existing information. The likely impact should be checked in EIA study. | B- |
| | | OS<br>No effect to Natural Environment | OS<br>No effect | C |
| | (3) Hydrology | PCS/CS<br>During the construction, stormwater overflows the banks of river. | PCS/CS<br>By construction of widening NH61C, hydrological condition may be affected if proper design is not made. | B- |
| | | OS<br>No effect | OS<br>No effect | C |
| | (4) Topography and Geology | PCS/CS/OS<br>The using or natural resources, such as stones, rocks and sand from quarries will affect natural topography. | PCS/CS<br>- The design should be properly prepared to avoid any incidents of land slide, erosion, etc. based on the design and technical standards.<br>- Minor geographical changes at construction site, quarry, and disposal site of earth materials.<br>- Topographical changes by embankment might cause flow and retention of surface water | B- |
| | | | | B- |
| 4 Social Environment | (1) Resettlement | PCS<br>Resettlement, compensation and relocation of households | PCS<br>- The estimated occupied land area: about 75ha (12ha in Can Tho and 63ha in Hau Giang), 70% for paddy field land. The resettlement, compensation and relocation activities in Can Tho area already completed since 2012. However, in some areas, the local people still cultivate the agricultural crops. The carefully assessment should be done for the compensation and allowances activities for the project.<br>- Affect to the about 130 houses in Hau Giang Province (partially or entirely) (50 in Vi Thanh city, 30 in Vi Thuy district and 50 in Chau Thanh A). | A- |
| | | CS/OS<br>No effect | CS/OS<br>No effect | C |
| | (2) Living and Livelihood | PCS/CS | PCS/CS | B- |

| Category | | Activities to be performed | Finding of Environmental and Social Considerations | Rating |
|---|---|---|---|---|
| | | People's incomes are affected by loss of jobs, land, and fields | - The livelihood of inhabitants will be affected due to disruption of the existing agricultural pattern of project area. However adequate compensation for landowner as well as cultivator is ensured by Resettlement Action Plan (to prepared in the next phase) policy that provides for compensation at full replacement costs, additional assistances to cover transaction and registration costs, additional assistances for vulnerable project affected person and livelihood restoration.<br>- Accidents are expected to increase during construction due to movement of heavy construction vehicle. Contractor will be required to install traffic signals, road mark, zebra mark, guard rail...<br>- There is a possibility that infectious disease would be spread by construction workers. The contractor will be required to develop and carry out HIV/AIDS prevention/awareness raising plan services.<br>- The project is expected to significantly reduce the traffic congestion in the area and hence reduce the occurrence of accidents during operation phase. However, temporary disruption of traffic flow and increased accidents are expected during construction phase. Mitigation measures should be provided in EMP.<br>- The restriction of local people's movement would happen by construction vehicles and construction activities. These impacts will be minimized by the Contractor's traffic management plan (to be prepared by the contractors). The routes should be watered to reduce dust as a mitigation measure. | |
| | | OS<br>No effect | OS<br>No effect | C |
| | (3) Heritage | In this project area, no heritage sites are at risk of being affected. | N/A | C |
| | (4) Landscape | Construction works including embankment and cutting. | - There is no valuable landscape in and around the project road to be protected. But some civil works may affect the existing landscape in local area. | B- |
| | (5) Ethnic Minorities and Indigenous Peoples | PCS/CS/OS<br>The project area is inhabited by ethnic minorities such as Khmer, Chinese, and San Diu. The proportion of ethnic minorities accounts for about 3-4%, mainly concentrated in Chau Thanh A and Vi Thuy districts, Hau Giang province. | PCS/CS/OS<br>- Transport on the existing roads during road upgrading might cause traffic safety risks and hazards for the indigenous peoples living along the road, especially in densely populated areas. Crowded construction sites/worker camps may increase risk of COVID-19 transmission<br>- A health and safety management program will be formulated and implemented in cooperation with local transport and health management authorities.<br>- It is considered that the daily lifestyles of the ethnic minorities in and surround the project areas are almost merged to and similar to the Kinh group (predominant ethnic in Vietnam). Although significant impact is not expected on ethnic minorities, the further study is suggestive in the next phase. | B- |
| | (6) Working Conditions | PCS/CS<br>Many workers from many contractors will be gathered for working | PCS/CS<br>- The project contractors should not violate any law on labor.<br>- The contractor should develop and implement an occupational safety and health plan, and in accordance with the laws of Vietnam government.<br>- Occupation health and safety training program should be provided to workers to educate them not to violate local safety. | B- |
| | | OS<br>High traffic volume and many vehicles | OS<br>- During the operation phase, the main risk is f road traffic accidents | B- |

| Category | | Activities to be performed | Finding of Environmental and Social Considerations | Rating |
|---|---|---|---|---|
| 5 Others | (1) Impacts during Construction | PCS/CS/OS<br>- During the construction, trucks transporting construction materials will cause traffic congestion<br>- Construction works contain many risks of site accidents<br>- The mobilization of many workers, people and engineers from outside to local areas will cause social issues; | PCS/CS/OS<br><br>During all phases, the main risk is the risk of road traffic accidents | A- |
| | (2) Monitoring | - | - | - |
| 6 Note | Reference to Checklist of Other Sectors | - | - | - |
| | Note on Using Environmental Checklist | - | - | - |

Note: - PCS: Pre-construction stage, CS: Construction stage, OS: Operation stage

- Rating: A: Significant impact, B: Mid impact, C: Small/ Negligible impact, U: Unknown, NA: Not applicable, +: Positive effect, -: Negative impact

Source: The Study Team

# 8. Conclusions and Recommendations

## 8.1. Conclusions

Since 2017, the Government of Vietnam has addressed a sustainable and climate change-resilient development of the Mekong Delta Region. In 2022, the Study commenced in the growing momentum of regional development, attested by the approval of the regional development masterplan in February and the issuance of the government's action plan in June. Therefore, 2022 was an epoch-making year not only for the Study but also for the entire MRD.

After the study mobilization in February 2022, JST visited 13 special city/provinces which constitute the MRD. It was an important step for JST to familiarize the team with the study area and develop the latest socio-economic database. JST contracted out to a local firm to conduct traffic surveys to focus on river crossing traffic by vehicles and ferries along the Hau River from March to April 2022. The traffic results clearly show the development impact of long-span bridges. After bridge construction, river crossing traffic sharply increased and industrial investment was attracted beyond the Hau River.

In July 2022, JST submitted the Interim Report where the two target projects are reported and confirmed:

(a) The Can Tho City section on the new inter-provincial corridor from Sa Dec (Dong Thap Province)–O Mon (Can Tho City)–Giong Rieng (Kien Giang Province); and

(b) Upgrading of NH 61C from Can Tho–Vi Thanh (Hau Giang Province).

Can Tho City take a role of regional center in various social activities and of regional hub in domestic and international trading activity. In the southern part of the Mekong Delta delineated by the Hau River, Can Tho City and Hau Giang Province have the highest development potentials. It is remarkable that 5 expressways which are provisionally operated or under construction or planned are surrounded by the target projects. The target projects are designed to be national highways. Combined with the expressway network, the target projects will serve as an artery of Greater Can Tho in the future.

JST faced with administrative, technical issues when studying the target projects.

In regard to the administrative issue, JST expected to receive draft pre-FS study reports from Can Tho City and Hau Giang Province by September 2022. Due to the delayed approval of the target project proposals by MPI and other reasons, those draft reports were not submitted on time. To respond such situations, JST changed its study direction at the end of September, from reviewing their draft reports to give pre-input to them. It is noted that JICA received the draft version of the pre-FS report on the NH61C project from Hau Giang DOT in December 2022. As of writing the DFR, Can Tho DOT has not submitted two pre-FS reports yet.

In regard to the technical issue, the two target projects have common and different issues. The road design to adapt climate change is a common issue. The Study employs the MONRE's scenario of RCP 4.5 for road design. The different issues by project are reported as follows:

- The IPC Project will develop a new road to traverse from Dang Thap Province, Can Tho City to Kien Giang Province. The three local governments must be coordinated to decide route alignment and road sectional design and others. The road

development in the section of the provinces of Dong Thap and Kien Giang is supposed to be funded by the ADB, but they made little progress in project preparation during the Study. In December 2022, Can Tho DOT revealed to change the road sectional design, initially from 2-lane to 4-lane probably without the coordination with the neighboring provinces. JST tried to follow the Can Tho DOT's idea as long as we can.

- The 61C Project will widen the existing 2-lane road to 4-lane. Practical road and bridge widening methods are necessary without disturbance of existing traffic or with minimum disturbance. After the opening of the existing NH61C in 2012, the road surface has subsided in a widespread manner due to the soft soil condition. The project thus needs not only widening but also rehabilitation of the road with climate change adaption. JST suggested a couple of practical methods to address those issues.

To gage economic impact of the two target projects, the Study has undertaken economic analysis. The project EIRR is estimated at 13.8, higher than the social discount rates in Viet Nam (10 %).

The Study also paid attention to the project's funding aspect on the condition that Can Tho City and Hau Giang Province would receive JICA ODA loans through the government's on-lending mechanism. The GOV has regulated such as on-lending mechanism with sufficient experiences, and now intends to increase such practices.

The Study conducted a preliminary examination of environmental and social considerations on the target projects. Since both sides of the GOV and JICA may treat the projects as Category A, careful attitude will be required to reduce significant adverse impact on the environment and society in the course of further project preparation and implementation.

## 8.2. Recommendations

### 8.2.1. For Transport Network Planning

The Study's target projects located in Can Tho City and Hau Giang Province are strategically important to form a transport network of the region's most significant growth area surrounded by five expressways which are provisionally operated or under construction or under planned. The regional development masterplan is available in 2022 while Can Tho City and Hau Giang Province have their own transport development plans issued in 2015 and 2111, respectively. These plans do not include the target projects and most of the on-going expressway projects. Can Tho Bridge, the first bridge over the Hau River since 2010, substantially expanded socio-economic activities across the river. However, there is no integrated planning document covering both and the adjoining areas which will be affected by the target projects, the surrounding expressways and other important infrastructure projects.

The Study, therefore, conceptualized Greater Can Tho in Chapter 4 of this report. It is quite a new concept and no previous discussions at least on the development planning documents of the central and local governments as well as the donor community of Vietnam. But there is a significance to work out such a metropolitan development plan for strategic project formation and justification.

To concretize the Greater Can Tho concept and identify the necessary roles of the target

projects, it is suggested that the following planning works be undertaken:

- The Study conducted road traffic surveys along the Hau River and developed the transport network for demand forecast consisting of arterial roads and major inland waterways. It was enough to evaluate the regional significance of the target projects. To understand detailed infrastructure use patterns, such as peak time, travel purpose, vehicle/fleet type, etc., however, it is suggested that local roads and local inland waterways be added to the planning network and additional traffic surveys be conducted at more sites.
- The target projects are designed to cross over many inland waterways and local roads. JST observed not a few boats in navigation at the project sites but their activities such as routine routes and carrying cargo types are not sure. For utilizing the target projects, the present combination of road traffic with IWT service as well as the hierarchical IWT service among narrow and wide waterways and riverports must be understood.
- A hierarchical transport network consisting of radial and circumferential roads from Can Tho City CBD has not been well planned although it is important to ensure efficient traffic movement of goods and people. Such a network must be planned and realized regardless of city boundary and physical barriers such as rivers and swamps. In the future, IWT will keep an important role and a new railway link will connect Can Tho CBD with HCM City. To develop a balanced transport system among several modes, modal transfer facilities such as riverports, railway stations, bus terminals and ICDs will become more important than the present situations.
- A long-term gateway development plan must take an important position in a Greater Can Tho development plan. For this purpose, the Study recognizes that the existing Can Tho International Airport will be expanded unless there be any physical constraints, and Tran De Port will be newly constructed. The Study mentions the port project must overcome local hydrographic issues in collaboration with experienced port and hydrographic engineers.

JICA as a development partner of Vietnam has contributed to metropolitan transport planning in Hanoi City, HCM City and Danang City. Then, JICA supported some key infrastructure projects of roads and bridges, urban rails, seaports and airports which were identified from those planning documents. Judging from such experiences, it is the time for Can Tho City, as the fourth largest in Vietnam, to form a comprehensive transport development plan in the scale of Greater Can Tho.

### 8.2.2. For Designing of the Target Projects

The new IPC project starting from Sa Dec (Dong Thap Province) via O Mon (Can Tho City) to Giong Rieng (Kien Giang Province) requires close coordination among the three local governments in terms of route alignment, design of road and bridge, construction schedule and so on. Similarly, good collaboration is required between Can Tho City and Hau Giang Province to implement the NH61C project.

Sound resilience against climate change impact is a common development issue. To operate as all-weather roads, MONRE's scenario RCP 4.5 is applied to road design particularly planned road surface height. NH61C suffers from widespread road surface

subsidence spots, although it started to operate in 2012. Those problematic spots should be repaired in the project, i.e., 30 cm on average, in addition to the calculated additional height to respond to climate change impact, i.e., 15 cm from the 25 years probability. JST did not receive any road surface inundation damage record. Also, JST has not collected and analyzed inundation records along the project roads. It is thus suggested that past inundation records be analyzed on and around the road alignment. If necessary, planned road surface height and flood relief culvert must be reconsidered.

The target projects will have to tackle with soft soil conditions taking the land subsidence experience occurred on NH61C into account. The Study suggests sound soil compaction in terms of earthwork volume and time before embankment work and georid (geo-textile sheet) placement on the new embankment. Since the Study worked with limited data, it is suggested that appropriate geotechnical survey be conducted to prepare reliable local database for structure planning such as determination of exact pier positions and others.

Although the pace and extent of road subsidence would be alleviated by the proposed measures, it cannot stop residual settlement, and thus, periodical repair work must be necessary. It is suggested to duly include such periodical work in the project's O&M plan.

### 8.2.3. For Evaluation / Implementation of the Target Projects

#### 1) Economic analysis

For enhancing reliability in economic analysis, it is suggested to estimate project costs again in the F/S stage. More accurate construction costs will be estimated based on a topographic survey. In the project's RAP, the necessary amounts of land acquisition and resettlement will be counted. Economic benefit analysis should not be a problem since there is a profound experience in benefit calculation using VOC and TTC as indicators in Vietnam, but Can Tho City and Hau Giang Province should collaborate in analyzing NH61C as one project.

#### 2) Funding Arrangement

Vietnam has well developed its on-lending mechanism to tap ODA loans to provincial governments and other public entities with many experiences. Decree 79/2021 indicates projects /programs relating to climate change in the MDR can enjoy special on-lending ratio in line with Government Resolution 41/2021, not less than 10%. MPI proposed PM to apply 10% to the target projects.

#### 3) Environmental and Social Considerations:

In accordance with the related regulation of the GOV, the target projects are under the Project Proposal stage and they will go to the pre-F/S and F/S stages. Based on the project descriptions to be figured out by F/S, EIA and RAP studies will be conducted fully in accordance with the related legislation and regulations of Vietnam including EIA approval from Vietnam authorities.

On the other hand, the target projects are expected to be recognized as Category-A under JICA Guidelines for Environmental and Social Considerations, in case of applying Yen loan scheme including sector loan. In such case, the EIA and RAP will be conferred and reviewed by JICA Advisory Committee in order to verify the fulfillment of policies and requirements of

the JICA guidelines. It is suggested that the EIA and RAP studies and outcomes be prepared in due considerations of the requirements of the JICA guidelines.

**Table 8.2.1 Activity Flows of the Target Projects**

| N⁰ | Project phase | Environmental considerations | Social considerations |
|---|---|---|---|
| 1 | Pre-Feasibility study | Prepare of Preliminary Environmental Impact Assessment (PEIA) shall be conducted | The key social impacts should be identified, including the land acquisition impact, impacts on vulnerable social groups such as women, children, elderly peoples, people in poverty, indigenous people, the person with disabilities, ethnic minorities… |
| 2 | Feasibility study | Prepare and get the approval of EIA | Resettlement action plan (RAP), including Inventory of Loss data and results of public consultation should be prepared. Project-affected people, such as people to be resettled involuntarily and/or people who may lose their livelihoods by the projects, should be provided sufficient compensations and supports by the project proponents in a timely manner. |
| 3 | Detailed design | Revise of EIA, if necessary | Updated Resettlement Action Plan (uRAP) should be prepared if necessary, including Detail Measurement Survey, results of public consultation, and revised replacement cost. Compensations should be calculated at full replacement cost as much as possible and provided in advance of the construction. |
| 4 | Construction phase | Monitoring activities on EIA implementation, mitigation measures, and monitoring of the environment management plan | Monitoring activities on uRAP implementation should be made. |
| 5 | Operation Phase | Monitoring of environment indicators as mentioned in approved EIA | |

Source: The Study Team

The remarks below are provided for the further studies and activities on environmental and social considerations which would be conducted according to both the Vietnam regulations and JICA guidelines' policy and requirements.

**4) Environment Aspects**

- A baseline survey is recommendable to be conducted to collect further information for baseline data of air quality, noise, vibration, water quality, hydrology conditions, and so on.
- A study on the institutional framework of local areas is recommendable regarding environment and social considerations. Gaps between JICA guidelines and legal frameworks on environment and social are also recommendable to be examined more precisely.
- Alternative analysis is recommendable to be conducted. Since both the target projects are under master plan formulation and pre-F/S stage in this reporting time, alternatives will be examined during the process of the proposal of the target projects respectively. The alternative analysis is recommendable to include the "with" and "without project" options, a proposal not to implement the target projects. The alternative analysis also needs to consider "zero option" which is an option in that the project purpose is met by a method/business which is not subject to EIA. In addition, alternatives of specific designs will be considered during the pre-F/S stage for preliminary design and/or the F/S stage for basic design.
- Analysis of mitigation measures, environmental management plan, and monitoring

plan are recommendable to be formulated in the course of the further EIA studies for both the target projects respectively.

**5) Social Aspects**

- Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.
- Project-affected people, such as people to be resettled involuntarily and/or people who may lose their livelihoods by the Project, shall be provided sufficient compensation and support by the project proponents promptly (the public consultation and information disclosure should be conducted in the F/S stage for both the target projects).
- Compensation standards are disclosed and consistently applied. The project-affected persons need to be aware of the compensation standards, including the replacement cost that will be applied to the compensation rate.
- Appropriate participation of the project-affected people and their communities should be promoted in the planning, implementation and monitoring of measures against involuntary resettlement and loss of livelihood.
- Resettlement Action Plans (RAP) should be prepared for both the target projects respectively and made available to the public before the resettlement and provision of compensation and support. In preparing the RAP, consultations should be held with the project-affected people and communities based on sufficient information made available to them in advance. When consultations are held, explanations should be given in languages and forms that are understandable to the project-affected people.
- Appropriate consideration should be given to vulnerable social groups, such as women, children, elderly peoples, people in poverty, indigenous peoples, persons with disabilities, refugees, internally displaced persons, and minorities.

In general, the prepared pre-F/S reports by the Vietnamese localities will be duly reviewed by JICA as one important step in the formulation of the ODA project. As long as the Study Team observed, however, any designs in the pre-F/S are not made based on topographic survey results, and even the elevation of road infrastructure cannot be designated properly. This inaccuracy of project descriptions affects all the project features, including environmental and social considerations. To smoothly prepare the target projects in the procedure of bilateral ODA loan scheme, it is suggested that Can Tho City and Hau Giang Province enhance accuracy in their development plans and designs with providing necessary information for project appraisal in the following stages.

# APPENDIX

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# List of Figures and Tables

# 1. Appendix 1 Screenline Survey

## 1.1. Objectives

The JICA project "Data Collection Survey on Transportation Network for Regional Economic Development in Mekong Delta" places a focus on reviewed existing transport network in Mekong Delta.

In this context, this project is conducted in accordance with these following objectives:

- To update traffic data based on the conduct of supplementary surveys.
- To conduct demand analysis for transportation system in Mekong Delta.

The Screen Line Survey is conducted to get the traffic volume in the most important corridor of Mekong Delta through 2 bridges and 3 ferries. The survey aims to determine the number of vehicles, the number of passengers on the vehicle and the number of passengers crossing the ferry.

## 1.2. Scope and Coverage

### 1.2.1. Survey Items

In Bridge Survey, following items are collected.

- Traffic Count Survey (Vehicular Traffic Count)
- Vehicle Occupancy Survey

In Ferry Port Survey, following items are collected.

- Vehicle Count Survey (Number of Vehicles Carried)
- Passenger Count Survey (Number of Passengers Carried)

### 1.2.2. Survey Method

#### 1) Bridge Survey

The predetermined vehicle types for both the traffic count and vehicle occupancy surveys are based on the classification in the METROS study[1] as followings:

| | | | |
|---|---|---|---|
| 1) Bicycle | 2) Electric bicycle | 3) Motorcycle | 4) Car |
| 5) Taxi | 6) Minibus | 7) Standard Bus | 8) Small Truck |
| 9) Big Truck | 10) Container | 11) Others | |

##### (a) Traffic Count Survey

Traffic volume shall be counted by video record for each direction and for all predetermined vehicle types.

Before conducting the survey, the survey team will survey the field, contact relevant regulators to report and coordinate throughout the survey

At each survey location has a camera and an engineer. An engineer has responsible for set up and operate the camera. Equipment and machines are prepared and checked before conducting surveys, to ensure convenience during the survey. The equipment that needs to prepare includes: Camera , power source, memory card, jack…

The counting survey shall enumerate all vehicles passing through the survey stations.

[1] JICA: Data Collection Survey on Railways in Major Cities in Vietnam, 2016.

Vehicle counting will be done manually at the office. Arrange 3 surveyor to count vehicles in each direction, considering the enough social distance.

#### (b) The Occupancy Survey

The Occupancy Survey shall be conducted manually near station of vehicle survey. Survey locations are selected in places with good visibility, ventilation and safety for the survey work to take place smoothly and ensure results. Survey method as follows:

The sample vehicles shall be selected randomly to exceed sampling rate of 20% by vehicle types and direction by hourly traffic volume;

Vehicles expected bus (6,7) will be recorded according to the number of people on the vehicle (including the driver);

Vehicles 6, 7 recorded according to the proportion of passengers on the bus (reaching 25%, 50%, 75%, 100%, 125%, 150%, 175%, 200% or more);

Arrange 3 surveyor to count occupancy in each direction, considering the enough social distance

### 2) Ferry Survey

The predetermined vehicle types is same classification with the Bridge Survey

#### (a) Vehicle Count Survey

The number of vehicles carried by the all-ferry services for whole day will be counted.

#### (b) Passenger Count Survey

The number of passengers carried by the all-ferry services for whole day will be counted.

## 1.2.3. Survey Coverage

The screenline survey is set at in Hau River (see Figure 1.1). The number of survey sites and their survey time are depending on the traffic flows and the operating times of ferries as follows: traffic count at 2 bridges is 24 hours; occupancy count at 2 bridges is 16 hours; vehicle and passenger count at 3 ferries is operating hours of these ferries (shown in Table 1.1).

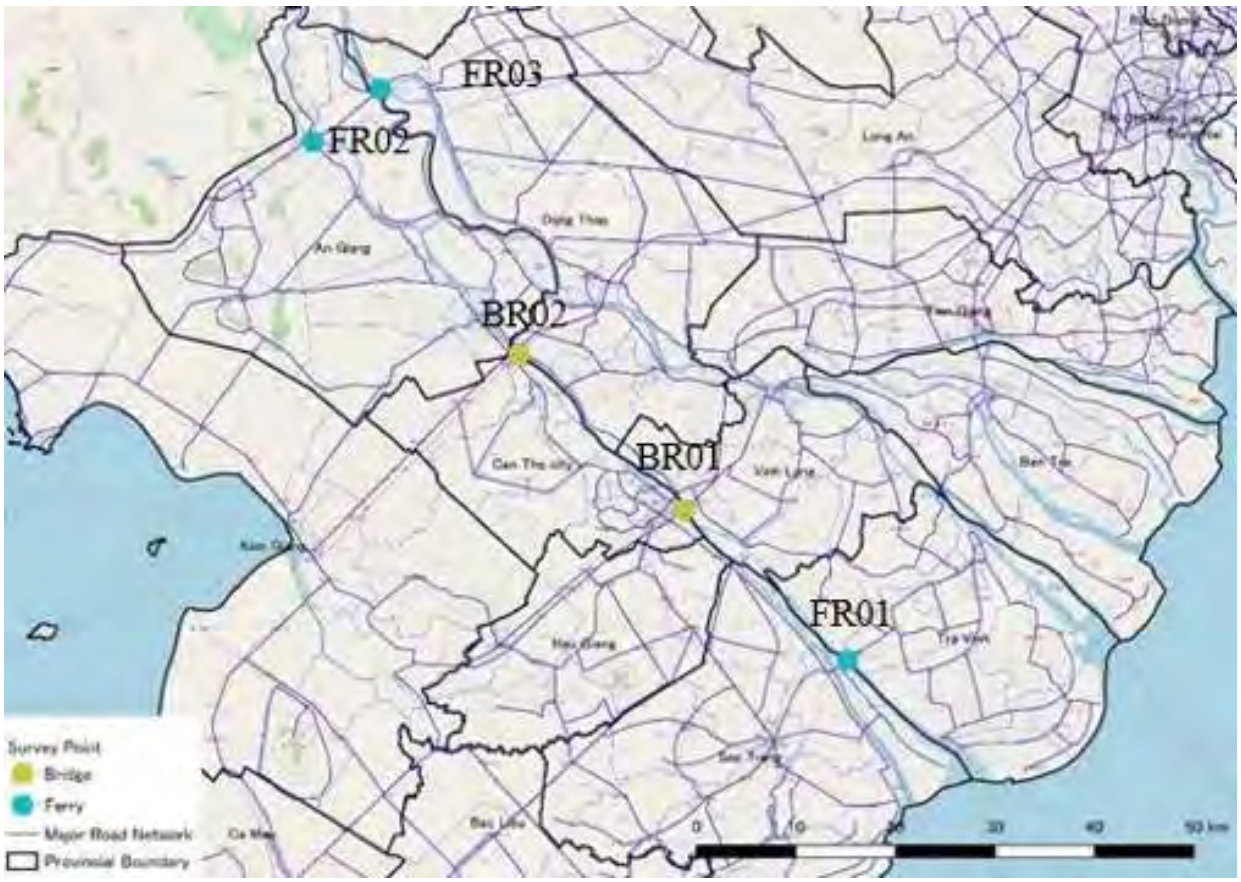


**Figure 1.1 Survey locations in Screenline Survey**

**Table 1.1 Survey locations and survey time in Screenline survey**

| No | Location | Survey Period | |
|---|---|---|---|
| | | Traffic Count | Occupancy/passenger Count |
| BR01 | Can Tho Bridge | 24 hours | 16 hours |
| BR02 | Vam Cong Bridge | | |
| FR01 | Dai Ngai Ferry | 17 hours | 17 hours |
| FR02 | Chau Giang Ferry | 24 hours | 24 hours |
| FR03 | Tan Chau Ferry | | |

## 1.3. Survey Implementation Schedule

The survey was conducted as shown in the schedule in the table below:.

Table 1.2 Implementation Schedule for Screenline Survey

| Month | February | | March 2022 | | | | April 2022 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Week | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| **1. Preparation**<br>- Preparing survey devices<br>- Defining survey locations in advance<br>- Training supervisors and surveyors | | | | | | | | | | |
| **2. Traffic survey** [1),2)]<br>- Traffic count<br>- Occupancy count | | | | | | | | | | |
| **3. Data input and processing** | | | | | | | | | | |
| **4. Report** | | | | | | | | | | |

1) The survey at Tan Chau and Chau Giang ferries was carried out on: March 8th, 2022

2) The survey at Dai Ngai ferry, Vam Cong and Can Tho bridges was carried out on: March 10th, 2022.

## 1.4. Survey organization

The survey is conducted by the survey team with following members:

- **Manager** is responsible for the overall project: legal, quality, human resources.
- **Chief Supervisors** are responsible for overall survey activities and submitting the final reports; coordinating closely with the JICA Study Team in the course of the survey.
- **Team leaders (is one of eight surveyors)** is responsible for management group of surveyors for survey activities in a specific station.
- **Supervisors** are mainly responsible for field surveys, training and supervising surveyors.
- **Surveyors** collect data of traffic count during the field survey.
- **Technicians** have responsible for video recording at stations.
- **Encoders** are responsible for extracting and inputting data into computers for processing.
- **Chief Encoder** is responsible for management group of encoder.
- **Report editors** edit report every week and month.
- **Translators translate** from Vietnamese to English.

Responsibility of the members is summarized in Table 1.3.

Table 1.3 List of Survey Staffs

| Position | Number | Organization | Name |
|---|---|---|---|
| Manager | 1 | Center for Environment and Transport Development | Dr. Trinh Van Chinh |
| Chief supervisor | 1 | Ho Chi Minh City University of Transport | MSc. Pham Minh Chau |
| Team leader | 5 | Can Tho University | Students |
| Supervisor | 5 | Ho Chi Minh City University of Transport | Dr. Trinh Van Chinh |
| | | | Dr. Nguyen Trong Tam |
| | | | Msc. Hoang Huu Nam |
| | | | Msc. Pham Minh Chau |
| | | Can Tho University | Dr. Nguyen Thi Thu Ha |
| Technician | 5 | Ho Chi Minh City University of Transport | Students |
| Surveyor | 30 | Can Tho University | Students |
| Encoder | 30 | Can Tho University | Students |
| Chief encoder | 1 | Ho Chi Minh City University of Transport | Msc. Pham Minh Chau |
| Report editor | 1 | Ho Chi Minh City University of Transport | Msc. Pham Minh Chau |
| Translator | 1 | Ho Chi Minh City University of Transport | Msc. Pham Minh Chau |

## 1.5. Survey Results

The screen line survey was implemented well based on the TOR and working plan. The survey forms of traffic count, occupancy and passenger count were kept carefully before and after encoding. And the survey report was made including survey description, major activities and related information;

The survey data were organized in 5 Excel files with two sheets of traffic count and occupancy/passenger count; together with related information such as maps and pictures. In the following tables, the survey results are summarized:

### 1.5.1. Bridge Survey (Only Traffic Count)

## Table 1.4 Summary of Bridge Survey Result (1)

| General | | | | | | | | | Traffic Count | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station No. | Station Name | Direction: From | Direction: To | Date | Date | Date | Weather | Time:From | 1) Bicycle | 2) Electric bicycle | 3) Motorcycle | 4) Car | 5) Taxi | 6) Minibus | 7) Standard Bus | 8) Small Truck | 9) Big Truck | 10) Container Truck | 11) Others |
| No.(1-5) | Code No. | | | yyyy | mm | dd | 1:fine 2:Crowd 3:Rain 4:Others | hour (0-23) | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 22 | 0 | 0 | 349 | 80 | 7 | 13 | 25 | 87 | 88 | 30 | 3 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 23 | 0 | 0 | 155 | 109 | 4 | 25 | 50 | 96 | 93 | 27 | 7 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 0 | 0 | 0 | 154 | 66 | 0 | 21 | 32 | 66 | 93 | 25 | 11 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 1 | 0 | 0 | 145 | 71 | 3 | 16 | 25 | 49 | 90 | 34 | 4 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 2 | 0 | 0 | 174 | 48 | 2 | 20 | 22 | 0 | 154 | 9 | 3 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 3 | 1 | 0 | 242 | 61 | 3 | 30 | 10 | 0 | 178 | 7 | 1 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 4 | 1 | 0 | 307 | 98 | 0 | 23 | 13 | 4 | 154 | 21 | 5 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 5 | 1 | 0 | 745 | 135 | 3 | 29 | 15 | 2 | 202 | 20 | 0 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 6 | 1 | 2 | 2,514 | 190 | 3 | 20 | 16 | 96 | 140 | 29 | 2 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 7 | 0 | 0 | 2,020 | 239 | 3 | 19 | 17 | 102 | 185 | 46 | 4 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 8 | 0 | 0 | 1,316 | 305 | 8 | 18 | 23 | 121 | 182 | 50 | 3 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 9 | 0 | 0 | 1,111 | 335 | 7 | 22 | 40 | 109 | 167 | 44 | 7 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 10 | 0 | 2 | 1,034 | 371 | 24 | 24 | 38 | 89 | 242 | 22 | 3 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 11 | 0 | 0 | 950 | 359 | 8 | 16 | 38 | 84 | 209 | 21 | 5 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 12 | 0 | 0 | 1,129 | 335 | 12 | 25 | 29 | 70 | 221 | 19 | 4 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 13 | 0 | 0 | 1,172 | 336 | 10 | 26 | 21 | 120 | 233 | 16 | 10 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 14 | 1 | 0 | 1,014 | 348 | 1 | 23 | 27 | 126 | 225 | 25 | 1 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 15 | 1 | 0 | 1,140 | 380 | 2 | 33 | 30 | 130 | 223 | 21 | 9 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 16 | 0 | 0 | 1,357 | 316 | 5 | 23 | 26 | 66 | 212 | 21 | 5 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 17 | 0 | 0 | 1,762 | 372 | 2 | 27 | 24 | 51 | 274 | 24 | 10 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 18 | 0 | 1 | 1,281 | 351 | 3 | 17 | 19 | 38 | 179 | 35 | 18 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 19 | 0 | 0 | 852 | 292 | 7 | 14 | 19 | 41 | 222 | 20 | 7 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 20 | 0 | 0 | 512 | 249 | 4 | 17 | 12 | 39 | 137 | 18 | 13 |
| 4 | BR01 | Vinh Long | Can Tho | 2022 | 3 | 10 | 1 | 21 | 0 | 0 | 411 | 155 | 2 | 20 | 12 | 49 | 110 | 25 | 7 |
| **4** | **BR01** | **Vinh Long** | **Can Tho** | **Subtotal** | | | | | **6** | **5** | **21,846** | **5,601** | **123** | **521** | **583** | **1,635** | **4,213** | **609** | **142** |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 22 | 0 | 0 | 408 | 96 | 1 | 5 | 36 | 20 | 140 | 18 | 3 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 23 | 0 | 0 | 140 | 75 | 0 | 6 | 36 | 17 | 94 | 9 | 2 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 0 | 0 | 0 | 82 | 64 | 1 | 7 | 25 | 13 | 66 | 17 | 1 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 1 | 0 | 0 | 87 | 51 | 0 | 5 | 17 | 22 | 82 | 7 | 3 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 2 | 0 | 0 | 58 | 66 | 2 | 10 | 8 | 23 | 73 | 7 | 1 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 3 | 0 | 0 | 139 | 83 | 2 | 11 | 10 | 16 | 87 | 10 | 1 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 4 | 2 | 0 | 280 | 110 | 1 | 14 | 3 | 25 | 97 | 21 | 3 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 5 | 0 | 0 | 492 | 154 | 2 | 26 | 7 | 45 | 140 | 9 | 3 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 6 | 1 | 0 | 1,241 | 279 | 7 | 24 | 16 | 51 | 116 | 4 | 3 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 7 | 1 | 0 | 1,423 | 281 | 4 | 27 | 23 | 76 | 140 | 11 | 6 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 8 | 0 | 0 | 1,101 | 311 | 9 | 32 | 28 | 107 | 215 | 16 | 3 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 9 | 0 | 0 | 1,175 | 295 | 7 | 26 | 30 | 90 | 248 | 29 | 7 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 10 | 0 | 0 | 1,272 | 302 | 6 | 22 | 31 | 64 | 310 | 38 | 7 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 11 | 0 | 0 | 1,332 | 267 | 5 | 27 | 31 | 44 | 316 | 32 | 6 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 12 | 1 | 0 | 1,027 | 263 | 8 | 25 | 37 | 50 | 264 | 26 | 5 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 13 | 0 | 0 | 988 | 329 | 6 | 27 | 27 | 47 | 269 | 25 | 4 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 14 | 0 | 0 | 1,333 | 443 | 3 | 31 | 30 | 61 | 274 | 23 | 1 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 15 | 0 | 0 | 1,667 | 342 | 3 | 29 | 16 | 50 | 367 | 53 | 7 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 16 | 0 | 0 | 1,813 | 317 | 4 | 19 | 18 | 32 | 284 | 18 | 3 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 17 | 1 | 0 | 2,100 | 341 | 5 | 24 | 18 | 19 | 339 | 21 | 4 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 18 | 0 | 0 | 1,312 | 227 | 2 | 23 | 11 | 35 | 220 | 32 | 8 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 19 | 0 | 0 | 825 | 168 | 2 | 20 | 14 | 37 | 241 | 20 | 6 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 20 | 0 | 0 | 677 | 145 | 1 | 17 | 27 | 33 | 182 | 26 | 4 |
| 4 | BR01 | Can Tho | Vinh Long | 2022 | 3 | 10 | 1 | 21 | 0 | 0 | 573 | 141 | 4 | 11 | 31 | 28 | 175 | 26 | 8 |
| **4** | **BR01** | **Can Tho** | **Vinh Long** | **Subtotal** | | | | | **6** | **0** | **21,545** | **5,150** | **85** | **468** | **530** | **1,005** | **4,739** | **498** | **99** |

## Table 1.5 Summary of Bridge Survey Result (2)

| General | | | | | | | | | Traffic Count | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station No. | Station Name | Direction: From | Direction: To | Date | Date | Date | Weather | Time:From | 1) Bicycle | 2) Electric bicycle | 3) Motorcycle | 4) Car | 5) Taxi | 6) Minibus | 7) Standard Bus | 8) Small Truck | 9) Big Truck | 10) Container Truck | 11) Others |
| No.(1-5) | Code No. | | | yyyy | mm | dd | 1:fine 2:Crowd 3:Rain 4:Others | hour (0-23) | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 | 0-9999 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 22 | 0 | 0 | 88 | 90 | 2 | 13 | 9 | 37 | 69 | 5 | 2 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 23 | 0 | 0 | 59 | 59 | 0 | 17 | 26 | 36 | 75 | 5 | 2 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 0 | 0 | 0 | 51 | 53 | 1 | 14 | 38 | 32 | 72 | 13 | 0 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 1 | 0 | 0 | 67 | 57 | 0 | 18 | 22 | 24 | 104 | 10 | 2 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 2 | 1 | 0 | 46 | 40 | 2 | 14 | 17 | 34 | 50 | 6 | 0 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 3 | 0 | 0 | 120 | 45 | 0 | 15 | 20 | 25 | 62 | 8 | 0 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 4 | 0 | 0 | 197 | 40 | 0 | 19 | 4 | 59 | 62 | 9 | 0 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 5 | 2 | 0 | 350 | 76 | 0 | 18 | 9 | 59 | 46 | 8 | 0 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 6 | 9 | 0 | 607 | 88 | 0 | 12 | 6 | 46 | 84 | 10 | 1 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 7 | 1 | 0 | 497 | 89 | 4 | 16 | 4 | 84 | 72 | 9 | 0 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 8 | 0 | 0 | 437 | 122 | 6 | 13 | 6 | 51 | 89 | 13 | 2 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 9 | 0 | 0 | 437 | 146 | 8 | 18 | 13 | 78 | 83 | 11 | 1 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 10 | 0 | 0 | 402 | 161 | 3 | 12 | 12 | 67 | 113 | 5 | 0 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 11 | 0 | 0 | 353 | 145 | 6 | 18 | 11 | 74 | 74 | 7 | 5 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 12 | 0 | 0 | 365 | 154 | 3 | 15 | 15 | 76 | 121 | 8 | 2 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 13 | 0 | 0 | 377 | 168 | 2 | 11 | 13 | 85 | 107 | 16 | 3 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 14 | 0 | 0 | 391 | 198 | 4 | 16 | 15 | 36 | 139 | 4 | 4 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 15 | 0 | 0 | 374 | 157 | 7 | 18 | 12 | 25 | 166 | 5 | 4 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 16 | 0 | 0 | 376 | 173 | 5 | 15 | 10 | 24 | 144 | 7 | 2 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 17 | 0 | 0 | 479 | 190 | 1 | 10 | 12 | 21 | 121 | 7 | 4 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 18 | 0 | 0 | 306 | 124 | 2 | 6 | 6 | 59 | 57 | 7 | 3 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 19 | 0 | 0 | 218 | 97 | 1 | 13 | 10 | 44 | 67 | 9 | 1 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 20 | 0 | 0 | 139 | 112 | 1 | 9 | 9 | 46 | 62 | 6 | 3 |
| 5 | BR02 | Dong Thap | Can Tho | 2022 | 3 | 9 | 1 | 21 | 0 | 0 | 120 | 102 | 0 | 7 | 12 | 41 | 52 | 7 | 0 |
| **5** | **BR02** | **Dong Thap** | **Can Tho** | **Subtotal** | | | | | **13** | **0** | **6,856** | **2,686** | **58** | **337** | **311** | **1,163** | **2,091** | **195** | **41** |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 22 | 0 | 0 | 67 | 49 | 0 | 4 | 10 | 14 | 109 | 2 | 0 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 23 | 0 | 0 | 28 | 50 | 0 | 7 | 17 | 6 | 73 | 4 | 1 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 0 | 0 | 0 | 13 | 54 | 0 | 6 | 19 | 7 | 63 | 2 | 0 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 1 | 1 | 0 | 24 | 44 | 0 | 6 | 13 | 13 | 50 | 3 | 1 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 2 | 0 | 0 | 30 | 58 | 4 | 2 | 9 | 21 | 24 | 2 | 2 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 3 | 0 | 0 | 69 | 45 | 1 | 5 | 2 | 34 | 45 | 2 | 0 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 4 | 0 | 0 | 129 | 53 | 0 | 6 | 5 | 39 | 33 | 4 | 2 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 5 | 2 | 0 | 261 | 56 | 2 | 6 | 1 | 27 | 36 | 3 | 0 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 6 | 4 | 0 | 411 | 66 | 0 | 9 | 2 | 58 | 26 | 2 | 1 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 7 | 1 | 0 | 455 | 100 | 5 | 9 | 6 | 85 | 36 | 2 | 2 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 8 | 0 | 0 | 461 | 121 | 2 | 14 | 13 | 117 | 46 | 5 | 1 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 9 | 0 | 0 | 407 | 174 | 4 | 20 | 19 | 123 | 64 | 5 | 0 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 10 | 0 | 0 | 402 | 158 | 4 | 21 | 20 | 109 | 73 | 6 | 1 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 11 | 0 | 0 | 382 | 127 | 3 | 28 | 14 | 88 | 89 | 10 | 1 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 12 | 0 | 0 | 376 | 136 | 3 | 15 | 22 | 127 | 86 | 7 | 0 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 13 | 4 | 0 | 401 | 153 | 1 | 20 | 13 | 107 | 95 | 6 | 1 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 14 | 0 | 0 | 373 | 198 | 0 | 26 | 21 | 66 | 135 | 10 | 1 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 15 | 0 | 0 | 394 | 177 | 4 | 18 | 12 | 51 | 174 | 14 | 1 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 16 | 0 | 0 | 547 | 165 | 3 | 21 | 27 | 40 | 147 | 15 | 2 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 17 | 2 | 0 | 550 | 143 | 3 | 16 | 15 | 38 | 126 | 11 | 0 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 18 | 0 | 0 | 367 | 138 | 2 | 8 | 15 | 22 | 122 | 12 | 2 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 19 | 0 | 0 | 245 | 92 | 1 | 18 | 14 | 20 | 100 | 11 | 2 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 20 | 0 | 0 | 152 | 64 | 0 | 11 | 14 | 25 | 108 | 17 | 2 |
| 5 | BR02 | Can Tho | Dong Thap | 2022 | 3 | 9 | 1 | 21 | 0 | 0 | 106 | 53 | 5 | 11 | 10 | 18 | 119 | 6 | 5 |
| **5** | **BR02** | **Can Tho** | **Dong Thap** | **Subtotal** | | | | | **14** | **0** | **6,650** | **2,474** | **47** | **307** | **313** | **1,255** | **1,979** | **161** | **28** |

## 1.5.2. Ferry Survey

**Table 1.6 Summary of Ferry Survey Result (1)**

| No | Cd | Direction | | Date | | | Weather 1:fine 2:Crowd 3:Rain 4:Others | Time | 1) Bicycle | 2) Electric bicycl | 3) Motorcycle | 4) Car | 5) Taxi | 6) Minibus | 7) Standard Bus | 8) Small Truck | 9) Big Truck | 10) Container | 11) Others | Passengers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | yyyy | mm | dd | | hr | | | | | | | | | | | | |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 4 | 1 | 1 | 41 | 2 | 0 | 2 | 0 | 2 | 7 | 0 | 0 | 108 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 5 | 2 | 3 | 108 | 8 | 0 | 1 | 0 | 4 | 4 | 0 | 0 | 179 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 6 | 0 | 0 | 78 | 5 | 0 | 1 | 0 | 0 | 4 | 0 | 0 | 110 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 7 | 0 | 1 | 68 | 8 | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 172 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 8 | 1 | 0 | 75 | 10 | 0 | 0 | 0 | 4 | 2 | 0 | 1 | 184 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 9 | 2 | 0 | 95 | 16 | 0 | 1 | 0 | 7 | 11 | 0 | 0 | 160 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 10 | 1 | 0 | 42 | 4 | 0 | 0 | 0 | 5 | 8 | 0 | 1 | 91 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 11 | 0 | 0 | 84 | 12 | 0 | 0 | 0 | 0 | 15 | 0 | 0 | 127 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 12 | 0 | 0 | 64 | 9 | 0 | 0 | 0 | 4 | 5 | 0 | 0 | 130 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 13 | 0 | 0 | 57 | 14 | 0 | 0 | 0 | 3 | 7 | 0 | 0 | 92 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 14 | 0 | 0 | 57 | 8 | 0 | 0 | 0 | 13 | 7 | 0 | 0 | 103 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 15 | 0 | 0 | 52 | 8 | 0 | 1 | 1 | 0 | 2 | 0 | 1 | 95 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 16 | 0 | 0 | 46 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 83 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 17 | 0 | 0 | 65 | 8 | 0 | 0 | 0 | 11 | 10 | 0 | 2 | 112 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 18 | 0 | 0 | 55 | 4 | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 79 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 19 | 0 | 0 | 27 | 4 | 0 | 1 | 0 | 5 | 10 | 0 | 0 | 52 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 20 | 0 | 0 | 6 | 4 | 0 | 1 | 1 | 5 | 4 | 0 | 0 | 43 |
| 1 | FR-01 | Tra Vinh | Soc Trang | 2022 | 3 | 10 | 1 | 21 | 0 | 0 | 4 | 2 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| 1 | FR-01 | Tra Vinh | Soc Trang | Subtotal | | | | | 7 | 5 | 1,024 | 126 | 0 | 8 | 2 | 66 | 117 | 0 | 6 | 1920 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 4 | 1 | 0 | 51 | 6 | 0 | 0 | 0 | 1 | 7 | 0 | 0 | 95 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 5 | 0 | 0 | 54 | 4 | 0 | 0 | 0 | 1 | 4 | 0 | 0 | 104 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 6 | 0 | 0 | 59 | 4 | 0 | 1 | 0 | 1 | 5 | 0 | 0 | 95 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 7 | 0 | 0 | 67 | 2 | 0 | 0 | 1 | 5 | 7 | 0 | 1 | 147 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 8 | 0 | 1 | 81 | 13 | 0 | 0 | 2 | 4 | 1 | 0 | 1 | 160 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 9 | 0 | 0 | 64 | 13 | 0 | 0 | 0 | 1 | 8 | 0 | 0 | 163 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 10 | 1 | 0 | 73 | 5 | 0 | 0 | 0 | 5 | 12 | 0 | 1 | 131 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 11 | 1 | 1 | 85 | 10 | 0 | 0 | 0 | 8 | 8 | 0 | 0 | 151 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 12 | 0 | 0 | 44 | 7 | 0 | 0 | 0 | 1 | 5 | 0 | 0 | 105 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 13 | 0 | 0 | 50 | 8 | 1 | 0 | 0 | 2 | 9 | 0 | 0 | 124 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 14 | 0 | 0 | 65 | 4 | 0 | 1 | 0 | 6 | 11 | 0 | 0 | 120 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 15 | 0 | 1 | 55 | 5 | 1 | 1 | 0 | 3 | 5 | 0 | 0 | 102 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 16 | 0 | 0 | 71 | 7 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 129 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 17 | 2 | 1 | 62 | 3 | 0 | 0 | 0 | 1 | 7 | 0 | 1 | 108 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 18 | 0 | 0 | 33 | 5 | 0 | 2 | 1 | 2 | 10 | 0 | 0 | 108 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 19 | 0 | 0 | 26 | 5 | 0 | 1 | 0 | 2 | 7 | 0 | 0 | 80 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 20 | 0 | 0 | 19 | 4 | 0 | 0 | 0 | 4 | 11 | 0 | 1 | 59 |
| 1 | FR-01 | Soc Trang | Tra Vinh | 2022 | 3 | 10 | 1 | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | FR-01 | Soc Trang | Tra Vinh | Subtotal | | | | | 5 | 4 | 959 | 105 | 2 | 6 | 4 | 47 | 126 | 0 | 5 | 1981 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 9 | 17 | 0 | 483 | 24 | 1 | 1 | 0 | 10 | 0 | 0 | 7 | 834 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 10 | 6 | 0 | 451 | 33 | 2 | 3 | 0 | 19 | 0 | 0 | 6 | 607 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 11 | 9 | 1 | 314 | 19 | 0 | 3 | 1 | 13 | 1 | 0 | 5 | 566 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 12 | 9 | 0 | 366 | 26 | 0 | 2 | 0 | 23 | 0 | 0 | 5 | 455 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 13 | 10 | 0 | 423 | 22 | 0 | 1 | 0 | 15 | 13 | 0 | 2 | 974 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 14 | 9 | 0 | 321 | 28 | 1 | 4 | 0 | 9 | 10 | 0 | 3 | 664 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 15 | 2 | 0 | 411 | 24 | 1 | 1 | 0 | 14 | 11 | 0 | 5 | 697 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 16 | 6 | 1 | 403 | 33 | 0 | 2 | 0 | 4 | 13 | 0 | 8 | 624 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 17 | 9 | 1 | 495 | 17 | 2 | 5 | 0 | 6 | 13 | 0 | 3 | 726 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 18 | 4 | 0 | 478 | 19 | 0 | 1 | 0 | 5 | 14 | 0 | 2 | 830 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 19 | 2 | 1 | 345 | 21 | 2 | 1 | 0 | 0 | 7 | 0 | 0 | 470 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 20 | 5 | 0 | 189 | 16 | 2 | 2 | 1 | 1 | 2 | 0 | 2 | 266 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 21 | 1 | 0 | 68 | 7 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 141 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 22 | 0 | 0 | 60 | 8 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 107 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 23 | 0 | 0 | 19 | 14 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 82 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 0 | 0 | 0 | 15 | 6 | 0 | 4 | 0 | 2 | 2 | 0 | 2 | 81 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 1 | 1 | 0 | 12 | 5 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 50 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 2 | 1 | 0 | 35 | 3 | 0 | 4 | 0 | 2 | 5 | 0 | 1 | 75 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 3 | 2 | 0 | 48 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 84 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 4 | 4 | 0 | 107 | 4 | 0 | 2 | 1 | 2 | 5 | 0 | 4 | 233 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 5 | 20 | 1 | 296 | 6 | 0 | 5 | 1 | 6 | 4 | 0 | 4 | 658 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 6 | 39 | 1 | 825 | 11 | 1 | 6 | 0 | 12 | 5 | 0 | 3 | 1047 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 7 | 33 | 0 | 794 | 19 | 3 | 1 | 1 | 16 | 6 | 0 | 6 | 1091 |
| 2 | FR-02 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 8 | 19 | 0 | 529 | 31 | 0 | 2 | 0 | 16 | 3 | 0 | 0 | 654 |
| 2 | FR-02 | Dong Thap | An Giang | Subtotal | | | | | 208 | 6 | 7,487 | 396 | 15 | 55 | 5 | 177 | 118 | 0 | 70 | 12016 |

## Table 1.7 Summary of Ferry Survey Result (2)

| No | Cd | Direction | | Date | | | Weather 1:fine 2:Crowd 3:Rain 4:Others | Time | 1) Bicycle | 2) Electric bicycl | 3) Motorcycle | 4) Car | 5) Taxi | 6) Minibus | 7) Standard Bus | 8) Small Truck | 9) Big Truck | 10) Container | 11) Others | Passengers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | yyyy | mm | dd | | hr | | | | | | | | | | | | |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 9 | 16 | 0 | 578 | 23 | 5 | 12 | 12 | 12 | 12 | 0 | 12 | 912 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 10 | 20 | 1 | 582 | 30 | 2 | 27 | 6 | 27 | 6 | 0 | 9 | 920 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 11 | 17 | 2 | 545 | 25 | 0 | 27 | 3 | 27 | 3 | 0 | 8 | 943 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 12 | 13 | 0 | 399 | 30 | 0 | 29 | 5 | 29 | 5 | 0 | 1 | 635 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 13 | 9 | 0 | 320 | 28 | 0 | 5 | 1 | 10 | 13 | 0 | 7 | 632 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 14 | 18 | 0 | 453 | 28 | 1 | 4 | 2 | 18 | 12 | 0 | 5 | 728 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 15 | 16 | 0 | 458 | 25 | 0 | 2 | 4 | 6 | 11 | 0 | 10 | 738 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 16 | 17 | 1 | 574 | 21 | 0 | 3 | 0 | 7 | 7 | 0 | 5 | 835 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 17 | 25 | 1 | 771 | 28 | 1 | 6 | 0 | 6 | 5 | 0 | 3 | 1225 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 18 | 14 | 1 | 459 | 17 | 0 | 1 | 0 | 5 | 4 | 0 | 4 | 703 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 19 | 0 | 1 | 405 | 14 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 614 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 20 | 4 | 0 | 375 | 18 | 0 | 1 | 1 | 2 | 2 | 0 | 1 | 708 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 21 | 1 | 0 | 218 | 7 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 454 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 22 | 0 | 0 | 111 | 10 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 200 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 23 | 0 | 0 | 66 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 114 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 0 | 3 | 0 | 22 | 5 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 53 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 1 | 0 | 0 | 23 | 6 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 81 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 2 | 0 | 0 | 17 | 5 | 0 | 1 | 0 | 2 | 0 | 0 | 1 | 48 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 3 | 0 | 0 | 29 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 54 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 4 | 1 | 0 | 51 | 2 | 1 | 1 | 0 | 1 | 4 | 0 | 4 | 98 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 5 | 2 | 0 | 140 | 5 | 1 | 0 | 0 | 0 | 11 | 0 | 1 | 202 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 6 | 7 | 0 | 254 | 3 | 1 | 3 | 1 | 6 | 8 | 0 | 5 | 408 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 7 | 7 | 1 | 326 | 17 | 3 | 1 | 0 | 8 | 17 | 0 | 5 | 523 |
| 2 | FR-02 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 8 | 9 | 1 | 468 | 21 | 1 | 3 | 0 | 9 | 12 | 0 | 3 | 699 |
| 2 | FR-02 | An Giang | Dong Thap | Subtotal | | | | | 199 | 9 | 7,644 | 378 | 16 | 129 | 35 | 182 | 137 | 0 | 86 | 12527 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 9 | 4 | 1 | 61 | 9 | 0 | 2 | 0 | 1 | 6 | 0 | 2 | 136 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 10 | 2 | 1 | 59 | 14 | 0 | 2 | 0 | 1 | 0 | 0 | 2 | 153 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 11 | 4 | 0 | 53 | 6 | 0 | 2 | 0 | 2 | 5 | 0 | 1 | 123 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 12 | 4 | 0 | 49 | 10 | 0 | 2 | 0 | 0 | 7 | 0 | 2 | 116 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 13 | 1 | 0 | 47 | 8 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | 101 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 14 | 4 | 0 | 44 | 8 | 0 | 2 | 1 | 5 | 1 | 0 | 1 | 121 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 15 | 1 | 0 | 47 | 12 | 0 | 2 | 0 | 2 | 6 | 0 | 1 | 138 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 16 | 4 | 1 | 43 | 6 | 0 | 1 | 0 | 0 | 6 | 0 | 1 | 119 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 17 | 3 | 0 | 62 | 4 | 0 | 2 | 0 | 3 | 5 | 0 | 0 | 144 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 18 | 1 | 0 | 41 | 9 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 91 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 19 | 4 | 0 | 73 | 8 | 0 | 3 | 0 | 1 | 1 | 0 | 0 | 192 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 20 | 0 | 0 | 35 | 7 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 66 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 21 | 0 | 0 | 9 | 8 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 64 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 22 | 0 | 0 | 6 | 7 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 29 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 23 | 0 | 0 | 8 | 7 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 49 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 15 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 1 | 0 | 0 | 8 | 5 | 0 | 2 | 0 | 0 | 6 | 0 | 0 | 64 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 2 | 0 | 0 | 4 | 0 | 0 | 3 | 0 | 0 | 2 | 0 | 0 | 38 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 3 | 0 | 0 | 3 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 46 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 4 | 0 | 0 | 4 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 19 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 5 | 3 | 0 | 16 | 2 | 0 | 1 | 1 | 2 | 3 | 0 | 2 | 43 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 6 | 1 | 0 | 22 | 2 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 66 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 7 | 0 | 0 | 29 | 6 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 95 |
| 3 | FR-03 | Dong Thap | An Giang | 2022 | 3 | 8 | 1 | 8 | 2 | 0 | 37 | 8 | 0 | 2 | 0 | 2 | 1 | 0 | 0 | 145 |
| 3 | FR-03 | Dong Thap | An Giang | Subtotal | | | | | 38 | 3 | 760 | 151 | 0 | 31 | 2 | 27 | 61 | 0 | 18 | 2173 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 9 | 3 | 0 | 52 | 7 | 0 | 2 | 0 | 13 | 0 | 0 | 0 | 158 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 10 | 4 | 0 | 49 | 6 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 95 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 11 | 1 | 0 | 32 | 7 | 1 | 3 | 0 | 5 | 1 | 0 | 2 | 127 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 12 | 2 | 0 | 43 | 8 | 0 | 1 | 0 | 3 | 3 | 0 | 3 | 85 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 13 | 2 | 0 | 39 | 16 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 107 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 14 | 2 | 0 | 52 | 19 | 0 | 4 | 0 | 8 | 3 | 0 | 0 | 178 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 15 | 3 | 0 | 37 | 6 | 0 | 3 | 1 | 5 | 1 | 0 | 0 | 153 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 16 | 1 | 0 | 35 | 11 | 0 | 0 | 3 | 5 | 0 | 0 | 2 | 153 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 17 | 4 | 0 | 30 | 7 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 84 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 18 | 1 | 0 | 18 | 14 | 0 | 1 | 1 | 2 | 1 | 0 | 1 | 98 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 19 | 0 | 0 | 24 | 8 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 67 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 8 | 1 | 20 | 0 | 0 | 15 | 8 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 45 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 21 | 0 | 0 | 7 | 6 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 58 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 22 | 0 | 0 | 8 | 2 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 27 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 23 | 0 | 0 | 2 | 3 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 11 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 0 | 0 | 0 | 5 | 8 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 26 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 1 | 0 | 0 | 8 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 11 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 2 | 0 | 0 | 3 | 6 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 45 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 3 | 2 | 0 | 9 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 4 | 3 | 0 | 17 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 30 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 5 | 4 | 0 | 43 | 4 | 0 | 1 | 0 | 0 | 1 | 0 | 2 | 72 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 6 | 7 | 0 | 130 | 1 | 0 | 1 | 0 | 1 | 5 | 0 | 0 | 193 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 7 | 4 | 0 | 71 | 4 | 0 | 1 | 0 | 3 | 1 | 0 | 1 | 139 |
| 3 | FR-03 | An Giang | Dong Thap | 2022 | 3 | 10 | 1 | 8 | 4 | 0 | 75 | 12 | 0 | 0 | 0 | 5 | 8 | 0 | 2 | 145 |
| 3 | FR-03 | An Giang | Dong Thap | Subtotal | | | | | 47 | 0 | 804 | 172 | 1 | 20 | 7 | 77 | 26 | 0 | 14 | 2134 |

## 1.6. Problems and solutions

### 1.6.1. The passenger volume is nearly same from two directions but the volume of vehicles is quite different at Tan Chau ferry

The surveyor who counted the vehicles from Dong Thap to An Giang had entered the data of the opposite direction.

### 1.6.2. The surveying location of Dai Ngai ferry

Ferry count survey was conducted at riverbank B of Dai Ngai ferry (Figure 1.2). The consultant interviewed the person in charge of Dai Ngai ferry administration office about selling tickets at 4 ferry terminals (B - F - E - A).


**Figure 1.2 4 riverbanks of Dai Ngai ferry**

Ticket sales data was provided as shown in Figure 1.3. The data was compared with the survey data that surveyors counted on the same day, March 10th. The number of automobiles is similar value but the number of motorcycles is quite different. The person in charge explained that some passengers have bought monthly tickets, and others who work for state agencies get free tickets.

| | TRAFFIC SURVEY 10/3 | | TICKET SALES 10/3 | | | |
|---|---|---|---|---|---|---|
| | Riverbank B | Riverbank F | Riverbank B | Riverbank F | Riverbank E | Riverbank A |
| Motorcycles | 959 | 1024 | 635 | 624 | 640 | 627 |
| Automobiles | 295 | 319 | 287 | 301 | 347 | 358 |
| | | | | | 1,21 | 1,19 |

**Figure 1.3 Total tickets sold at Dai Ngai ferry on March 10th**

The number of automobiles passing by ferry from riverbank E and A is 1.2 times more than the number of automobiles passing by ferry B and F. So the impact factor should be 1.2

### 1.6.3. 42 % of the taxis at Vam Cong bridge operated alone, without passenger

Can Tho city is a central city of the Mekong Delta. The demand for traveling by taxis from Can Tho to other places is high, so taxis without passenger go back in the opposite direction to Can Tho are also equally high.

Figure 1.4 shows two options for traveling from Can Tho International Airport to Lap Vo town and Cao Lanh city.


**Figure 1.4 Two routes from Can Tho City to Lap Vo Town**

### 1.6.4. Difficulty on Counting the traffic volume from the located camera

The video shooting from only one side seems to be difficult to traffic count. The survey section has wide width, high share of large vehicles (intercity bus, truck) and small motorcycles. The traffic movement is easily blocked by the large vehicles, especially for the traffic flows in the opposite site.

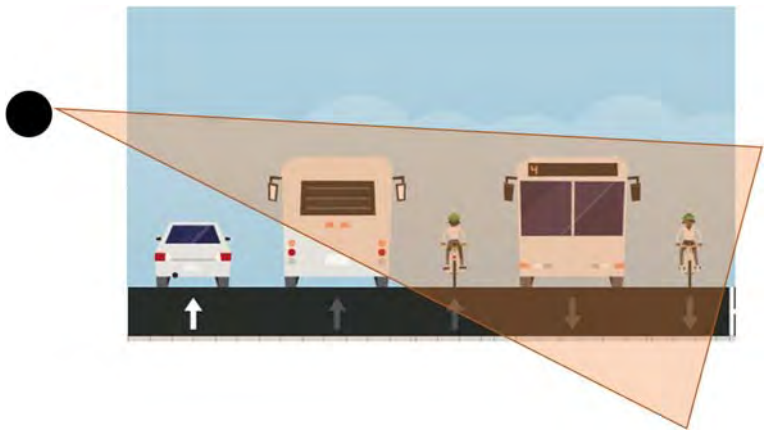

**Figure 1.5. The camera's angle of view**

According to the site observation, video shooting from one side can be counted. The camera is located high on the light pole and the light stays on during the night time as well. The

observation distance of the camera is long and wide, so there is enough space and time for the surveyor to count the vehicles. The pictures taken at ferries and bridges clearly show the movement of vehicles.

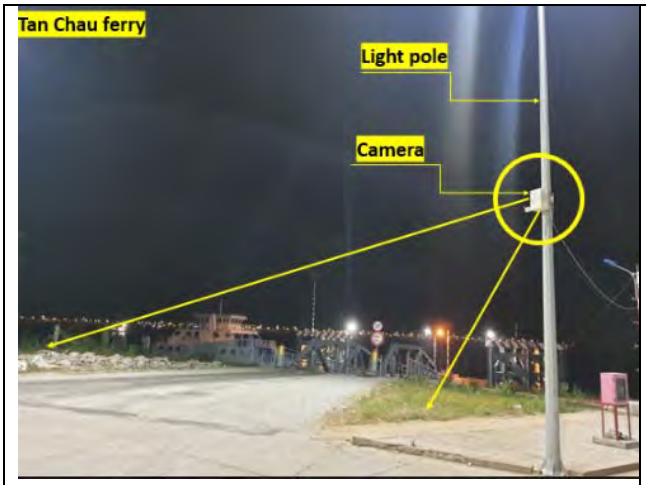


**Figure 1.6. The position of camera at Tan Chau ferry**

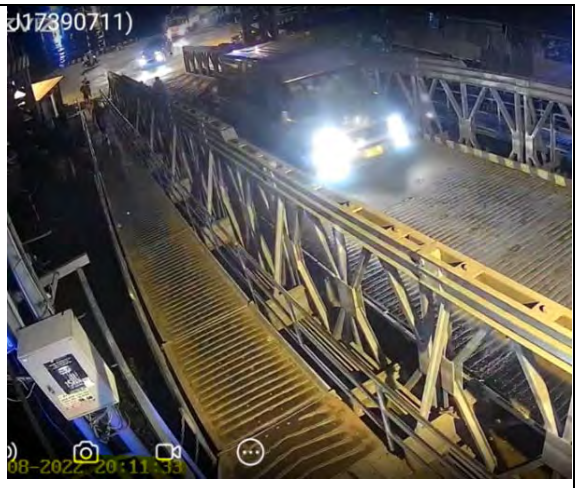

**Figure 1.7. The capture of camera at Chau Giang ferry at night**


**Figure 1.8. The camera at Vam Cong bridge catching the vehicles from the opposite direction**

### 1.6.5. Counting passenger at the ferry site

In Clause 2, Article 23 of the Vietnam Road Traffic Law 2008, there are regulations on ferry crossings and pontoon bridges as follows:

When getting off the ferry, being on the ferry, and when getting on the ferry, everyone has to get off the bus; except for the drivers, sick people, the elderly and the disabled.

Most of the people who got off the vehicles to go by foot were passengers on the intercity

buses and motorcycles. In fact, there are still many people sitting in the vihicles for many reasons. So the surveyors must try to count the passengers go by foot and also the ones still staying in the vehicles.

According to the site observation, when the vehicles wait for the ferry, the surveyors have enough time to count all the passengers riding vehicles also the others staying in the cars and foot-passengers as well.

**Figure 1.9. The waiting area for motorbikes and passengers in Dai Ngai Ferry (BR01)**

### 1.6.6. Consideration on the Survey Times

In the TOR, the survey period is proposed to be started from 6:00. However, the survey sites are distributed very far from each other. It takes a long time to go from Can Tho city to those sites. To ensure convenience for surveying and to comply with technical requirements as well, the survey time is changed as follows:

At Chau Giang and Tan Chau ferries) the time schedule is changed starting at 9 am and ending at 9 am on the day after. The scheduled time at the Dai Ngai ferry (4:00 - 21:00) is fixed.

At Vam Cong and Can Tho bridges, the time schedule of vehicle count is changed starting from 22:00 to next 22:00.The occupancy survey is from 6:00 to 22:00, as same as the TOR.

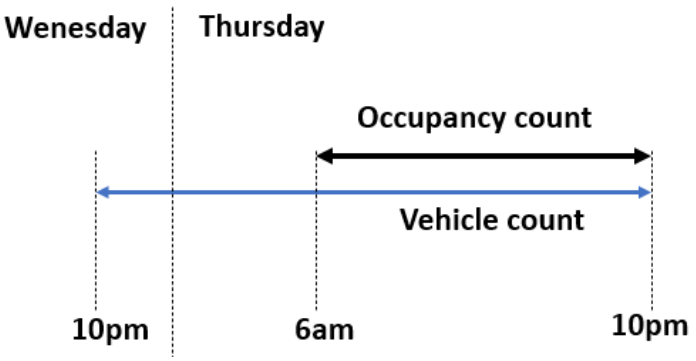


**Figure 1.10. The survey time of vehicle and occupancy count at bridge sites**

# 2. Appendix 2 The List of Medium and Small Bridges

With referring to the policy in 8.4.7.2), the optimum bridge plan was studied based on the site conditions in every crossing points. However, in this preliminary study, obtainable information for bridge planning was limited. Only on Google earth map, widths of canal and road were identified*. Based on the information, the medium and small bridges on the entire route with extension sections were studied with referring to the existing bridge plan in Kien Giang Province (Referring to Letter 864/UBND-KT).

**Table 2.1 The List of Medium and Small Bridges**

| Province | Section | No. | Identified width of canal & road (m)* | Span arrangement (m) | Bridge Length (m) | Clearance | Remarks |
|---|---|---|---|---|---|---|---|
| Dong Thap | Section 1-1 (-14+311-5+870) | 1 | 12 | 18 | 26 | - | Existing bridge |
| | | 2 | 12 | 18 | 26 | - | Existing bridge |
| | | 3 | 105 | 6x33 | 206 | - | Existing bridge |
| | | 4 | 6+22+4 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 5 | 4+15+4 | 24.5 | 32.5 | 10x3 | |
| | | 6 | 4+28+7.5 | 33+33+33 | 107 | 15x4 | |
| | | 7 | 4+15+4 | BA+24.5+BA | 42.5 | 10x3 | |
| | | 8 | 4+28+7.5 | 33+33+33 | 107 | 15x4 | |
| | | 9 | 3+12+3 | 24.5 | 32.5 | 10x3 | |
| | | 10 | 3+12+3 | 24.5 | 32.5 | 10x3 | |
| | | 11 | 3+12+3 | 24.5 | 32.5 | - | Existing bridge |
| | Section 1-2 (-5+870-0+00) | 1 | 10 | 12.5 | 20.5 | - | Existing bridge |
| | | 2 | 90 | 11x40 | 448 | - | Existing bridge |
| | | 3 | 10 | 12.5 | 20.5 | - | Existing bridge |
| | | 4 | 3+20+3 | 18.6+18.6+18.6 | 63.8 | - | Existing bridge |
| | | 5 | 22 | 18.6+24.5+18.6 | 69.7 | - | Existing bridge |
| | | 6 | 3+20+3 | 18.6+18.6+18.6 | 63.8 | - | Existing bridge |
| | Section 1-3 (0+00-Omon) | 1 | 6+25+6 | 12.5+18.6+12.5 | 51.6 | 15x4 | |
| | | 2 | 6+25+6 | 12.5+18.6+12.5 | 51.6 | 15x4 | |
| | | 3 | 3+11+3 | 24.5 | 32.5 | 10x3 | Assumed |
| | | 4 | 6+25+6 | 12.5+18.6+12.5 | 51.6 | 15x4 | |
| | | 5 | 3+12+3 | 24.5 | 32.5 | 10x3 | |
| | | 6 | 3+10+3 | 24.5 | 32.5 | 10x3 | Assumed |
| | | 7 | 0+20+4 | 24.5+BA | 37.5 | 10x3 | |
| | | 8 | 4+30+4 | BA+33+BA | 51 | 15x4 | |
| | | 9 | 4+15+4 | BA+24.5+BA | 42.5 | 10x3 | |
| | | 10 | 4+20+4 | BA+33+BA | 51 | 10x3 | |
| | | 11 | 3+12+3 | BA+24.5+BA | 42.5 | 10x3 | |
| | | 12 | 3+20+3 | BA+18.6+BA | 36.6 | 10x3 | |
| | | 13 | 3+20+3 | BA+24.5+BA | 42.5 | 10x3 | |
| | | 14 | 3+20+3 | 33+33+33 | 107 | 10x3 | |
| | | 15 | 3+25+3 | BA+33+BA | 51 | 10x3 | |
| | | 16 | 4+20+4 | 33+33+33 | 107 | 10x3 | |
| | | 17 | 3+15+3 | 18.6+18.6+18.6 | 63.8 | 10x3 | |
| | | 18 | 3+15+3 | BA+18.6+BA | 36.6 | 10x3 | |
| | | 19 | 3+15+3 | 12.5+24.5+12.5 | 57.5 | 10x3 | |
| | | 20 | 3+15+3 | BA+18.6+BA | 36.6 | 10x3 | |
| | | 21 | 4+15+0 | 3x40+48+72+48+4x40+44+40 | 510 | 10x3 | |
| | | | 5+42+3 | | | 30x7 | |
| | | 22 | 3+20+7.5 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 23 | 4+15+4 | BA+18.6+BA | 36.6 | 10x3 | |
| | | 24 | 4+15+4 | BA+18.6+BA | 36.6 | 10x3 | |
| Can Tho | Section 2-1 (Omon) | | | | | | |
| | Section 2-2 (Omon-45+750) | 1 | 3+12+3 | 24.5 | 32.5 | 10x3 | |
| | | 2 | 3+12+3 | 12.5+24.5+12.5 | 57.5 | 10x3 | |
| | | 3 | 3+15+3 | 12.5+24.5+12.5 | 57.5 | 10x3 | |
| | | 4 | 3+15+3 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 5 | 3+12+3 | 24.5 | 32.5 | 10x3 | |

| Province | Section | No. | Identified width of canal & road (m)* | Span arrangement (m) | Bridge Length (m) | Clearance | Remarks |
|---|---|---|---|---|---|---|---|
| | | 6 | 3+15+3 | BA+24.5+BA | 42.5 | 10x3 | |
| | | 7 | 7.5+30+7.5 | 12.5+24.5+12.5 | 57.5 | 15x4 | |
| | | 8 | 5+25+5 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 9 | 3+15+3 | 24.5 | 32.5 | 10x3 | |
| | | 10 | 5+20+5 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 11 | 0+32+9 | 24.5+33+24.5 | 90 | 25x6 | |
| | | 12 | 5+25+5 | 12.5+24.5+12.5 | 57.5 | 10x3 | |
| | | 13 | 3+25+3 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 14 | 3+15+3 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 15 | 3+20+3 | BA+24.5+BA | 42.5 | 10x3 | |
| | | 16 | 3+15+3 | BA+18.6+BA | 36.6 | 10x3 | |
| | | 17 | 4+25+4 | 12.5+24.5+12.5 | 57.5 | 10x3 | |
| | | 18 | 3+15+3 | BA+18.6+BA | 36.6 | 10x3 | |
| | | 19 | 3+15+3 | BA+18.6+BA | 36.6 | 10x3 | |
| | | 20 | 3+15+3 | BA+18.6+BA | 36.6 | 10x3 | |
| | | 21 | 3+12+3 | BA+18.6+BA | 36.6 | 10x3 | |
| | | 22 | 3+20+3 | 12.5+24.5+12.5 | 57.5 | 10x3 | |
| | | 23 | 3+15+3 | BA+18.6+BA | 36.6 | 10x3 | |
| | | 24 | 3+11+3 | 24.5 | 32.5 | 10x3 | Assumed |
| | | 25 | 5+35+5 | 24.5+33+24.5 | 90 | 25x6 | |
| | | 26 | 3+12+3 | BA+24.5+BA | 42.5 | 10x3 | |
| | | 27 | 3+12+3 | BA+24.5+BA | 42.5 | 10x3 | |
| | | 28 | 3+12+3 | BA+24.5+BA | 42.5 | 10x3 | |
| | | 29 | 3+15+3 | BA+33+BA | 51 | 10x3 | |
| | | 30 | 3+25+3 | 24.5+33+24.5 | 90 | 10x3 | |
| | | 31 | 0+12+0 | 33 | 41 | 10x3 | |
| | | 32 | 0+12+0 | 33 | 41 | 10x3 | |
| | | 33 | 5+45+5 | 3x33 | 107 | 15x4 | |
| | | 34 | 3+15+3 | BA+24.5+BA | 42.5 | 10x3 | |
| | | 35 | 3+15+3 | 33+33 | 68 | 10x3 | |
| | | 36 | 3+25+3 | 12.5+18.6+12.5 | 51.6 | 15x4 | |
| | | 37 | 3+15+3 | 24.5 | 32.5 | 10x3 | |
| | | 38 | 3+15+3 | 24.5 | 32.5 | 10x3 | |
| | | 39 | 3+20+3 | BA+24.5+BA | 42.5 | 10x3 | |
| | | 40 | 3+15+3 | 24.5 | 32.5 | 10x3 | |
| | | 41 | 3+22+3 | 18.6+18.6+18.6 | 63.8 | 10x3 | |
| Kien Giang | Section 3-1 (45+750-61+800) | 1 | 3+20+3 | 18.6+18.6+18.6 | 63.8 | 10x3 | |
| | | 2 | 3+15+3 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 3 | 3+20+3 | 18.6+18.6+18.6 | 63.8 | 10x3 | |
| | | 4 | 3+12+3 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 5 | 3+15+3 | 18.6+18.6+18.6 | 63.8 | 10x3 | |
| | | 6 | 3+30+3 | 5x24.5 | 130.5 | 15x4 | |
| | | 7 | 0+20+3 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 8 | 3+20+3 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 9 | 3+20+3 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 10 | 3+20+3 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 11 | 5+45+9 | 3x40+48+72+48+3x40 | 416 | 30x7 | |
| | | 12 | 3+20+3 | 5x24.5 | 130.5 | 10x3 | |
| | | 13 | 3+20+3 | 18.6+18.6+18.6 | 63.8 | 10x3 | |
| | | 14 | 5+22+5 | 18.6+18.6+18.6 | 63.8 | 10x3 | |
| | | 15 | 5+25+5 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 16 | 3+20+3 | 18.6+18.6+18.6 | 63.8 | 10x3 | |
| | | 17 | 5+30+5 | 5x24.5 | 130.5 | 15x4 | |
| | Section 3-2 (61+800-66+150) | 1 | 3+18+0 | 12.5+18.6 | 39.1 | 10x3 | |
| | | 2 | 7.5+25+3 | 18.6+18.6+18.6 | 63.8 | 10x3 | |
| | | 3 | 3+25+3 | 3x33 | 107 | 10x3 | |
| | | 4 | 3+12+3 | 12.5+18.6+12.5 | 51.6 | 10x3 | |
| | | 5 | 5+30+5 | 5x24.5 | 130.5 | 15x4 | |

Note*: Widths of canal and road were identified on Google earth map

Source: The Study Team