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Report No: PAD4134

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF US\$230.763 MILLION

TO THE

SOCIALIST REPUBLIC OF VIET NAM

FOR A

BINH DUONG PROVINCE'S WATER ENVIRONMENT IMPROVEMENT PROJECT
DECEMBER 13, 2023

Water Global Practice
East Asia And Pacific Region

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CURRENCY EQUIVALENTS

(Exchange Rate Effective - November 2, 2023)

Currency Unit = VND

VND24,577 = US\$1

FISCAL YEAR

January 1 - December 31

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ABBREVIATIONS AND ACRONYMS

ASBR	Advanced Sequencing Batch Reactor
BEPCC	Board for Environment Protection and Climate Change
BIWASE	Binh Duong Water Supply, Sewerage, and Environment Joint Stock Company
CPF	Country Partnership Framework
DA	Designated Account
DARD	Department of Agriculture and Rural Development
DOC	Department of Construction
DoF	Department of Finance
DONRE	Department of Natural Resources and Environment
DPI	Department of Planning and Investment
E&S	Environmental and Social
ERR	Economic Rate of Return
ESCP	Environmental and Social Commitment Plan
ESCOP	Environmental and Social Code of Practice
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESRS	Environmental and Social Review Summary
ESS	Environment and Social Standards
FM	Financial Management
GBV	Gender-Based Violence
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GRM	Grievance Redress Mechanism
GRS	Grievance Redress Service
HCMC	Ho Chi Minh City
IEC	Information, Education, and Communication
IPF	Investment Project Financing
ISP	Implementation Support Plan
LMP	Labor Management Procedures
MARD	Ministry of Agriculture and Rural Development
M&E	Monitoring and Evaluation
MOC	Ministry of Construction
MOF	Ministry of Finance
MONRE	Ministry of Natural Resources and Environment
MPI	Ministry of Planning and Investment
MTIP	Medium-Term Investment Plan
NDC	Nationally Determined Contribution
NPV	Net Present Value
O&M	Operations and Maintenance
ODA	Official Development Assistance
OOG	Office of Government

PDO	Project Development Objective
PMU	Project Management Unit
PPC	Provincial People's Committee
PPP	Public-Private Partnership
PPSD	Project Procurement Strategy for Development
PSC	Project Steering Committee
QCBS	Quality- and Cost-Based Selection
RAP	Resettlement Action Plan
RFB	Request for Bids
SAV	State Audit Office of Viet Nam
SCADA	Supervisory Control and Data Acquisition
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
SKER	Southern Key Economic Region
SOE	State-Owned Enterprise
TA	Technical Assistance
TORs	Terms of Reference
VNEPS	Viet Nam National Electronic Procurement System
WSP	Water and Sanitation Program
WWMB	Wastewater Management Board (Binh Duong Provincial Management Board for Wastewater Projects)
WWTP	Wastewater Treatment Plant



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DATASHEET

BASIC INFORMATION

Project Beneficiary(ies) Viet Nam	Operation Name Binh Duong Province's Water Environment Improvement Project		
Operation ID P173716	Financing Instrument Investment Project Financing (IPF)	Environmental and Social Risk Classification Substantial	

Financing & Implementation Modalities

<input type="checkbox"/> Multiphase Programmatic Approach (MPA)	<input type="checkbox"/> Contingent Emergency Response Component (CERC)
<input type="checkbox"/> Series of Projects (SOP)	<input type="checkbox"/> Fragile State(s)
<input type="checkbox"/> Performance-Based Conditions (PBCs)	<input type="checkbox"/> Small State(s)
<input type="checkbox"/> Financial Intermediaries (FI)	<input type="checkbox"/> Fragile within a non-fragile Country
<input type="checkbox"/> Project-Based Guarantee	<input type="checkbox"/> Conflict
<input type="checkbox"/> Deferred Drawdown	<input type="checkbox"/> Responding to Natural or Man-made Disaster
<input type="checkbox"/> Alternative Procurement Arrangements (APA)	<input type="checkbox"/> Hands-on Expanded Implementation Support (HEIS)

Expected Approval Date 11-Jan-2024	Expected Closing Date 31-Oct-2029
Bank/IFC Collaboration No	

Proposed Development Objective(s)

The objective of the Project is to reduce environmental pollution caused by urban wastewater in order to protect water quality and increase people’s access to improved wastewater services in the Project Areas of Binh Duong Province.

Components

Component Name	Cost (US\$)
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Component 1: Wastewater infrastructure development	246,402,000.00
Component 2: Institutional strengthening and implementation support	64,394,000.00

Organizations

Borrower: Socialist Republic of Viet Nam
 Implementing Agency: Binh Duong Provincial Peoples' Committee respresented by Management Board for Wastewater Projects

PROJECT FINANCING DATA (US\$, Millions)

Maximizing Finance for Development

Is this an MFD-Enabling Project (MFD-EP)? Yes

Is this project Private Capital Enabling (PCE)?

SUMMARY

Total Operation Cost	310.80
Total Financing	310.80
of which IBRD/IDA	230.76
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Bank for Reconstruction and Development (IBRD)	230.76
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Non-World Bank Group Financing

Counterpart Funding	80.03
Local Govts. (Prov., District, City) of Borrowing Country	80.03

Expected Disbursements (US\$, Millions)

WB Fiscal Year	2024	2025	2026	2027	2028	2029	2030
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Annual	5.00	5.00	30.00	75.00	67.00	35.00	13.76
Cumulative	5.00	10.00	40.00	115.00	182.00	217.00	230.76

PRACTICE AREA(S)

Practice Area (Lead)

Water

Contributing Practice Areas

Climate Change; Environment, Natural Resources & the Blue Economy; Urban, Resilience and Land

CLIMATE

Climate Change and Disaster Screening

Yes, it has been screened and the results are discussed in the Operation Document

SYSTEMATIC OPERATIONS RISK- RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	● Low
2. Macroeconomic	● Low
3. Sector Strategies and Policies	● Low
4. Technical Design of Project or Program	● Moderate
5. Institutional Capacity for Implementation and Sustainability	● Moderate
6. Fiduciary	● Moderate
7. Environment and Social	● Substantial
8. Stakeholders	● Low
9. Other	● Moderate
10. Overall	● Moderate

POLICY COMPLIANCE

Policy



Does the project depart from the CPF in content or in other significant respects?

Yes No

Does the project require any waivers of Bank policies?

Yes No

ENVIRONMENTAL AND SOCIAL

Environmental and Social Standards Relevance Given its Context at the Time of Appraisal

E & S Standards	Relevance
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	Relevant
ESS 10: Stakeholder Engagement and Information Disclosure	Relevant
ESS 2: Labor and Working Conditions	Relevant
ESS 3: Resource Efficiency and Pollution Prevention and Management	Relevant
ESS 4: Community Health and Safety	Relevant
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Relevant
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Relevant
ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Not Currently Relevant
ESS 8: Cultural Heritage	Relevant
ESS 9: Financial Intermediaries	Not Currently Relevant

NOTE: For further information regarding the World Bank’s due diligence assessment of the Project’s potential environmental and social risks and impacts, please refer to the Project’s Appraisal Environmental and Social Review Summary (ESRS).

LEGAL

Legal Covenants

Sections and Description

Institutional Arrangements (Section I.A.1 of Schedule 2, Loan Agreement) The Borrower shall cause Binh Duong PPC to maintain, throughout the period of implementation of the Project Wastewater Management Board with composition, powers, functions, staffing, facilities and other resources acceptable to the Bank responsible for: (i) planning and managing the implementation of the Project, including, procurement, financial management, implementation of the environmental and social instruments; (ii) ensuring coordination among all relevant departments and agencies; and (iii) monitoring and reporting on all Project activities.



Subsidiary Agreement (Section I.B of Schedule 2, Loan Agreement) To facilitate the carrying out of the Project, the Borrower shall make the proceeds of the Loan available to Binh Duong PPC under a subsidiary agreement between the Borrower and Binh Duong PPC under the same terms and conditions as shall have been received from the Bank and in accordance with the provisions of this Agreement and the Borrower's on-lending policies and regulations. In the event that the on-lending policies and regulations of the Borrower as relevant or applicable to the Subsidiary Agreement are inconsistent with this Agreement, the provisions of this Agreement shall govern. The Borrower shall exercise its rights under the Subsidiary Agreement in such manner as to protect the interests of the Borrower and the Bank and to accomplish the purposes of the Loan.

Annual Work Plans (Section I.C.1 of Schedule 2, Loan Agreement) The Borrower shall cause Binh Duong PPC to: (a) prepare and furnish to the Bank by January 15 of each year during the implementation of the Project, a draft Annual Work Plan for review and comment; (b) taking into account the Bank's comments, finalize and furnish to the Bank no later than February 15 of each year, during the implementation of the Project, the Annual Work Plan, acceptable to the Bank; (c) thereafter ensure the implementation of the Project during the following calendar year in accordance with the Annual Work Plan agreed with the Bank and in a manner acceptable to the Bank; and (d) except as the Bank shall otherwise agree in writing, not amend, suspend, abrogate, or waive said Annual Work Plans or any provision thereof.

Project Implementation Plan (Section I.C.2 of Schedule 2, Loan Agreement) Throughout the implementation of the Project, the Borrower shall cause Binh Duong PPC to carry out the Project in accordance with the Project Implementation Plan in a timely and efficient manner acceptable to the Bank and except as the Bank shall otherwise agree in writing, not amend, suspend, or waive said Project Implementation Plan or any provision or schedule thereof. In the event of any inconsistency between the provisions of the Project Implementation Plan and those of this Agreement, the provisions of this Agreement shall prevail.

Environmental and Social Standards (Section I.D of Schedule 2, Loan Agreement) The Borrower shall cause Binh Duong PPC to: (a) ensure that the Project is carried out in accordance with the Environmental and Social Standards, in a manner acceptable to the Bank; (b) ensure that the Project is implemented in accordance with the Environmental and Social Commitment Plan ("ESCP"), in a manner acceptable to the Bank; (c) ensure that all measures necessary are taken to collect, compile, and furnish to the Bank through regular reports, with the frequency specified in the ESCP, and promptly in a separate report or reports, if so requested by the Bank, information on the status of compliance with the ESCP and the environmental and social instruments referred to therein, all such reports in form and substance acceptable to the Bank, setting out, inter alia: (i) the status of implementation of the ESCP; (ii) conditions, if any, which interfere or threaten to interfere with the implementation of the ESCP; and (iii) corrective and preventive measures taken or required to be taken to address such conditions; and the Bank is promptly notified of any incident or accident related to or having an impact on the Project which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers, in accordance with the ESCP, the environmental and social instruments referenced therein and the Environmental and Social Standards; (d) maintain, publicize, and operate an accessible grievance redress mechanism, to receive and facilitate resolution of concerns and grievances of Project-affected people, and take all measures necessary and appropriate to resolve, or facilitate the resolution of, such concerns and grievances in accordance with the ESCP, the environmental and social instruments referenced therein and the Environmental and Social Standards, and all in a manner acceptable to the Bank; and (e) ensure that all bidding documents and contracts for civil works under the Project include the obligation of contractors, subcontractors and supervising entities to: (i) comply with the relevant aspects of the ESCP and the environmental and social instruments referred to therein; and (ii) adopt and enforce codes of conduct that should be provided to and signed by all workers, detailing measures to address environmental, social, health and safety risks, and the risks of sexual exploitation and abuse, sexual harassment and violence against children, all as applicable to such civil works commissioned or carried out pursuant to said contracts.



Mid-term Review (Section II.2 of Schedule 2, Loan Agreement) The Borrower shall, through Binh Duong PPC, carry out jointly with the Bank, not later than thirty-six (36) months after the Effective Date, or such other period as may be agreed by the Bank, a mid-term review to assess the status of Project implementation, as measured against the performance indicators set forth in the Project Implementation Plan. Such review shall include an assessment of: (i) the progress in implementation; (ii) the results of monitoring and evaluation activities; (iii) the progress on procurement and disbursement; (iv) compliance with safeguards requirements; (v) adequacy of implementation arrangements; and (vi) the need to make any adjustments to the Project to improve performance.

Conditions

Type	Citation	Description	Financing Source
Effectiveness	Article IV	Binh Duong PPC has adopted the Project Implementation Plan in form and substance acceptable to the Bank and in accordance with this Agreement	IBRD/IDA



I. STRATEGIC CONTEXT

A. Country Context

1. **Comprehensive reforms since 1986 (known as ‘Đổi Mới’) have led Viet Nam along a stable economic growth pathway, transforming the country from a low-income to a middle-income economy in one generation.** Viet Nam has had one of the fastest gross domestic product (GDP) per capita growth rates (averaging 5.5 percent a year) in the world since the early 1990s, yielding a three-and-a-half-fold increase in average income. Economic growth has brought dramatic structural transformation, with the agricultural sector's share of GDP falling from more than 40 percent in the late 1980s to less than 20 percent in recent years. Continued growth of the domestic private sector is expected to be a driving force for economic development and job creation, particularly as state-owned enterprise (SOE) reforms progress, and as Viet Nam continues a path toward its longer-term aspirations of being a “modern and industrialized nation moving toward becoming a prosperous, creative, equitable, and demographic society.”¹

2. **Viet Nam has performed well in terms of poverty reduction and shared prosperity.** More than 40 million Vietnamese were lifted out of poverty between 1990 and 2014, extreme poverty (income of less than US\$1.90 per person per day) fell from 50 percent in 1993 to less than 3 percent today, and consumption for the bottom 40 percent of the population grew by 6.8 percent annually over the same period. Access to basic infrastructure has also improved substantially. Electricity is now available to almost all households, up from less than half in 1993. Access to clean drinking water and improved sanitation in urban areas has risen from less than 20 percent of all households in 1999 to more than 95 percent and 89 percent, respectively, in 2020.² By the World Bank's measure of shared prosperity (that is, income growth of the bottom 40 percent of the population), Viet Nam is one of the most noteworthy cases of long-term shared prosperity globally. Furthermore, Viet Nam's economy demonstrated great resilience to the negative effects of the COVID-19 pandemic, with household income and poverty-related impacts being notable but temporary.

3. **Emerging economic and demographic trends are placing increased demands on service delivery and social protection systems.** Viet Nam's population is currently around 96 million and growing. Urban centers, as important hosts for industry, manufacturing, and services,³ are the main population and economic growth areas providing an increasing contribution to GDP (currently around 50 percent). In addition, an important feature of urbanization is the emergence of the urban middle class,⁴ which is currently around 10 percent of the population but is expected to reach over 50 percent by 2035 (Systematic Country Diagnostic 2016 – Report 108348). This middle class has rising expectations in terms of their quality of life and living environment, and willingness to pay for improved municipal services, along with expectations of greater voice and choice in decision-making.

4. **Globally, Viet Nam has been ranked among the top five countries most affected by natural disasters and climate change.** This is due largely to a concentration of population and economic assets in vulnerable coastal lowlands and deltas. Specifically, 70 percent of the population is at risk from typhoons, floods, droughts, sea water intrusion, landslides, forest fires, and occasional earthquakes. Climate change will increase the impact of weather-related hazards in terms of frequency and intensity of hydro-meteorological events.⁵ In deltaic regions, drainage and groundwater extraction will

¹ Viet Nam 2035: Toward Prosperity, Creativity, Equity, and Democracy. 2016.

² Progress on Drinking Water, Sanitation and Hygiene. WHO-UNICEF Joint Monitoring Report.

³ The annual rural-to-urban migration rate is 1 percent (SCD 2016), and the urban population has grown from 13 million in 1986 to over 30 million today. The urban land area also increased by about 50 percent between 2000 and 2010; however, density fell from 19.4 residents per hectare in 2005 to 18.6 residents per hectare in 2010 despite an additional 3.0 million urban residents.

⁴ Defined to have consumption needs of US\$15 per day at 2011 purchasing power parity levels.

⁵ Official climate change scenarios from the MONRE project show annual mean temperature increases of 0.6°C to 1.2°C by 2040 relative to 1980–1999. Sea level rise of 0.22 m and an increase in rainfall of between 12.4 percent and 33.3 percent is expected by 2030, based on scenario RPC4.5,



exacerbate land subsidence⁶ and increase the threat of coastal flooding. Coastal cities will be affected by flooding due to the increased intensity of tropical cyclones as well as to sea-level rise induced by climate change. Furthermore, sea-level rise can lead to saltwater intrusion into coastal aquifers, affecting groundwater quality and contaminating drinking water sources. It is estimated that Viet Nam's average disaster-related losses stand at approximately US\$2.4 billion per year or almost 1.5 percent of GDP.⁷ As Viet Nam strives to become a modern, industrialized economy by 2035, economic growth will need to adapt to becoming more resource efficient, and therefore less vulnerable to climate shocks on resource availability, as well as to address other consequences of climate change.

B. Sectoral and Institutional Context

5. **Viet Nam's water endowment has helped shape its development gains,⁸ but action is needed to address emerging risks and ensure sustainable growth.** Recent analytics⁹ identified three critical challenges for the water sector, whereby inaction today could reduce GDP growth by nearly 6 percent annually by 2030.

- **Boosting efficiency.** Within 25 years, Viet Nam's urban population will require twice as much water as current systems supply and two-thirds of the country live in river basins that will be water stressed by 2030. Demand management through efficiency gains is needed to meet new challenges associated with rapid urbanization and climate change, particularly from flooding, pollution, and competition for water.
- **Reducing threats.** Pollution constitutes one of the greatest threats to the national economy, with its impact on human health estimated to reduce GDP by 3.5 percent by 2035. Only 46 percent of urban households have a connection to drainage, and only 12.5 percent of municipal wastewater is treated. Uncollected and untreated wastewater can mix with floodwaters entering natural water bodies during climate change-induced floods, which aggravate water pollution issues and associated public health risks, that is, the spread of waterborne diseases.
- **Improving governance.** There is a lack of common data to facilitate coordinated multisector planning. Although economic instruments (including tariffs and fees) have been introduced, their implementation and impact have been limited. There is a shortfall in the water sector investments, with needs estimated at US\$2.7 billion annually to achieve water and sanitation targets alone, against the current financing of roughly US\$1.0 billion annually. However, the scope for private investment in the water sector is widening, including equitization (privatization) of water supply utilities and public-private partnerships (PPPs).

6. **The World Bank's flagship 'Water Governance Report'¹⁰ highlights seven key recommendations to address the challenges facing the water sector:** (a) improve water resources management institutions and planning to address the division of tasks, improve regulations and incentives for water efficiency, and ring-fence revenues to reinvest in the water sector; (b) manage Viet Nam's water at the basin level through inclusive governance arrangements to address intersectoral issues for planning, water allocation, pollution control, and flooding and drought resilience; (c) increase the value

and will further increase flood levels.

⁶ For example, in the Mekong delta region, land subsidence is 6 mm per year.

⁷ UNISDR. 2014. *Prevention Web: Basic Country Statistics and Indicators*. <https://www.preventionweb.net/countries>.

⁸ With nearly 3,500 rivers of more than 10 km in length in 16 major basins and with plentiful rainfall—almost 2,000 mm a year—the country is rich in water resources. Water features extensively in the country's history, art, and traditions. Rivers have determined the location of settlements and cities and power the country's industry. Their ample waters irrigate more than 4 million ha (Transforming Cultures eJournal – Vol.5 No 1 June 2010: Waterborne: Vietnamese Australians and river environments in Viet Nam and Sydney - Cadzow, Byrne, and Goodall). A vast network of 7,500 dams store and divert water to thousands of irrigation schemes, making Viet Nam one of the world's rice baskets. Hydropower accounts for about 42 percent of installed generation capacity of about 19.5 GW, with a further 193 projects (5.6 GW) under construction.

⁹ World Bank. 2019. *Viet Nam: Towards a Safe, Clean and Resilient Water System*.

¹⁰ World Bank. 2019. *Viet Nam: Towards a Safe, Clean and Resilient Water System*.



produced by water in agriculture; (d) give the highest policy priority to reducing water pollution, with a focus on infrastructure, incentives, and regulation, including making domestic wastewater collection, treatment, and reuse an investment priority and business opportunity and strengthening water quality monitoring and regulatory and enforcement systems; (e) improve risk management and disaster response and strengthen resilience, including an integrated drought and flood monitoring and warning system and locally specific climate risk and vulnerability assessments; (f) develop and scale up market-based financing and incentives; and (g) strengthen water security for settlements, which will require improving resilience to climate-related risks, protection of water sources, and provision of high-quality water supply and sanitation services.

7. **Government authorities are prioritizing public investment programs that stimulate and promote climate resilience, green growth, and sustainable water management.** Viet Nam's National Socio-Economic Development Plan 2021–2025 (NSEDP) emphasized development of human capital, enhancing of scientific and technological capacity, increasing of resilience to climate change impacts and adaptation, improved disaster risk management, and better environmental protection and management of natural resources. Several national policies and measures to adapt to climate change and water-related risks have been initiated, along with targeted investment programs to address existing, devastating impacts of water pollution,¹¹ including in Binh Duong Province.¹²

8. **Binh Duong Province has fostered strong and rapid development, with high rates of economic growth and urbanization.** In 2022, the GDP of Binh Duong Province increased by about 8.01 percent in comparison with 2021, with average GDP per capita reaching VND 167.7 million (approximately US\$7,100) per person. It is located close to the economic hub of Ho Chi Minh City (HCMC) and is home to several important industries. The province's annual budget revenue in 2022 is the sixth largest in the country. As of 2022, Binh Duong Province was home to 2.7 million people, rendering it Viet Nam's seventh-most populated province and one of the country's fastest growing populations. The province is an employment hub attracting migrant workers, resulting in the highest positive net migration rate within the country (20.04 percent). Roughly, around 80 percent of Binh Duong's population lives in urban areas, more than double the national average of 31.3 percent. Urbanization increased by 41 percent in the 2014–2018 period compared to a national urban growth rate of 9.8 percent.

9. **However, the province faces adverse impacts associated with inadequate wastewater management, placing development gains at risk.** While wastewater generation has increased substantially in Binh Duong Province, treatment capacity remains inadequate. In the urbanized areas of southern Binh Duong Province, the existing treatment capacity is only 40 percent of the current needs. Drainage is also inadequate in several areas, with relatively low levels of rainfall causing urban flooding. Municipal wastewater pollution, together with frequent urban inundation contribute to the spread of waterborne diseases, which particularly affect women and other vulnerable groups due to their disadvantageous socioeconomic conditions. Binh Duong Province needs to address such gaps in wastewater management, not only through infrastructure investments but also by strengthening policies, regulations, and institutions. Despite being heavily affected, women are underrepresented in management and decision-making within the sector. For example, women comprise only 10.7 percent of representatives on the Provincial Steering Board for Environment Protection and Climate Change (BEPCC), an institution mandated to advise and coordinate on issues related to environmental protection and climate change. Such

¹¹ Over the next 15 years, wastewater is expected to account for the largest share of effluents (about 60 percent) and contribute to water-related problems that combined could reduce Viet Nam's annual GDP by 4.3 percent. Water pollution affects the health of people and productivity of industries and is projected to lead to US\$12.4 to US\$18.6 million in costs per day by 2030 if treatment measures are not implemented.

¹² For example, the Ministry of Natural Resources and Environment (MoNRE) announced the National Climate Change Strategy in 2011, the National Green Growth Strategy was adopted in 2012 to attract financing for climate change risks, the Law on Natural Disaster Prevention and Control was enacted in 2013, and Viet Nam ratified the Paris Agreement in 2016.



low representation limits alignment with gender equality principles in public policies and reduces the value and importance of equal participation and representation of men and women in decision-making roles.

10. **Municipal wastewater pollution is a leading cause of water quality deterioration in the Dong Nai and Sai Gon Rivers, presenting a water security risk for downstream communities.** The project areas are situated immediately upstream of the confluence of the Sai Gon and Dong Nai Rivers, which are the source of drinking water for more than 10 million inhabitants in the Binh Duong and Dong Nai Provinces and HCMC. Furthermore, these two rivers provide ecosystem services to Viet Nam's Southern Key Economic Region (SKER),¹³ which contributes 60 percent of Government revenues in Viet Nam. The industrial parks in Binh Duong are already equipped with wastewater collection and treatment facilities to meet the required standards and are closely monitored by the Department of Natural Resources and Environment (DONRE). However, municipal wastewater with high nutrient and pollutant loads is discharged into the Dong Nai and Sai Gon Rivers with limited to no treatment. It is estimated that about 75 percent of municipal wastewater within the south of Binh Duong Province is being discharged untreated into the Sai Gon and Dong Nai Rivers, with an average biochemical oxygen demand (BOD₅) pollution load of about 46 tons of BOD₅ per day.

11. **The province has prioritized the development of municipal wastewater services; however, further investments are required to reduce risks of pollution to the public and environment.** The World Bank-financed Viet Nam Urban Water Supply and Wastewater Project (P119077) supported Di An, the most densely populated town in Binh Duong, with financing from 2016 to 2018 for the installation of a wastewater treatment plant (WWTP) of 20,000 m³ per day. By end-2022, with support from various financing institutions, the province has developed four municipal WWTPs with a combined capacity of 87,000 m³ per day. However, this capacity meets only about 40 percent of the wastewater treatment requirements. Furthermore, it is estimated that by 2030, a population of around 3.5 million in the urban areas of South Binh Duong will generate 498,000 m³ of wastewater per day. Accordingly, despite significant efforts there remains a critical need to expand the current system.

12. **It is within this context that the Binh Duong Province's Water Environment Improvement Project has been prepared.** Through investment in climate-resilient infrastructure and institutional support activities, this project will build upon and leverage previous investments to help reduce threats from inadequate wastewater management and contribute to the long-term sustainable development and inclusive growth of Binh Duong Province. Moreover, the project responds to key recommendations and policy priorities of sector analytics as highlighted in the Water Governance Report, including the need to prioritize efforts to reduce water pollution, improve efficiency, and create an enabling environment to leverage private-sector participation.

C. Relevance to Higher Level Objectives

13. **The project is fully aligned with the World Bank Group's Country Partnership Framework (CPF, Report No. 111771-VN) for Viet Nam 2018–2022.** It directly contributes to the achievement of Objective 5 of the CPF, to “improve planning, management, and delivery of infrastructure and land in cities,” and the first focus area, to “enable inclusive growth and private sector participation.” Second, the project will support the achievement of Objective 10 of the CPF, to “increase climate resilience and strengthen disaster risk management” under the third focus area (“enhance environmental sustainability and resilience”).

¹³ SKER comprising eight provinces and cities: HCMC, Dong Nai, Binh Duong, Ba Ria - Vung Tau, Binh Phuoc, Tay Ninh, Long An, and Tien Giang Provinces.



14. **Project investments directly support the Government's commitment to Sustainable Development Goal No. 6: to achieve universal and equitable access to safe and affordable drinking water, sanitation, and hygiene by 2030.** Project areas will secure long-lasting environmental and health benefits through wastewater infrastructure development.

15. **The project is consistent with Viet Nam's climate and development priorities.** The project is aligned with Viet Nam's National Strategy on Climate Change for the period until year 2050 that was approved on July 26, 2022, and builds on findings of the Viet Nam Climate Change and Development Report—Reconciling Economic Success with Climate Change Risks (2022). The project will contribute to building the country's climate change mitigation and adaptation capacity in line with its commitments under the United Nations Framework Convention on Climate Change, including its updated (2022) Nationally Determined Contribution (NDC)¹⁴ for unconditional reduction of 15.8 percent greenhouse gas (GHG) emission and conditional reduction of 43.5 percent by 2030. On mitigation, the NDC identifies optimization of treatment conditions of domestic and industrial wastewater, application of biotechnology to remove methane from domestic wastewater treatment processes, and recovery of methane from industrial wastewater treatment as GHG reduction measures from the waste sector. On adaptation, the [National Adaptation Plan for the Period 2021–2030, with a Vision to 2050](#), identifies treatment of wastewater up to standards following technical regulations and criteria for reuse, as one of the measures to effectively use and prevent reduction and degradation of water and land resources to improve overall resilience. This project supports wastewater pollution reduction through improved wastewater services, which is strongly supported by the NDC and National Action Plan, thus, is consistent with and contributes to the country's climate commitments.

16. **Wastewater management services are an integral part of the World Bank's Green, Resilient and Inclusive Development approach.** Inadequate wastewater services can have long-term adverse impacts on human capital accumulation, cognition, educational outcomes, and welfare, especially for the poor and marginalized, which can impede development efforts and erase development gains. Untreated wastewater discharge also poses threats to both natural and human environments. This project will help improve wastewater treatment infrastructure systems, including WWTPs and sewers, as well as wastewater management capacity, including both institutions and financial sustainability, for Binh Duong Province to improve its wastewater services to contribute to sustainable and inclusive socioeconomic development.

17. **Moreover, the project's contribution to long-term growth is significant, including human, natural, and physical capital development, which will help ensure that the province's economy will rebound stronger and better after the COVID-19 pandemic.** For instance, the expansion of improved wastewater services along with health and hygiene promotional activities will help prevent water-borne disease and protect human health during infectious outbreaks, including from viruses such as SARS-CoV-2 (which causes COVID-19) and possible future recurrences, for which handwashing is an important barrier to transmission. The project will help build resilience, with interventions to enhance Binh Duong Province's capacity to cope with and recover from external shocks, including natural disasters and climate change impacts.

II. PROJECT DESCRIPTION

¹⁴ <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Viet%20Nam%20First/VIETNAM'S%20INDC.pdf>.

Such activities include, among others, treatment of domestic effluents discharged to receiving waterways, promotion of energy-saving technologies aimed at reducing electricity consumption and GHG emissions, outreach activities to promote environmental sanitation and behavior change, enhancing integrated investment planning and management capacity of local government authorities, creating an enabling environment to attract private-sector participation to enhance investment efficiency and long-term sustainability of wastewater utilities.



A. Project Development Objective

PDO Statement

18. The Project Development Objective (PDO) is to reduce environmental pollution caused by urban wastewater in order to protect water quality and increase people's access to improved wastewater services in the Project Areas of Binh Duong Province.

PDO Level Indicators

19. Results toward the achievement of the PDO will be measured using the following indicators:
- Number of people who have gained access to improved wastewater services as a result of the project (total number)
 - Additional pollutants removed by WWTPs (tons per year of BOD₅ and Total Nitrogen).

B. Project Components

20. Project investments focus on expanding municipal wastewater collection and treatment capacity in the southern part of Binh Duong Province - Thuan An City, Di An City, and Tan Uyen City. The current sewage collection and treatment systems only cover a small portion of the urban areas¹⁵ and there is a critical need for infrastructure expansion. In addition, the project includes targeted activities to strengthen institutional and financial capacity for sustainable wastewater services.

21. The project area of Thuan An City, Di An City, and Tan Uyen City cover an area of more than 33,000 ha, with a total population of around 1.4 million. The total investment is estimated at US\$310.796 million, of which the proposed IBRD loan will finance US\$230.763 million. The lending instrument is Investment Project Financing (IPF), to be implemented over a five-year period. The project is structured into two components, as summarized below. Further details are provided in annex 2.

Component 1: Wastewater infrastructure development (Total estimated cost: US\$246.402 million; from which US\$224.002 million in IBRD financing and US\$22.4 million in counterpart funding)

22. Component 1 will enable the scale-up of wastewater treatment facilities and sewerage coverage to increase the overall percentage of municipal wastewater being collected and treated across the south Binh Duong region and will support the development of climate-resilient infrastructure (see paragraph 56) by incorporating climate change scenarios and adaption and mitigation measures into the planning and engineering designs. On mitigation, the technical solutions were selected with consideration of potential GHG emissions and energy efficiency. On adaption, potential risks of abnormal and extreme climate events including increase of hourly rainfall, increase of water consumption due to higher temperature, as guided by the Government's climate change scenarios (updated by MONRE in 2020) were considered in designing the invested infrastructure. This infrastructure will expand coverage and improve the treatment capacity of the municipal wastewater management system in the project areas. This component will finance goods and works to enable the required municipal wastewater infrastructure investments. This will include civil and electrical/mechanical installations for sewerage collection, conveyance (including pumping stations and pressure lines), treatment, energy-efficient installations, and facilities for safe disposal and/or reuse of waste by-products. Such investments will expand

¹⁵ Coverage rates are currently less than 10 percent in Tan Uyen City, around 19 percent in Thuan An City, and 17 percent in Di An City



access to wastewater collection and treatment and help the province adapt to anticipated impacts from climate change, by reducing surface water and groundwater water contamination, as well as reducing public health risk of uncollected and untreated wastewater combining with floodwaters during climate change-induced flooding events. Circular economy principles along with energy efficiency measures will be applied in both existing and new WWTPs, including variable speed motors, LED lighting, operational Supervisory Control and Data Acquisition (SCADA) systems, solar panels, and facilities for the reuse of treated sludge and fit-for-purpose re-use of treated wastewater.

23. The proposed infrastructure will increase coverage of improved wastewater services from less than 10 percent to 32 percent in Tan Uyen City, 19 to 45 percent in Thuan An City, and 17 to 45 percent in Di An City. The priority expansion areas target water quality 'hot-spots' identified through surveys, which are predominately high-density urban areas. Moreover, the interventions will reduce pollution loads to the Sai Gon and Dong Nai River systems, contributing to broader efforts for environmental protection of surrounding areas and downstream communities.

24. Specific investments under Component 1 include the following:

Sub-component 1.1 – Tan Uyen City (estimated cost: US\$134.213 million; from which US\$122.012 million from IBRD financing, US\$12.201 million in counterpart funding): this sub-component includes (i) Construction of sewage collection and network, including sewage pumping stations, (ii) Construction of a new WWTP with first stage capacity of 20,000 m³ per day and (iii) Reconstruction of a drainage canal, around 1.4 km in length, adjacent to the planned WWTP to support the safe evacuation and disposal of treated effluents.

Sub-component 1.2 – Thuan An City (estimated cost: US\$ 43.470 million; from which US\$39.518 million from IBRD financing, US\$ 3.952 million in counterpart funding): this sub-component includes (i) Expansion of sewage collection and network, including sewage pumping stations, and (ii) Expansion of existing WWTP with additional treatment capacity of 20,000 m³ per day.

Sub-component 1.3 – Di An City (estimated cost: US\$68.718 million; from which US\$62.472 million from IBRD financing, US\$6.247 million in counterpart funding): this sub-component includes (i) Expansion of sewage collection and network, including sewage pumping stations, and (ii) Expansion of existing WWTP with additional treatment capacity of 20,000 m³ per day which will build on the recently completed Viet Nam Urban Water Supply and Wastewater Project (P119077).¹⁶

Component 2: Institutional strengthening and implementation support (Total estimated cost: US\$64.394 million; from which US\$6.761 million in IBRD financing, US\$57.633 million in counterpart funding)

25. Component 2 finances goods and services to enhance institutional and implementation capacity of the Binh Duong Provincial Management Board for Wastewater Projects (referred to as the Wastewater Management Board [WWMB])¹⁷ for effective project implementation and sustainability of infrastructure investments. This component will also help advance public health preventative measures, including increasing awareness of handwashing and hygienic practices. Specific activities will be implemented under three subcomponents, as follows:

¹⁶ Year 1 targets in household connections in the Results Framework reflect the continuation from the recently completed Viet Nam Urban Water Supply and Wastewater Project (P119077) which supported constructing a WWTP in Di An.

¹⁷ Established in December 2019, the WWMB has the mandate for asset planning, development, and management, while operations and maintenance (O&M) wastewater infrastructure is to be supported through private sector participation. Currently the Binh Duong Water Supply, Sewerage, and Environment Joint Stock Company (BIWASE) has been appointed for the operation and management of the drainage and wastewater assets.



Subcomponent 2A: Preparation of an integrated wastewater management orientation in Binh Duong Province (US\$0.823 million in counterpart funding)

26. This subcomponent includes technical assistance (TA) underlying the preparation of an integrated wastewater management orientation for Binh Duong Province by supporting the development of a strategic document that will include a comprehensive review of the existing wastewater situation (in both urban and rural areas), planning and growth scenarios, and wastewater management alternatives throughout the entire province, including infrastructure, financing, and institutional elements. It will involve an options analysis, consultations and prioritization processes, preparation of a plan for cost-effective medium- and long-term investments, and a road map for wastewater tariff adjustments, along with operational procedures and guidelines for wastewater asset management and an institutional capacity improvement plan. The orientation will also include considerations of lower-carbon alternatives (mitigation) and measures to reduce risks from climate hazards to build resilience (adaptation) in the infrastructure planning/construction master plans.

27. The strategic intention is to provide clear guidance on how to effectively achieve policy objectives of universal coverage under a holistic, cost-effective, and sustainable approach. The wastewater management orientation will be prepared with consideration of the construction master plans, with a view to reduce environmental impacts associated with rapid urbanization and build resilience to increased exposure and vulnerability to climate change. The orientation will integrate relevant sector innovations, including newer concepts of nature-based solutions along with the principles of a circular economy. Recommendations will include measures with gender-targeted community and citizen engagement.

Subcomponent 2B: Project implementation support (estimated cost: US\$38.741 million; from which US\$6.761 million in IBRD financing, US\$31.980 million in counterpart funding)

28. Subcomponent 2B includes financing for project management and implementation support activities, including Project Management Unit (PMU) operating costs for technical, safeguards and fiduciary management, including for grievance redress, gender and citizen engagement, monitoring and evaluation (M&E), including beneficiary satisfaction surveys and stakeholder consultations, financial audits, independent monitoring for E&S safeguards, and other day-to-day management and implementation costs.

29. It also includes consultancy activities to support infrastructure developments, including surveys, detailed designs, bidding documents, construction supervision, and contract management. In addition, this subcomponent will support information, education, and communication (IEC) activities focused on (a) handwashing and hygienic practices, (b) promoting of household connections to the municipal sewerage system, and (c) increasing of willingness to pay for wastewater services. Some of these activities will be conducted in collaboration with municipal women's unions. The subcomponent will also provide trainings on gender and wastewater management for provincial male and female leaders. Some of the trained women will be nominated for membership in Binh Duong Provincial BEPCC.

30. The Binh Duong WWMB will also be supported through TA to develop its capacity for asset management and complex procurement, including tendering processes for private sector participation, specifically developing bidding documents, including a draft contract template, to facilitate the selection of the most cost-effective and qualified service provider.

Subcomponent 2C: Compensation and site clearance (US\$24.830 million in counterpart funding)

31. This subcomponent supports, through counterpart funding, all costs associated with resettlement, compensation, land acquisition (see paragraph 80), and site clearance required for project implementation.

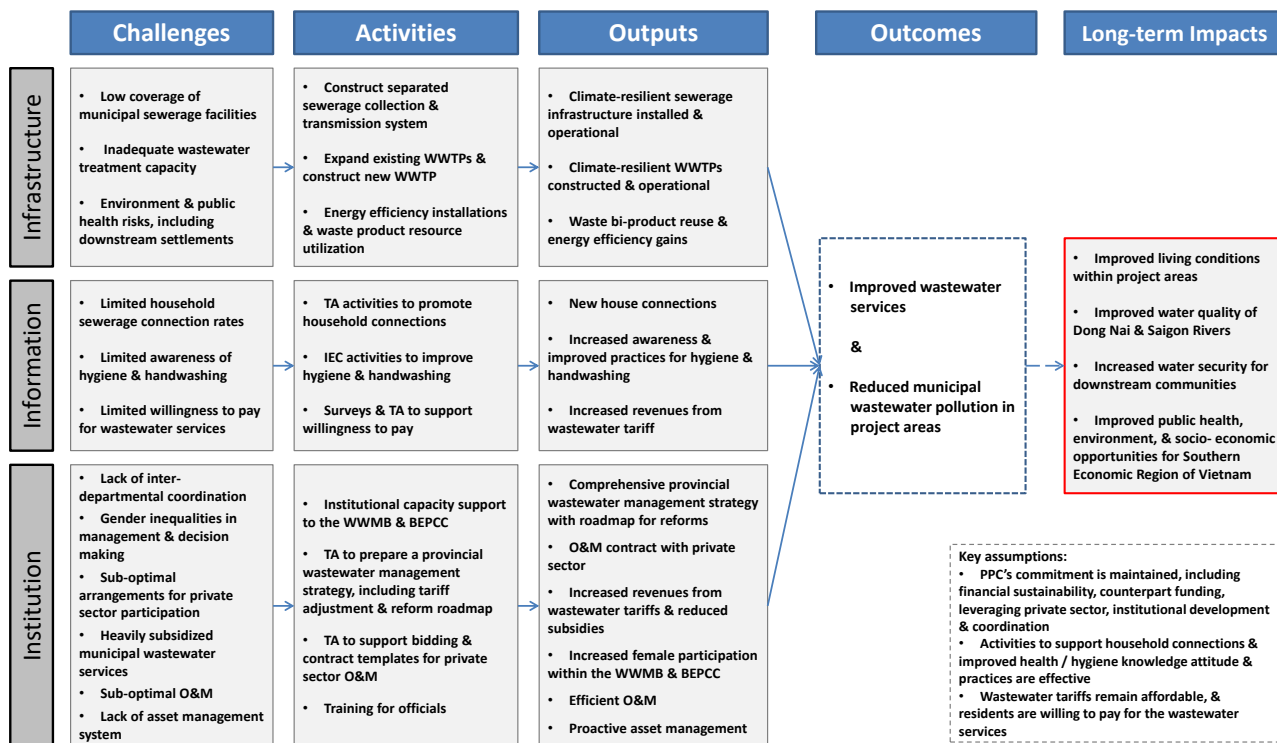


C. Project Beneficiaries

32. The project is designed to reach and benefit roughly 550,000 residents of Thuan An, Di An, and Tan Uyen in Binh Duong Province by 2032.¹⁸ In addition, the Provincial and City/District People’s Committees will benefit through TA and capacity development activities. Moreover, project activities will contribute to broader programs to reduce pollution in the Dong Nai and Sai Gon River system which will provide multiple benefits to residents, the environment, and economy of this important sub-region, including settlements directly dependent on water from the rivers. For example, the drinking water for more than 10 million people in Dong Nai, Binh Duong, and HCMC comes from the Dong Nai River.

D. Results Chain

Figure 1. Project Theory of Change



E. Rationale for Bank Involvement and Role of Partners

33. Through this project, the World Bank intends to support a comprehensive approach to help the province achieve its long-term vision for sustainable economic growth and development. The World Bank has been closely engaged in Viet Nam’s water sector through a series of projects for over 20 years, working closely with both central ministries and provincial authorities. The World Bank brings extensive experience to this project, drawing upon global and Vietnamese best practices to support efficient and sustainable investments. The project builds upon the successfully closed Urban Water Supply and Wastewater Project (P119077) and is designed to deepen and expand development impacts through

¹⁸ The project-end beneficiary target, however, is set at 374,900, which will be the number of additional beneficiaries provided with wastewater services by the end of project implementation (2028). The full capacity of the new plants is expected to be reached by 2032, serving an estimated 550,000 people.



infrastructure and institutional strengthening. With the establishment of the WWMB, Binh Duong has the potential to become a center for sectoral knowledge and experience which could be replicated and shared with other provinces of Viet Nam. The World Bank is thus well positioned to continue providing TA and financing.

34. Specific aspects of the World Bank's value added demonstrated through this engagement include (a) support for integrated planning, management, and coordination; (b) promotion of new technologies and concepts, including the circular economy and energy efficiency; (c) support for improved institutional and PPP arrangements for sustainable services, including an integrated wastewater management strategy, financing and affordability mechanisms, along with asset management models for sustainable O&M; (d) increased attention to climate change adaptation and mitigation; and (e) support to improve gender equality and social inclusion in project areas. Project preparation benefited from World Bank-led studies, TA, and expert opinion across these areas, which will continue during project implementation, supported by the Global Water Security and Sanitation Partnership.

F. Lessons Learned and Reflected in the Project Design

35. **To maximize development impacts, including investment efficiency and financial sustainability, it is important to prioritize and support the uptake of new household connections.** Wastewater investment projects often face challenges in meeting planned connection targets, which can result in idle capacity of WWTPs and a continuation of untreated wastewater discharging into river systems. A better alignment of demand- and supply-side activities, along with strong support for creating an enabling environment, can help ensure barriers to connection are overcome and the full benefits of investments are realized.

36. **Careful consideration regarding the financial sustainability of investments will enhance project benefits in the long run.** Investments in the wastewater sector are largely dependent on public financing; however, the public sector rarely allocates the required budget for O&M. Inadequate capacity of wastewater management departments regarding O&M is also an issue that can lead to rapid deterioration of assets. Through the provincial wastewater management strategy, the project will support the development of a new tariff road map¹⁹ to enhance sustainability of infrastructure investments and improved O&M arrangements.

37. **A robust M&E system supports effective planning and implementation.** A robust sector M&E system and regular reporting is a fundamental requirement to assess project outcomes and service delivery. The project proposes a comprehensive M&E system that includes regular customer surveys, with the aim of engaging beneficiaries in actions necessary for improving services. Customer surveys will also be conducted to evaluate the effectiveness of IEC activities in terms of encouraging people to pay for wastewater services and improving handwashing and hygiene awareness and behaviors.

38. **Private sector participation can drive improvements in the quality and efficiency of wastewater services.** Private sector participation can offer important opportunities to improve service performance in terms of efficiency and sustainability. The project will provide TA to support the selection and contracting process for PPP O&M arrangements, with a focus on transparent and competitive processes. This is expected to lead to improvements in the cost-effectiveness of service provision, together with better financial, commercial, and technical sustainability.

39. **Institutional strengthening is a necessary part of project design to ensure achievement of results and sustainability of interventions.** Several supporting activities for building institutional capacity for project implementation, asset management, and service delivery are included under Component 2, including the development of a provincial

¹⁹ Approval of the wastewater management orientation, which includes a tariff adjustment road map, is an intermediary indicator in the project Results Framework.



wastewater management orientation, which will help enhance internal coordination and define the roles and responsibilities of the key agencies to enhance development of the sector across urban, peri-urban, and rural areas.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

40. The project implementation arrangements are informed by experience and well-defined institutional mandates within the province. The Binh Duong Provincial People's Committee (PPC) is the decision-maker regarding the investment and is responsible to the Central Government for project preparation and implementation. The PPC has approved the Project Feasibility Study and other relevant project documents. As per the PPC's decision, the WWMB has been appointed as the project owner and will serve as the PMU. The PMU will be responsible for day-to-day activities, including procurement, financial management (FM), disbursement, M&E, safeguards management, audits, quality oversight, and progress reporting. It will also coordinate and report on project activities, including communications with the World Bank and government agencies.

41. The PMU's organizational structure and terms of references (TORs) for key positions have been agreed to and are outlined in the Project Implementation Plan. The PMU structure includes three city/district-level units to support implementation and coordinate with district authorities. Land acquisition and resettlement are the responsibility of district-level units. The PMU will be supported by engineering consultants for detailed design and construction supervision, who will provide quality assurance and quality control systems, along with support for environmental and social (E&S) safeguards management, M&E, and other critical areas for project implementation. During implementation, the PMU will be responsible for and work closely with the district-level units on IEC activities, including the household connection campaigns and handwashing and hygiene behaviors change programs.

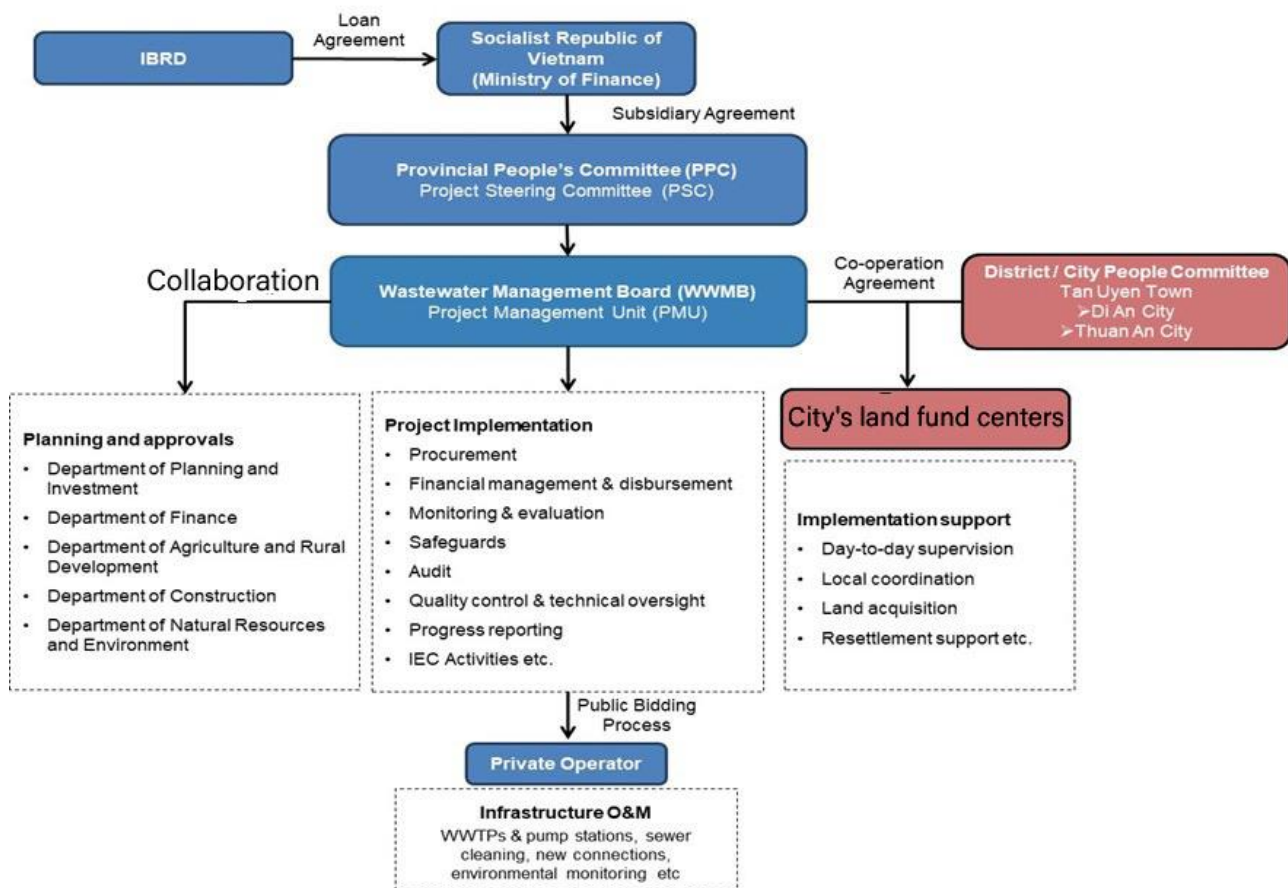
42. Project implementation will require technical inputs, clearance, and/or facilitating support from various provincial line departments: the Department of Planning and Investment (DPI), Department of Finance (DoF), Department of Construction (DOC), Department of Agriculture and Rural Development (DARD), and DONRE. Such departments have specific roles and responsibilities during the review and appraisal processes before submission to the PPC for approval. The coordination of inputs from each line department will be part of the role of the PMU, with support from the PPC. A Project Steering Committee (PSC) has been established during preparation and will be maintained to ensure strong engagement and close collaboration among relevant provincial departments and agencies during implementation.

43. The O&M of infrastructure investments will be carried out by an eligible private service provider selected through a public tendering process as required by the current Government's regulations (Decree 32/2019-ND-CP). Under Component 2, the project will provide TA to Binh Duong Province to support the development of bidding documents, including a draft contract template, to facilitate the selection of the most cost-effective and qualified service provider.

44. Overall project institutional arrangements are illustrated in figure 2.



Figure 2. Project Institutional Arrangement



B. Results Monitoring and Evaluation Arrangements

45. Project performance will be monitored based on the indicators and methodologies detailed in the Results Framework (Section VII). The PMU will be responsible for the project results M&E. Specifically, they will (a) ensure timely identification of bottlenecks during implementation, (b) monitor the performance of the project toward achievement of its objectives, and (c) provide regular monitoring reports on the progress of activities under Components 1 and 2. The PMU includes a full-time M&E specialist, who will help integrate results and coordinate data collection and analysis and who will oversee the work of the M&E consultant described below. The project monitoring indicators were developed recognizing the capacity, availability of data, and costs of M&E.

46. An experienced and independent entity (firm or institute) will be selected by the PMU to design and manage the project’s M&E system. Specifically, this entity will (a) prepare the design of an M&E system (including data collection sites and M&E institutional arrangements at the district level), (b) carry out a baseline survey for the key performance indicators, and (c) prepare an M&E baseline survey report. The M&E entity will also carry out the following M&E activities during implementation: (a) collect data, (b) analyze and evaluate project performance based on the data collected, (c) prepare semiannual M&E reports, and (d) prepare a final impact/outcome assessment report.

47. The project will establish a baseline by conducting a beneficiary survey to measure who benefits, and to what extent, from the infrastructure and services and how it affects people’s lives in both social and economic terms. The PMU, with support from the consultant, will also collect and compile data to provide the basis for a comprehensive midterm



review. The PMU will also undertake an end-project review and prepare a final Implementation Completion and Results Report. In addition, data and information on project activities will be collected and collated quarterly. The PMU will be required to submit quarterly progress reports on implementation aspects that will include reporting on procurement, FM, physical implementation, and E&S aspects. Project financing includes an allocation for technical support to the PMU as needed to carry out their M&E duties and responsibilities.

C. Sustainability

48. Sustainability is a core project principle integrated at various levels of design, implementation, and operations, as described below.

49. **Technical sustainability.** The project will apply technical design standards and methods to support operational sustainability. This will include careful consideration of the quality and quantity of wastewater generated, climate resilience in terms of both mitigation and adaptation, life cycle costs, and operational capacity constraints. Modernization of technical standards and designs will provide systems that can be managed efficiently and operated reliably, while meeting customer demands for service and affordability.

50. **Environmental sustainability.** Principles of environmental sustainability are central to project design: (a) reduced wastewater pollution discharged resulting from the project will have positive environmental impacts, extending beyond the well-quantified socioeconomic benefits, including improvements to the ecosystems and biodiversity, amenity, and waterway recreation for downstream communities; (b) energy-efficient improvement measures will be undertaken to reduce the WWTP's operational energy consumption and associated GHG emissions; (c) circular economy principles are applied in project design to reduce resource consumption, including facilities for the reuse of treated sludge and of treated wastewater for limited internal purposes (for example, for cleaning of facilities and garden watering); and (d) the pollutant absorption capacity of receiving waterways has been assessed and results demonstrate the need for the project investments supporting the province's transitional plans toward a green and clean development pathway.

51. **Financial sustainability.** In addition to efforts to improve efficiency and reduce the operating costs of wastewater treatment, the project will support the development of an integrated wastewater management orientation, which will include a tariff road map to increase tariff revenues such that they cover all O&M expenses in the near to medium term, as well as full operational and investment costs in the longer term and mechanism for subsidizing the O&M costs of the service, should revenues from associated tariffs be inadequate for this purpose. Furthermore, the project will support the development of O&M arrangements with the private sector, with an emphasis on improving service coverage and efficiency to enhance long-term financial sustainability.

52. **Institutional sustainability.** The project will provide TA to strengthen the WWMB's asset planning, development, and management capacities. The WWMB will be supported to prepare the integrated wastewater management orientation, which will identify key areas for policy, regulatory, and institutional reform and outline a road map for development. The WWMB will also be supported to enhance its capacity in processing bidding for selecting qualified O&M operators and then effectively managing the signed contracts with those operators.

53. **Social sustainability.** Involvement of the community, district governments, and other key stakeholders in project preparation and during implementation will help arrive at locally supported outcomes. Critical to social sustainability will be the expansion of services and a demonstration that they meet public expectations and priorities through a transparent and efficient process. The project will support community consultation and participation to promote a sense of ownership of the activities and investments. Communications and public awareness programs will be implemented to support knowledge and behavioral changes targeted toward increasing household connections and willingness to pay for wastewater services. Citizen engagement mechanisms will be introduced to enhance accountability and recourse.



IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic and Financial Analysis

Technical

54. The project supports the improvement of wastewater services in rapidly growing urban centers of Binh Duong Province and responds to key recommendations and policy priorities from sector analytics as highlighted in the 'Water Governance Report', including the need to focus efforts on reducing water pollution, improving resource efficiency, and creating an enabling environment to leverage private-sector participation. Infrastructure development will substantially increase coverage in unserved, high-density, urban areas, reducing threats to public health and the environment and improving water quality in the Dong Nai and Sai Gon Rivers.

55. The investments are aligned with the Binh Duong Wastewater Master Plan (approved in 2003), while a new, forward-facing provincial wastewater strategy will be developed under the project. The World Bank has reviewed and confirmed that the proposed infrastructure solutions are based on technically sound feasibility studies and concept designs, supported by engineering investigations and analysis. The planning process considered various technical and institutional alternatives, operational capacity constraints, and life cycle costs to promote project sustainability. The pipeline design (sizing and locations) considers potential future development of the rapidly expanding urban centers to avoid unnecessary phasing, while the treatment capacity will be implemented under a modular approach to maximize investment efficiency. The design capacity calculations follow Government design standards, which are consistent with international practice. Priority is given to using local construction materials and equipment where feasible.

56. Potential impacts of climatic change, including sea level rise, and consideration of mitigation and adaption needs, have been applied during the process to optimize designs and reduce costs over the long term, thereby enhancing the climate resilience of the infrastructure constructed under the project. For example, climatic scenarios have influenced the locations, sizing, elevation, and some O&M requirements for the WWTPs and treated-effluent discharge points.

57. The selected wastewater treatment technology (Advanced Sequencing Batch Reactor [ASBR]) is well known in Viet Nam, and in Binh Duong in particular, since the WWTPs in Thu Dau Mot City, Thuan An City, and Di An City use the same technology. The technology meets the required treatment standards, which includes nutrient removal, requires less land, and can be optimized through automation processes to reduce operational risks and costs. Circular economy and energy-efficiency principles have been applied to the design to reduce costs and maximize the effective use of resources, including waste byproducts. Specifically, this includes the installation of variable-speed motors, LED lighting, operational SCADA systems, solar panels, and facilities for the reuse of treated sludge and treated wastewater for limited internal purposes (for example, for cleaning of facilities and garden watering).

58. Cost estimates prepared by the PMU and its consultant have been reviewed by the World Bank. The estimates are based on a comparison of market rates and include necessary provisions for contingencies. The proposed contract packaging considers potential technical and procurement risks and geographical constraints, and where possible, seeks to increase efficiency through economies of scale (by grouping similar investments into larger packages). Moreover, the procurement packaging and implementation time frames were reviewed from a technical perspective, and it was confirmed that the approach incorporates lessons learned through the experience of the previous projects and is considered achievable within the project duration. Detailed engineering designs and bidding documents have been prepared for three large civil contracts, with a total value of around US\$50 million (around 20 percent of the total project costs). Advance procurement activities are expected to start before project effectiveness to ensure readiness for implementation.



59. The provincial integrated wastewater management orientation to be developed under the project will provide the necessary framework for Binh Duong's new master plan, as required by applicable laws and regulations. The master plan will guide further development of wastewater infrastructure in the province in the context of rapid urbanization and industrialization as well as build resilience to potential impacts of climate change. The full operational efficiency and sustainability of the services and project infrastructure are expected to be achieved through selection of appropriately qualified operator(s), with effective support from the Binh Duong WWMB in asset management. TA activities under Component 2 will help achieve that goal. The project is aligned with the goals of the Paris Agreement on both adaptation and mitigation.

60. **Assessment and reduction of adaptation risks.** The main climate and disaster risks affecting the Binh Duong Province are extreme rainfall events and floods, increase of temperature, sea level rise, and cyclonic winds. A climate change risk screening was conducted, indicating an overall risk of moderate. To address these risks, the task team reviewed the recommendations provided in the Resilient Water Infrastructure Design Brief and adopted pertinent recommended measures into the project design to ensure new and expanded infrastructure are resilient to climate change. Such measures will increase the reliability of sanitation services, as service disruptions resulting from infrastructure damaged by extreme weather events will be less likely to happen. In addition, climate scenarios were applied in the project design, such as in the selection of the siting, sizing, elevation, and some of the WWTPs' O&M requirements and treated-effluent discharge points. Lastly, TA to improve utilities' operational, commercial, and financial performance will be provided, supporting utilities to continue investing in climate-resilient, reliable, and sustainable service delivery. Combined, these measures reduce material risks from climate hazards to an acceptable level, ensuring these risks will not have a material impact on the operation and its development objectives.

61. **Assessment and reduction of mitigation risks.** Project activities financed under this operation are universally aligned. All WWTPs and pumping stations supported under the project will rely on energy from the grid and the project will not involve any large-scale anaerobic treatment with significant methane emissions lacking biogas capture. Project design also applies circular economy principles to reduce resource consumption and raise environmental sustainability—among others, by building facilities for the reuse of treated sludge and of fit-for-purpose wastewater. This circular economy approach contributes to both mitigation (lower energy demand and fertilizer displaced by biosolids) and adaptation (reduced water pollution). The investment in wastewater collection and treatment plants will positively contribute to improving the local environment by reducing pollution in urban areas during flood events, through separation of wastewater from stormwater, and by reducing pollution in water bodies. In addition, TA will be provided to improve energy efficiency in wastewater service providers, which would further contribute to GHG emissions reduction efforts. Thus, the operation is not at a material risk of having a negative impact on the country's low-GHG emissions development pathways.

62. The operation is fully aligned with the goals of the Paris Agreement on both mitigation and adaptation. It will strengthen the country's capacity for climate change mitigation and adaptation supporting its NDC.

Economic and Financial Analysis

63. **Economic analysis.** A cost-benefit analysis was carried out for investments proposed in this project, which yielded satisfactory overall results. The principal drivers of value for the treatment plant and sewerage system investments under Component 1 are the estimated number of persons and institutions served by new connections to the system. The analysis finds that the combined project investments are economically worthwhile since they yield an economic rate of return (ERR) of 11.68 percent before accounting for GHG reduction benefits. The expansion of the existing systems in Di An and Thuan An generates higher ERRs than the new system designed for Tan Uyen, in part because of Tan Uyen's higher initial capital costs. The project investments in Tan Uyen can eventually support the future system expansions that are currently



possible in Di An and Thuan An. In addition to monetizable benefits, the project would generate other benefits that cannot be adequately measured, such as improved water environment and aquatic biodiversity and enhanced community amenity, recreation, and tourism opportunities. Thus, the ERRs are conservative estimates of project value.

64. Benefits are measured relative to the number of connections and average volumes of wastewater produced per connection. The value per connection is based on the difference in net benefits between with- and without-project scenarios. It is assumed that without the project, existing septic systems would continue to be used. The net benefits of participating in the project combine the benefits of (a) community-wide improvements in health, mortality, and productivity attributable to improved sanitation; (b) household-level savings in annualized costs of septic system maintenance; and (c) net out-of-pocket household-level costs²⁰ for a new connection. In addition, part of the initial capital costs of the projects are likely to generate long-term benefits for continued expansion of wastewater treatment beyond the project implementation period, as discussed further in annex 3.

65. **GHG accounting.** A World Bank standard technical assessment tool was used to analyze the impact of project investments and operations on GHG emissions. The wastewater collection and treatment activities under Component 1 have estimated net emissions reductions of 1,089,066 tCO₂eq over the economic lifetime of the project or an annual average reduction of 43,562 tCO₂eq, compared to the status quo. A sensitivity analysis is conducted to value CO₂eq emissions reductions using high and low shadow prices.²¹ At a high shadow price, the project achieves an ERR of 11.70 percent, an increase over the 11.68 percent ERR based only on wastewater treatment benefits. Applying a low shadow price on CO₂eq results in a smaller increase in the project-level ERR, at 11.69 percent.

66. **Financial analysis.** Financial projections of the three Binh Duong wastewater operational units, incorporating the project-funded additional treatment capacity per unit, have been undertaken to estimate (a) likely revenues to be provided by customer tariffs and (b) the level of provincial subsidies likely to be needed in the near term. Binh Duong’s wastewater tariff policy is to gradually increase current tariffs (which have been initially set at 15 percent of O&M costs, the remaining 85 percent of costs being covered by the provincial budget) to levels that would cover 100 percent of O&M costs by 2030 and to transition toward full cost recovery, including 100 percent of O&M costs plus full annual depreciation costs, incrementally thereafter with consideration to affordability constraints. A draft tariff road map to support Binh Duong Province in meeting its policy objectives up to 2030 has been prepared and appraised. Additional information is provided in annex 3.

67. The investment feasibility studies estimate that O&M costs are VND 6,207 per m³ at full utilization of treatment capacity, while the full cost-recovery tariff, defined as all direct operating, maintenance, and administrative costs plus depreciation costs, (for all three systems) is VND 20,642 (US\$0.89) per m³. The following summarizes the projected financial gaps in covering operating costs for each system for the years 2024 through 2030, that is, the period during which tariffs do not yet cover O&M expenses, as well as the projected amount of necessary Government subsidy to the systems.

Table 1. Net Revenue Gap/Government Subsidy Estimates 2024–2030, VND, millions

	2024	2025	2026	2027	2028	2029	2030
Di An	19,851	37,214	29,237	20,388	19,132	13,685	5,487
Thuan An	20,457	35,985	37,121	25,155	17,430	12,474	5,038
Tan Uyen		4,641	12,444	13,075	11,558	8,346	0

²⁰ Currently, households pay an environmental service fee based on their water consumption. This fee aims to account for the human and environmental impacts of untreated wastewater discharge. This fee would be eliminated for those who connect to the project.

²¹ In 2020 the high shadow price of carbon is US\$80/tCO₂e, the low prices is US\$40/tCO₂e. and the annual growth rate of the shadow prices is assumed to be 2.26 percent. ²² Decree 97/2018 / ND-CP and decision 1107/QD-BTC.



Combined Government subsidy required	40,308	77,839	78,803	58,618	48,120	34,505	10,525
(Approximate US\$, millions)	1.74	3.36	3.40	2.53	2.08	1.49	0.45

Note:

- a. According to Decree 80 and state budget law, wastewater service is a public service and PPC is responsible for providing such service to its citizens. The required subsidy is to be incorporated into the annual provincial public expenditures.
- b. Exchange rate effective as on January 13, 2021.

68. **Fiscal analysis.** A fiscal analysis has been conducted to analyze Binh Duong Province’s capacity to take on the proposed loan from the World Bank within the debt limit under the law, including the province’s capacity to provide counterpart funding to repay the loan and provide necessary operating subsidies. According to the 2015 Budget Law,²² Binh Duong Province is responsible for repayment of 70 percent of any official development assistance (ODA) borrowing. Its debt ceiling is 30 percent of its revenues (after required transfers to the Central Government). The proposed project is expected to be financed with an IBRD loan of US\$230.763 million, of which Binh Duong will have to repay around US\$161.53 million (principal) as well as the interest costs and loan financing charges. A without-project fiscal assessment based on revenue and debt projections through 2028 shows its highest debt-to-revenue ratio to be 10 percent, in 2025, or 34 percent of its debt ceiling. With the debt expected to be taken on by the province because of the project, its debt-to-revenue ratio rises to its highest point in 2026 to 10.7 percent or 36 percent of its debt ceiling. While the project therefore contributes significantly to the province’s overall debt burden, the analysis indicates enough fiscal capacity to (a) cover debt service for the proposed sub-loans under the project, (b) manage overall debt within the allowed limits, (c) provide the required counterpart fund contributions, and (d) provide the O&M subsidies needed.

69. **Affordability.** At the O&M cost coverage rate of VND 6,207 per m³, monthly charges related to wastewater would be about VND 62,100 (US\$2.66) or 0.3 percent of average household income. At the lowest household income quintile, wastewater services at expected O&M cost coverage levels are estimated to be approximately 0.7 percent of household income, while the next three income quintiles would likely pay between 0.3 and 0.4 percent of household income. The projected O&M cost-recovery tariff would therefore remain highly affordable for the average household. The full cost-recovery tariff (VND 20,642 per m³ or US\$ 0.89 per m³) is estimated to cost approximately 2.5 percent of monthly income of the lowest quintile and between 1.0 percent and 1.4 percent for the next three income quintiles. Since households of all income quintiles pay between 0.3 and 0.4 percent of their income for water services, both the O&M tariff and the full cost-recovery tariff fall within benchmarks for water and wastewater service affordability for households of all income quintiles (that is, 5 percent of household income), the project will support IEC activities to increase the willingness to pay for wastewater tariffs.

70. **Maximizing Finance for Development.** The project is designed to be ‘non-monetary private capital enabling’. That is, while the project does not currently mobilize private capital, in the medium and long term, it aims to provide a foundation for private sector investment through (a) strategy, policy, and regulatory development; (b) strengthened institutional and regulatory capacity; (c) an increasing cost-recovery strategy through tariff adjustments; and (d) the introduction of private operators in the O&M of assets. With the appropriate institutional arrangements in place and enhanced private sector involvement in operations, Binh Duong Province could attract private sector investment in the sector in the future, which in turn could improve operational efficiency, long-term financial sustainability, and the quality of services. Private capital-enabling result will be monitored by number of O&M contracts awarded to qualified operators.

B. Fiduciary

²² Decree 97/2018 / ND-CP and decision 1107/QD-BTC.



Financial Management

71. **FM implementation arrangement.** The PMU will be responsible for (a) project financial statements, (b) management of Designated Account (DA) for project activities, (c) contract management and payments, and (d) maintenance of accounting records. The annual external audits are performed independently by the State Audit Office of Viet Nam (SAV). The proposed arrangements meet the World Bank’s minimum FM requirements. An FM action plan with time-bound actions and an Implementation Support Plan (ISP) have been prepared to ensure sufficient FM capacities, as well as to address FM risks that have been identified as part of the FM assessment.

72. **FM capacity assessment.** The project FM assessment noted satisfactory FM arrangements of the provincial PMU of Binh Duong. The assessment has concluded that the proposed project FM arrangements meet the World Bank’s FM requirements, as stipulated in the Bank Policy/Bank Directive for Investment Project Financing. The main risk identified at appraisal includes potential delay/inadequacy of the country’s Medium-Term Public Investment Plan (MTIP) 2021–2025 and the insufficient budget allocation for both ODA and counterpart funds to the province/project, which, if materialized, will cause delays in project implementation.

Procurement

73. World Bank-financed procurement activities under the project shall be carried out in accordance with the World Bank’s ‘Procurement Regulations for IPF Borrowers dated November 2020 (the ‘Procurement Regulations’). During project preparation, the PMU has prepared a Project Procurement Strategy for Development (PPSD). The PPSD recommends the following risk-based procurement approaches to be followed to support the achievement of the PDO and deliver the best value for money: (a) the civil works contract for the WWTP in Tan Uyen, which has a large value (US\$30 million) and higher technical complexity, should be procured through the request for bids (RFB) method targeting the international market; (b) the large-value consulting service contract for construction supervision and contract management should be procured using the Quality- and Cost-Based Selection (QCBS) method, which would be open for international bidding; (c) other civil works contracts, which are of a simple technical nature, smaller value, and lower risk, should be procured through the RFB method with the national market approach, using the e-bidding process in the Viet Nam National Electronic Procurement System (VNEPS). The World Bank team has conducted a project procurement risk assessment for the project. The key risks identified at appraisal and proposed risk mitigation measures are presented in annex 1.

C. Legal Operational Policies

Legal Operational Policies	Triggered?
Projects on International Waterways OP 7.50	Yes
Projects in Disputed Area OP 7.60	No

Projects on International Waterways (OP/BP 7.50)

74. The policy is applicable to this project because some of the proposed activities involve discharging treated wastewater to tributaries of the Sai Gon River, which is shared between Viet Nam and Cambodia. Project activities involving the use of or risk of pollution of the parts of the Sai Gon River system, parts of which flow from Cambodia to Viet Nam, namely activities related to the upgrading of Thuan An WWTP, are limited to additions and alterations that



do not exceed or change the nature of the original scheme. Other investments related to the use of or risk of pollution of the river system, the new Tan Uyen WWTP and upgraded Di An WWTP, are located on canals or rivers which are tributaries of the Dong Nai River. The Dong Nai River, before it meets the Sai Gon River, is a tributary that runs exclusively within Viet Nam, which is the lowest downstream riparian country. The WWTP investments will reduce the flow of untreated wastewater into the river system. They are not expected to have adverse impacts on the quality or quantity of the Sai Gon River systems and will not be adversely affected by the other riparian's possible water use, and therefore meet the criteria for the exception to the notification requirement according to paragraphs 7 (a) and (c) of the policy, respectively. The exception to the notification requirement was approved by the Regional Vice President for East Asia and Pacific on December 16, 2020.

D. Environmental and Social

75. The project is expected to have direct positive benefits from improved wastewater collection and treatment services for residents of the Thuan An, Di An, and Tan Uyen urban areas in Binh Duong Province. The project will also bring indirect positive benefits from improved water quality of the Dong Nai and Sai Gon Rivers and to the people and economy downstream in the Dong Nai and Binh Duong Provinces and in HCMC. However, the project will also likely have some E&S risks associated with activities under Component 1. The project is being implemented under the World Bank's Environmental and Social Framework (ESF) with the following relevant Environmental and Social Standards (ESS): ESS1 (Assessment and Management of Environmental and Social Risks and Impacts); ESS2 (Labor and Working Conditions); ESS3 (Resource Efficiency and Pollution Prevention and Management); ESS4 (Community Health and Safety); ESS5 (Land Acquisition, Restrictions on Land Use and Involuntary Resettlement); ESS6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources); ESS8 (Cultural Heritage); and ESS10 (Stakeholder Engagement and Information Disclosure).

76. An Environmental and Social Impact Assessment (ESIA), in accordance with ESS1 and the other relevant ESS, has been carried out by the WWMB to identify and assess E&S risks and impacts and to provide information and data for the preparation of mitigation measures and E&S instruments. The potential E&S risks and impacts are assessed to be moderate to substantial but mostly temporary, predictable, and/or reversible. The ESF instruments have been prepared according to the ESIA, and disclosed locally on websites of Binh Duong Province and district offices (on December 2, 2022) and on the external website of the World Bank (on November 22, 2022).

77. **Environmental and Social Management Plan (ESMP).** An ESMP has been prepared as an integral part of the ESIA. The ESMP consists of mitigation, monitoring, and institutional measures to be carried out during project implementation and operation to avoid adverse E&S risks and impacts, offset them, or reduce them to acceptable levels. The ESMP also includes actions needed to implement the measures. It will require the contractor of each construction package to prepare contractor's ESMPs for addressing common construction impacts and relevant specific mitigation measures. The ESMP also includes technical design and management measures to address the environmental risks and impacts (sludge, odor, risks of WWTP malfunction, and so on) during operation of the WWTPs.

78. **Labor management.** The project will involve the following personnel: (a) direct workers (PMU staff or individual consultants employed by the PMU), (b) contracted workers (for example, working for construction enterprises/contractors), and (c) primary suppliers' workers. The WWMB has developed Labor Management Procedures (LMP) under the national law and in accordance with the requirements of ESS2 on Labor and Working Conditions. These procedures are designed to protect workers employed under the project and include requirements to implement adequate occupational health and safety measures for workers. The LMP identifies the main labor requirements and risks associated with the project and is designed to help the WWMB in determining the resources necessary to address the



project's labor issues. The LMP sets out details of the grievance redress mechanisms (GRMs) that will be provided for direct and contracted workers and describes the way in which these workers will be made aware of the mechanism. The LMP also incorporates labor requirements into the environmental, social, health, and safety (ESHS) specifications of the procurement documents and contracts with contractors and supervising firms. The LMP is subject to changes and will be reviewed and updated throughout development and implementation of the project to be sensitive to gender-based violence (GBV)/sexual exploitation and abuse (SEA)/sexual harassment (SH) issues and the ethical treatment and resolution of such complaints in a manner proportionate to the potential risks and impacts of the project.

79. **Community health and safety.** Regarding community health and safety, the ESIA finds that project activities can increase community exposure (especially vulnerable communities) to risks and impacts, including road traffic safety during construction; risks due to unexploded ordnances left from the war during project implementation; water pollution and environmental pollution due to emissions, odors, and generation of substantial amount of sludge from the WWTPs and maintenance of the sewerage collection system; and SEA, SH, and communicable diseases (HIV/AIDS, COVID-19). The WWMB has prepared an ESMP with measures to avoid, mitigate, and manage the identified potential risks and impacts according to the requirements of ESS4.

80. **Land acquisition and resettlement.** In terms of land acquisition and resettlement, the project will require about 12 ha of agricultural land from 94 households, from which 25 households are defined as significantly affected, but no household is being required to relocate. The land that will be acquired is not of high carbon stock or high biodiversity areas. The expansion of the WWTPs in Thuan An and Di An Cities is implemented within the boundaries of the existing WWTPs, where land was previously reserved for their expansion. The project may temporarily affect local businesses during installation of sewerage pipelines. The ESIA confirmed that there is no impact beyond the project footprint, and all proposed activities of the project were identified and approved by Binh Duong PPC. A Resettlement Plan has been prepared for the project according to the requirements of ESS5. The Resettlement Plan was cleared by the World Bank, and it was disclosed locally, at the office of PMU, city/town PCs, ward/commune PCs, and Binh Duong provincial portal, on December 7, 2022. The Resettlement Plan was also disclosed on the World Bank's external website on November 22, 2022. Land acquisition, compensation, support, and site clearance for the project will be implemented in compliance with the approved Resettlement Plan and monitored by a third party to be recruited by the PMU. Implementation of the Resettlement Plan will be considered completed when the adverse impacts of resettlement have been addressed in a manner that is consistent with the relevant plan as well as the objectives of ESS5. The mitigation measures of economic displacement will be considered completed when the external completion audit concludes that affected persons or communities have received all assistance for which they are eligible and have been provided with adequate opportunity to reestablish their livelihoods.

81. **Environmental and Social Commitment Plan (ESCP).** The WWMB has prepared an ESCP jointly with the World Bank, which has been agreed and is legally binding. It includes E&S measures and an implementation time frame to which the PPC has committed. An adaptive management process for addressing changes or unforeseen circumstances is also set out in the ESCP. Mitigation measures for site-specific impacts will be managed through the implementation of required E&S assessment instruments that have been prepared to meet the objectives of the relevant ESSs. The ESCP also includes the requirement for the recruitment of a third-party monitor by the PMU to provide independent monitoring on the implementation of E&S risks and impacts management, as well as GBV/SEA/SH. The draft ESCP was consulted with relevant agencies and disclosed on the Binh Duong Province's website on December 7, 2022, and on the World Bank external website on November 22, 2022.

82. **A Stakeholder Engagement Plan (SEP)** has been prepared by the PMU with specific identification and analysis of stakeholders. The SEP outlines the ways in which the project team will communicate with stakeholders and includes a mechanism by which people can raise concerns, provide feedback, or make complaints about the project and any project-



related activities. It will provide stakeholders with timely, relevant, understandable, and accessible information and consult with them in a culturally appropriate manner, free of manipulation, interference, coercion, discrimination, and intimidation. The SEP also focuses on awareness raising and stakeholder engagement with disadvantaged or vulnerable individuals or groups and will be adapted to consider such groups' or individuals' sensitivities, concerns, and cultural aspects, and ensure a full understanding of project activities and benefits. A GRM has been established at the project level to assist in resolving complaints and grievances in a timely, effective, and efficient manner. Specifically, it provides a transparent and credible process for fair, effective, and lasting outcomes. It also builds trust and cooperation as an integral component of broader community consultation that facilitates corrective actions. The SEP was disclosed on Binh Duong Province's website on December 7, 2022, and on the World Bank's external website on November 22, 2022.

Citizen Engagement

83. During preparation of the ESIA, ESCP, SEP, Resettlement Action Plan (RAP), LMP, and ESMP, consultations have been conducted with locally affected households; beneficiaries; vulnerable groups, including women; and local nongovernmental organizations. In the implementation phase, consultation with stakeholders will continue to be conducted during the technical design, implementation of E&S risk and impact management, and M&E of the project implementation. Mechanisms for consultation with and participation of different stakeholders, including women and vulnerable people, are established in the SEP, RAP, and ESIA/ESMP, including targeted communication tools, consultative processes such as workshops and focus group discussions, and feedback mechanisms to build ownership of project interventions and enhance the sustainability of project outcomes. The mechanisms also ensure that women are given opportunity to raise their will or voice rather than simply attending the consultations.

84. As part of Component 2, the project will promote service-oriented management that will include feedback from consumers on the services provided to them. The IEC program will help create an interactive space between the province, the districts, and citizens. This platform will be used to discuss performance and satisfaction surveys and project issues and will agree on joint measures at the local level and establish the procedures for two-way communication with citizens on key service issues and areas of reform (including tariff adjustments). Satisfaction with the service improvements will be tracked at the project start, at midterm, and upon completion. In addition, the survey will assess awareness about the project and satisfaction with the quality of the citizen engagement process. To increase accountability and improve the outcomes of the surveys and action plans for service improvements, such plans will be discussed at customer and stakeholder engagement meetings or surveys with direct and active participation of both men and women. The project's Results Framework includes indicators of the actual percentage of customers who are satisfied, disaggregated by gender, to measure progress in key consultation and engagement activities.

Gender

85. Binh Duong BEPCC represented by leaders of provincial departments, has a broad advisory and coordination role for the PPC. Only around 10 percent of the board membership is women.²³ This presents a risk that issues specifically relevant to women are not raised. This gender gap is not aligned with the Environmental Protection Law (2014), which promotes gender equality and development as a key underlying principle of environmental protection activities, nor is it in line with the National Strategy for Gender Equality (2021-2030), with the objective to increase female representation in leadership and management. During project preparation, it was observed that provincial managers (including provincial technical department heads and municipal people's committee chairs) remain unaware of the linkage between wastewater-management issues and gender-equality objectives. Moreover, there is a general lack of appreciation of the value of female representation in leadership and management positions. This is further exacerbated by women's lower

²³ The current BEPCC has 25 male members and 3 female ones.



access to and participation in trainings and capacity-building activities. Greater representation of women in policy and regulatory roles helps increase awareness of the concerns and needs of women²⁴. Their perspectives can influence how sectors are governed, by whom, and how resources are accessed and controlled. There is a growing body of rich literature on the positive link between gender diversity and institutional effectiveness. Evidence shows that institutions that are inclusive tend to perform better than those that are less gender diverse, both financially and in their ability to deliver and manage water resources.²⁵ Similarly, some studies show that women express more concern for and take action to help the environment than men.²⁶

86. Many households in the project cities use water from drilled wells polluted by untreated household wastewater, which is likely to cause water-borne diseases. Given the role of women in water provisioning for households, they are at increased risk of exposure to transmission and contraction of diseases²⁷. Also, Binh Duong province accommodates one of the country's largest migrant worker populations, which is disproportionately female (many women migrate for work in the province's industrial zones). Migrant worker communities tend to live in cheaper rented accommodation polluted with wastewater discharged directly from surrounding neighborhoods. Meanwhile, gender-disaggregated data on water-borne diseases have not been analyzed and reported, and therefore the different health risks between men and women are not well understood, and different prevention and mitigation strategies have not been developed.

87. In response to the above concerns, the provincial authorities will set a specific gender target to increase representation of women in BEPCC to 30 percent by the end of the project. Moreover, a representative from the provincial women's union will be included in BEPCC. This structural change is likely to facilitate an institutional shift and lead to more opportunities for BEPCC to understand and find solutions to the environmental risks for women, local and migrant alike, including those related to wastewater collection and treatment. The project will work with the regional leadership training center²⁸ to provide trainings on creating institutions that promote gender equality in leadership, while building awareness and knowledge on gender issues and solutions in wastewater management. The training will be provided to both female and male provincial leaders, some of whom will be nominated for membership of BEPCC. Such training will help to reduce training/capacity gaps between female and male leaders, address gender norms that associates leadership with men or as a "male" quality and enhance the capacity of BEPCC to promote women to participate actively and in more effective and meaningful ways in BEPCC. Furthermore, the project will collaborate with municipal women's unions to conduct awareness campaigns to increase household connections to the wastewater systems. Also, they will raise awareness of hygiene practices, especially causes of water-borne diseases, and promote hand-washing and other hygiene practices to reduce vulnerability to water-borne diseases among women, men, and their families in the project communities.²⁹

V. GRIEVANCE REDRESS SERVICES

²⁴ World Bank, 2019. *Women in Water Utilities: Breaking Barriers*.

²⁵ World Bank, 2019. *Women in Water Utilities: Breaking Barriers*.

²⁶ For some of these studies, see Brough et al 2016. Is Eco-Friendly Unmanly? the Green - Feminine Stereotype and Its Effect on Sustainable Consumption. *Journal of Consumer Research*, 43 (4): 567 – 582.

²⁷ WHO, 2011, Taking sex and gender into emerging infectious disease programs: an analytical framework

²⁸ This regional center belongs to Ho Chi Minh National Political Academy, which is responsible for providing training for mid- and high-level managers and leaders in the Communist Party and Government, central and local alike, across Viet Nam. The Academy runs a course for mid-level public officials titled "Women in Leadership" that promotes public institutions to address gender equality in leadership (supported by the World Bank Viet Nam Country Gender Program ASA). So far, more than 45,000 male and female officials across the country have taken this course.

²⁹ The women's union will have more opportunities to integrate these awareness-raising activities regarding wastewater management in other environment awareness campaigns in the province once it is represented in BEPCC.



88. Communities and individuals who believe that they are adversely affected by a project supported by the World Bank may submit complaints to existing project-level grievance mechanisms or the Bank's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the Bank's independent Accountability Mechanism (AM). The AM houses the Inspection Panel, which determines whether harm occurred, or could occur, as a result of Bank non-compliance with its policies and procedures, and the Dispute Resolution Service, which provides communities and borrowers with the opportunity to address complaints through dispute resolution. Complaints may be submitted to the AM at any time after concerns have been brought directly to the attention of Bank Management and after Management has been given an opportunity to respond. For information on how to submit complaints to the Bank's Grievance Redress Service (GRS), visit <http://www.worldbank.org/GRS>. For information on how to submit complaints to the Bank's Accountability Mechanism, visit <https://accountability.worldbank.org>.

VI. KEY RISKS

89. The overall risk rating for the Project is assessed as Moderate.

90. **Combined E&S risk is rated Substantial.** The E&S risk classification under the World Bank ESF is based on an assessment of inherent E&S risks and impacts of the project. While the social risk is rated Moderate, the environmental risk is rated Substantial as described below.

91. **Environmental risk is Substantial.** Due to potential risks and impacts to the environment and to people associated with construction and operation of the wastewater infrastructure, the environmental risk is assessed as Substantial. Environmental risks and impacts during construction include degradation of the local air, soil, and water environment due to exhaust gas emission and waste generation and disposal; water quality degradation and impacts to aquatic species and irrigation activities due to moderate-scale dredging; traffic safety and business disturbance; worker and community health and safety; damages to existing weak structures and local houses due to dredging or piling; and safety risk due to unexploded ordnance left from the war. The main environmental risks during operations include water pollution due to failure or malfunction of the WWTPs; environmental pollution due to emissions, odor, and generation of substantial amount of sludge from the WWTPs and maintenance of the sewerage collection system; and worker health and safety risks due to exposure to hazardous chemicals and pathogens. The risks and impacts during construction and operations are assessed as mostly reversible and are expected to be mitigated by good design and management practices. Relevant measures to mitigate and manage these risks and impacts are provided in the ESIA, with reference to the World Bank Group's Environmental, Health, and Safety Guidelines (WBG EHSG) on Water, and Good International Industry Practice. The key mitigation measures include the following: (a) using Environmental and Social Codes of Practice (ESCAP)—ESCAP will be applied to all bid packages by the contractors and supervised by the construction supervision consultant (or engineer); (b) bidding documents and construction contracts of each bid package will include the entire ESCOP and specific mitigation measures by type of construction activity and location consistent with the work content in the bid package; and (c) contractors will be required to prepare Site-Specific or Contractor's Environmental and Social Management Plan and submit to the construction supervision consultant and the PMU for review and approval at least two weeks before construction commencement.



VII. RESULTS FRAMEWORK AND MONITORING

PDO Indicators by PDO Outcomes

Baseline	Period 1	Period 2	Period 3	Period 4	Period 5	Closing Period
Improve wastewater services						
Number of people who gained access to improved wastewater services as a result of the project (Number)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	32,600.00	73,300.00	115,400.00	217,700.00	301,300.00	374,900.00
➤ Tan Uyen City (Number)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	0.00	0.00	0.00	46,100.00	75,600.00	104,200.00
➤ Thuan An City (Number)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	15,500.00	32,700.00	52,200.00	80,400.00	107,500.00	126,400.00
➤ Di An City (Number)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	17,100.00	40,600.00	63,200.00	91,200.00	118,200.00	144,300.00
Reduce municipal wastewater pollution						
Additional pollutants removed by WWTPs: BOD5 (Metric tons/year)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	263.00	327.00	342.00	822.70	675.30	593.20
➤ Tan Uyen City (Metric tons/year)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029
0.00	0.00	0.00	0.00	371.70	238.30	230.20
➤ Thuan An City (Metric tons/year)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	125.00	138.00	159.00	226.00	219.00	152.00
➤ Di An City (Metric tons/year)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029



0.00	138.00	189.00	183.00	225.00	218.00	211.00
Additional pollutants removed by WWTPs: Total Nitrogen (Metric tons/year)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	46.00	57.00	60.00	145.60	119.00	104.60
➤Tan Uyen City (Metric tons/year)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	0.00	0.00	0.00	65.60	42.00	40.60
➤Thuan An City (Metric tons/year)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	22.00	24.00	28.00	40.00	39.00	27.00
➤Di An City (Metric tons/year)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	24.00	33.00	32.00	40.00	38.00	37.00

Intermediate Indicators by Components

Baseline	Period 1	Period 2	Period 3	Period 4	Period 5	Closing Period
Component 1: Wastewater infrastructure development						
Number of new household connections to the wastewater system (Number)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	4,200.00	9,400.00	14,800.00	28,800.00	40,800.00	51,800.00
➤Tan Uyen City (Number)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	0.00	0.00	0.00	6,000.00	10,000.00	14,000.00
➤Thuan An City (Number)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	2,000.00	4,200.00	6,700.00	10,700.00	14,700.00	17,700.00
➤Di An City (Number)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	2,200.00	5,200.00	8,100.00	12,100.00	16,100.00	20,100.00
Additional volumes of municipal wastewater treated by the WWTPs with demonstrated GHG emission reduction (Cubic meters/year)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	1,551,250.00	1,927,200.00	2,011,150.00	4,839,900.00	3,971,200.00	3,489,400.00



➤Tan Uyen City (Cubic meters/year)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029
0.00	0.00	0.00	0.00	2,186,350.00	1,401,600.00	1,354,150.00
➤Thuan An City (Cubic meters/year)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	737,300.00	813,950.00	934,400.00	1,328,600.00	1,288,450.00	894,250.00
➤Di An City (Cubic meters/year)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	813,950.00	1,113,250.00	1,076,750.00	1,324,950.00	1,281,150.00	1,241,000.00
Length of sewer constructed (Kilometers)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	0.00	223.80	527.90	629.90	629.90	629.90
➤Tan Uyen City (Kilometers)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	0.00	36.40	211.40	311.00	311.00	311.00
➤Thuan An City (Kilometers)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	0.00	68.20	109.00	109.00	109.00	109.00
➤Di An City (Kilometers)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	0.00	119.20	207.40	209.80	209.80	209.80
Component 2: Institutional strengthening and implementation support						
Provincial wastewater management orientation adopted (Text)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
No	-	-	Draft orientation reviewed and consulted	Orientation accepted by PMU and submitted to PPC	Orientation approved by PPC	Orientation approved by PPC
O&M contracts to qualified operators awarded (Number)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	0.00	0.00	0.00	2.00	2.00	3.00
Transfer software and equipment for asset management (Text)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029



No	-	Procurement commenced	Supplied and installed	System trials, commissioning & training	System accepted by PMU	System accepted by PMU
Share of active members of Provincial Steering Board for Environmental Protection and Climate Change (BEPC) that are female (Percentage)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
11.00	11.00	15.00	20.00	25.00	30.00	30.00
Customer satisfaction rate to the improved wastewater service (Percentage)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	0.00	20.00	20.00	40.00	40.00	65.00
> from which percentage of women (Percentage)						
Oct/2023						Oct/2029
50.00						50.00
Number of government officials and utility professionals trained (Number)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	0	4.00	12.00	16.00	16.00	16.00
> Percentage of which female (Percentage)						
0.00	0	25.00	25.00	44.00	44.00	44.00
Number of people reached through IEC programs to support household connections and improved handwashing and hygiene awareness and practice (Number)						
Oct/2023	Dec/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Oct/2029
0.00	8,150.00	18,325.00	28,850.00	54,425.00	75,325.00	93,725.00



Monitoring & Evaluation Plan: PDO Indicators by PDO Outcomes

Improve wastewater services	
Number of people who gained access to improved wastewater services as a result of the project (Number)	
Description	This indicator measures beneficiaries based on the number of new connections to the system. Beneficiaries also include people who will access wastewater services through institutional connections (markets, schools, offices etc.).
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Tan Uyen City (Number)	
Description	This indicator measures beneficiaries based on the number of new connections to the system. Beneficiaries also include people who will access wastewater services through institutional connections (markets, schools, offices etc.).
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Thuan An City (Number)	
Description	This indicator measures beneficiaries based on the number of new connections to the system. Beneficiaries also include people who will access wastewater services through institutional connections (markets, schools, offices etc.).
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Di An City (Number)	
Description	This indicator measures beneficiaries based on the number of new connections to the system. Beneficiaries also include people who will access wastewater services through institutional connections (markets, schools, offices etc.).
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Reduce municipal wastewater pollution	
Additional pollutants removed by WWTPs: BOD5 (Metric tons/year)	
Description	This indicator will track pollutants (BOD5) removed by WWTP within the project areas, as a result of this project. The values of reduced BOD5 are based on assumption that influent water quality is used for the design and effluent water quality follows the QCVN 14-2008 (category A).
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant



Tan Uyen City (Metric tons/year)	
Description	This indicator will track pollutants (BOD5) removed by WWTP within the project areas, as a result of this project. The values of reduced BOD5 are based on assumption that influent water quality is used for the design and effluent water quality follows the QCVN 14-2008 (category A).
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Thuan An City (Metric tons/year)	
Description	This indicator will track pollutants (BOD5) removed by WWTP within the project areas, as a result of this project. The values of reduced BOD5 are based on assumption that influent water quality is used for the design and effluent water quality follows the QCVN 14-2008 (category A).
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Di An City (Metric tons/year)	
Description	This indicator will track pollutants (BOD5) removed by WWTP within the project areas, as a result of this project. The values of reduced BOD5 are based on assumption that influent water quality is used for the design and effluent water quality follows the QCVN 14-2008 (category A).
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Additional pollutants removed by WWTPs: Total Nitrogen (Metric tons/year)	
Description	This indicator will track pollutants (TN) removed by WWTP within the project areas, as a result of this project. The values of reduced Nitrogen are based on assumption that influent water quality is used for the design and effluent water quality follows the QCVN 14-2008 (category A).
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Tan Uyen City (Metric tons/year)	
Description	This indicator will track pollutants (TN) removed by WWTP within the project areas, as a result of this project. The values of reduced Nitrogen are based on assumption that influent water quality is used for the design and effluent water quality follows the QCVN 14-2008 (category A).
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant



Thuan An City (Metric tons/year)	
Description	This indicator will track pollutants (TN) removed by WWTP within the project areas, as a result of this project. The values of reduced Nitrogen are based on assumption that influent water quality is used for the design and effluent water quality follows the QCVN 14-2008 (category A).
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Di An City (Metric tons/year)	
Description	This indicator will track pollutants (TN) removed by WWTP within the project areas, as a result of this project. The values of reduced Nitrogen are based on assumption that influent water quality is used for the design and effluent water quality follows the QCVN 14-2008 (category A).
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant

Monitoring & Evaluation Plan: Intermediate Results Indicators by Components

Component 1: Wastewater infrastructure development	
Number of new household connections to the wastewater system (Number)	
Description	This indicator measures the number of new households connected to the sewerage system, as a result of this project.
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Tan Uyen City (Number)	
Description	This indicator measures the number of new households connected to the sewerage system, as a result of this project
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Thuan An City (Number)	
Description	This indicator measures the number of new households connected to the sewerage system, as a result of this project
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Di An City (Number)	
Description	This indicator measures the number of new households connected to the sewerage system, as a result of this project



Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Additional volumes of municipal wastewater treated by the WWTPs with demonstrated GHG emission reduction (Cubic meters/year)	
Description	This indicator will track volumes of wastewater treated by WWTPs that have applied technologies to reduce GHG emissions under this project, including resource recycling and reuse, energy efficiency improvement and renewable energy.
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Tan Uyen City (Cubic meters/year)	
Description	This indicator will track volumes of wastewater treated by WWTPs that have applied technologies to reduce GHG emissions under this project, including resource recycling and reuse, energy efficiency improvement and renewable energy.
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Thuan An City (Cubic meters/year)	
Description	This indicator will track volumes of wastewater treated by WWTPs that have applied technologies to reduce GHG emissions under this project, including resource recycling and reuse, energy efficiency improvement and renewable energy.
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Di An City (Cubic meters/year)	
Description	This indicator will track volumes of wastewater treated by WWTPs that have applied technologies to reduce GHG emissions under this project, including resource recycling and reuse, energy efficiency improvement and renewable energy.
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Length of sewer constructed (Kilometers)	
Description	This indicator measures the total length of new sewer constructed under the project, expressed in kilometers (km)
Frequency	Annual
Data source	PMU/Consultant reports



Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Tan Uyen City (Kilometers)	
Description	This indicator measures the total length of new sewer constructed under the project, expressed in kilometers (km)
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Thuan An City (Kilometers)	
Description	This indicator measures the total length of new sewer constructed under the project, expressed in kilometers (km)
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Di An City (Kilometers)	
Description	This indicator measures the total length of new sewer constructed under the project, expressed in kilometers (km)
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Component 2: Institutional strengthening and implementation support	
Provincial wastewater management orientation adopted (Text)	
Description	This indicator monitors the development and approval of the provincial wastewater management orientation.
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
O&M contracts to qualified operators awarded (Number)	
Description	This indicator will track progress of technical assistance to support improved private sector engagement (non-monetary private capital enabling) for operations and maintenance of the sewerage system.
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Transfer software and equipment for asset management (Text)	
Description	This indicator monitors progress of supply, installation and operations of software and equipment for a asset management system.
Frequency	Annual



Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Share of active members of Provincial Steering Board for Environmental Protection and Climate Change (BEPC) that are female (Percentage)	
Description	This indicator captures the percentage of female board members of BEPC
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Customer satisfaction rate to the improved wastewater service (Percentage)	
Description	Percentage of customers responded positively to the improvement of wastewater service at satisfaction surveys. The first surveys will be conducted at year 1, 4 and 6 of the project implementation.
Frequency	In year 1, at mid-term and at project closing
Data source	PMU/Consultant reports
Methodology for Data Collection	PMU will conduct sampled surveys with TOR acceptable to the Bank among the residents of the project cities on their satisfaction to the wastewater service provided
Responsibility for Data Collection	PMU/Consultant
from which percentage of women (Percentage)	
Description	this is percentage of women among respondents positively responded during the customer satisfaction surveys
Frequency	In year 1, at mid-term and at project closing
Data source	PMU/Consultant reports
Methodology for Data Collection	PMU will conduct sampled surveys with TOR acceptable to the Bank among the residents of the project cities on their satisfaction to the wastewater service provided
Responsibility for Data Collection	PMU/Consultant
Number of government officials and utility professionals trained (Number)	
Description	This indicator will monitor the number of government officials and water utility professionals participating in trainings on project management and asset management.
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Percentage of which female (Percentage)	
Description	this is percentage of women among the number of government officials and water utility professionals participating in trainings on project management and asset management
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant
Number of people reached through IEC programs to support household connections and improved handwashing and hygiene awareness and practice (Number)	



Description	This indicator will record the number of people reached through the counterpart funded IEC activities.
Frequency	Annual
Data source	PMU/Consultant reports
Methodology for Data Collection	Baseline is at year 2023. Results achieved by end of December every year, starting from year 2024, except for the last year of project implementation
Responsibility for Data Collection	PMU/Consultant



ANNEX 1: Implementation Arrangements and Support Plan

COUNTRY: Socialist Republic of Viet Nam Binh Duong Province's Water Environment Improvement Project

Project Institutional and Implementation Arrangements

1. The project will be implemented in a decentralized manner under the direction of the province's and project towns' administrations. The Binh Duong PPC is the decision-maker on the investment and is responsible for project preparation and implementation. As per the PPC's decision, the WWMB has been appointed as the project owner and will also serve as the PMU. The PMU will be responsible for day-to-day project management, including procurement, FM, disbursements, M&E, safeguards management, audit management, quality and compliance oversight, and progress reporting. The PMU will also monitor and coordinate project activities, including communications with the World Bank and government agencies.
2. The PMU's organizational structure and TORs for key positions have been agreed and are outlined in the Project Implementation Plan. The PMU structure includes three district-level units that will oversee day-to-day implementation and coordination with district authorities. Each district/town will sign a cooperation agreement with the PMU that will outline its roles and responsibilities in the execution of the project. Land acquisition and resettlement are the responsibility of district-level units.
3. The PMU will be supported by consultants for engineering design and construction supervision, for safeguards management, and for other critical areas of project implementation. During project implementation, the PMU will be responsible for carrying out IEC activities, including carrying out willingness-to-pay studies and supporting the household connection policy.
4. Project implementation will require technical inputs, clearance, and/or facilitating support from various line departments: DPI, DoF, DARD, DOC, and DONRE. Such departments have specific roles and responsibilities during the review and appraisal processes on investment processing and financing and technical aspects for submission to the PPC for approval. The coordination of inputs from each line department will be part of the role of the PMU, with support from the PPC.
5. A PSC has been established to ensure a strong engagement and close collaboration among relevant provincial departments/agencies. The PSC is chaired by the Vice Chairman of the Binh Duong PPC, with members from relevant provincial line departments/agencies/participating localities participating, to ensure timely coordination and effective sharing of information among the multiple departments.
6. Training will be provided during project implementation to the PMU in the areas of project management, ESF implementation, and M&E. The PMU, supported by consultants, is responsible for collecting, interpreting, and reporting the project's outcome and results indicators.
7. Relevant Central Government entities include Viet Nam's Office of Government (OOG) and line ministries: Ministry of Planning and Investment (MPI), Ministry of Finance (MOF), Ministry of Foreign Affairs, Ministry of Justice, Ministry of



Construction (MOC), Ministry of Agriculture and Rural Development (MARD), and MONRE. While the OOG provides approval for the project’s inclusion in the Medium-Term Investment Program (MTIP), along with the Project Investment Policy (or pre-feasibility study), the other central line ministries have ‘state management’ roles and responsibilities as stipulated in Government Decree No. 114/2021/ND-CP, issued on December 16, 2021, on management and use of ODA capital and concessional loans (as amended), and other applicable decrees. In short, the MPI will be the focal point in assisting the Government for unified state management of ODA and concessional loans; and the MOF is the official representative agency as the ‘borrower’ for ODA loans and/or concessional loans in the name of the state or the government from foreign sponsors. Other ministries such as MOC, MARD, and MONRE will engage on technical appraisal and clearances as per the regulatory requirements.

FM, Disbursement, and Procurement

FM and Disbursement Arrangements

8. The WWMB (PMU) will be responsible for (a) project financial statements, (b) management of DA for project activities, (c) contract management and payments, and (d) maintenance of accounting records. The function of annual external audit will be independently performed by SAV or a qualified auditor under TOR acceptable to the World Bank. These FM arrangements meet the World Bank’s minimum FM requirements.

9. The implementing agencies will use the FM policies and procedures that have been applied for existing projects in the implementation of the proposed project. These policies and procedures have been assessed as acceptable to the World Bank. An FM action plan with time-bound actions and an ISP have been prepared to improve FM capacities, as well as to address FM risks that have been identified as part of the FM assessment of the project.

10. An FM assessment for the proposed project has been carried out. It is noted that the satisfactory FM arrangements of the existing provincial PMU of Binh Duong will be followed for the proposed project. The assessment has concluded that the project meets the World Bank’s FM requirements, as stipulated in the Bank Policy/Bank Directive for Investment Project Financing. The main risks identified at appraisal include a potential delay/inadequacy of the country’s MTIP 2021–2025 and the insufficient budget allocation for both ODA and counterpart fund to the province/project, which, if it occurs, will cause implementation delays. To mitigate this risk, the PMU and Binh Duong PPC should work closely with the MPI to confirm inclusion of the project budget in the MTIP and establish, as needed, contingency resources. While a shortage of counterpart funding is regarded as a potential risk to project implementation, a fiscal impact analysis has been conducted that demonstrates that Binh Duong Province has enough resources to implement the project. Binh Duong Province also has a track record of being able to sustainably mobilize financial resources to implement such projects.

Table 1.1. FM Action Plan

	Actions on FM	Expected Date of Completion	Responsible Agency
1	Appointment of qualified experienced officers to oversee FM of the project	Done	PMU
2	Project implementation Plan, with detailed FM section	Done	PMU
3	Package for financial audit included in Procurement Plan for first year	Done	PMU
4	MTIP 2021–2025 allocates adequate budget for the project	Done (to be updated yearly)	PPC, PMU

11. **Accounting policies, systems, and procedures.** The project will adopt accounting policies and procedures applied

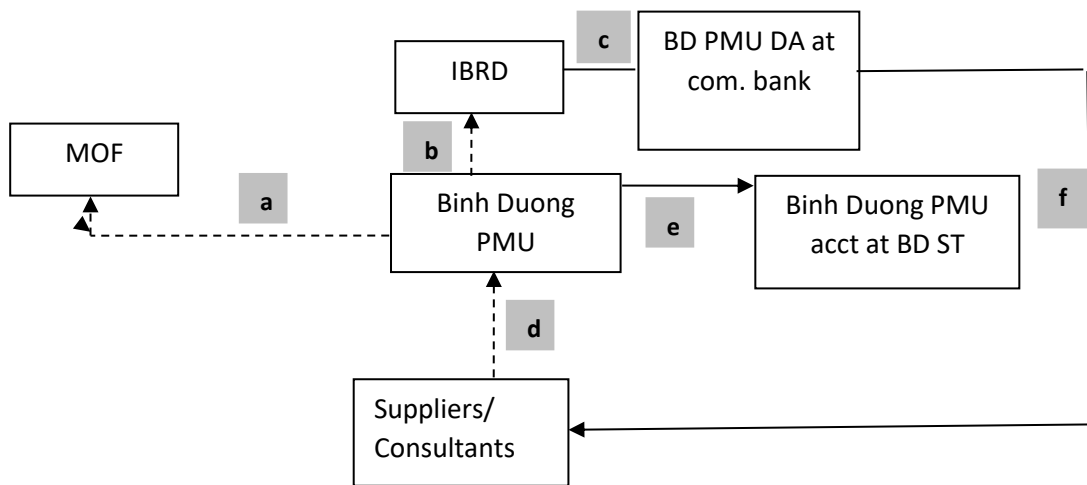


by the Vietnamese Government and acceptable to the World Bank.

12. **Internal controls.** The PMU is responsible for ensuring that an adequate internal control framework and internal controls are in place and operating for the project. Overall, the internal control system at the PMU is in place, in accordance with Government regulations, including authorization of payments and transactions, segregation of duties, asset physical management, cash management, budget formulation and variance analysis, and financial reporting.

13. **Funds flow.** A DA will be opened by the Binh Duong PMU at a commercial bank to receive funds for project activities.

Figure 1.1. Funds Flow Diagram for Project's Components



- (a) The PMU prepares the withdrawal application and sends it to the MOF-Debt Management and External Finance Department for co-signature.
- (b) The PMU submits the withdrawal application to IBRD.
- (c) IBRD disburses money to the DA of the PMU at a commercial bank acceptable to IBRD.
- (d) Suppliers/consultants submit claim for expenditures to the PMU.
- (e) The PMU reviews, certifies, and then submits to the State Treasury for its verification.
- (f) The Binh Duong PMU makes payment to the suppliers/consultants from the DA.

14. **External audit.** Project financial statements will be prepared by the Binh Duong PMU and will be audited in accordance with international auditing standards and in compliance with the independent auditing regulations of Viet Nam. The SAV or a qualified auditor will be appointed as the external auditor for this project under TOR acceptable to the World Bank. The PMU will submit its audited project financial statements to the World Bank annually by June 30 of the following year.

15. **Disbursement arrangement.** The disbursement methods will be Advances and Direct Payments. For Advances, funds flow will be channeled through the DA and the ceiling of the DA is US\$3 million. For Direct Payments, the minimum value of a direct payment is US\$500,000.



16. **Supporting documentation required for documenting eligible expenditures paid from the DA are Statements of Expenditures and Records.** The frequency for reporting eligible expenditures (consisting of goods, works, and consulting services exclusive of taxes) paid from the DA is quarterly. The Reimbursement, Special Commitment, and Direct Payment disbursement methods will also be available. Reimbursements would also be documented by Statements of Expenditures and Records. Direct Payments will be documented by Records. The minimum application size for Reimbursement, Special Commitment, and Direct Payments is included in the Disbursement and Financial Information Letter (DFIL).

Procurement

17. **Applicable procurement rules.** Procurement activities financed by the World Bank under the project shall be carried out in accordance with the World Bank's Procurement Regulations. However, for those works contracts that are procured using the RFB method with the national market approach, national competitive procedures will be used, subject to further modifications and waivers required by the World Bank. These modifications and waivers, which will be incorporated into the agreed Procurement Plan, include (a) non-application of domestic preference, (b) assurance of adequate time for bid preparation (at least 30 days for large-value contracts), (c) use of harmonized model bidding documents agreed with the World Bank, (d) no bid rejection for minor deviations or on the basis of comparison with cost estimates, (e) implementation of an effective mechanism for receiving and handling procurement complaints, and (f) incorporation of enhanced E&S requirements as described in the World Bank's ESF.

18. **Descriptions of procurement activities, PPSD, and Procurement Plan.** Civil works contracts proposed for World Bank financing under the project include construction of several WWTPs of 20,000 m³ per-day capacity, sewage collection and network expansions, including sewage pumping stations for Tan Uyen, Thuan An, and Di An Cities, and a drainage canal adjacent to the WWTP in Tan Uyen City. These civil works account for 98 percent of the total World Bank financing amount. Consulting services proposed for World Bank financing (2 percent) include construction supervision activities under Component 2.

19. During the project preparation, the PMU prepared a PPSD which was reviewed and agreed with the World Bank. This PPSD recommends the following procurement approaches to be followed to achieve the PDOs and deliver the best value for money: (a) the civil works contract for the WWTP in Tan Uyen, which has a large value (US\$30 million) and higher technical complexity, should be procured through the RFB method following the international market approach; (b) the large-value consulting service contract for construction supervision and contract management should be procured using the QCBS method following international market approach; and (c) other civil works contracts of smaller value and lower risk should be procured through the RFB method with national market approach using the e-bidding process in the VNEPS, which is applicable to World Bank/Asian Development Bank-financed projects. Based on this PPSD, the PMU also developed a detailed Procurement Plan for the initial 18 months of project implementation.

20. **PMU procurement capacity, risk assessment and mitigation measures, and World Bank review and support.** The PMU will be responsible for day-to-day procurement and contract management under the proposed project. The PMU is well organized, adequately staffed, and has experience applying World Bank procurement procedures through the successful implementation of the World Bank-financed Urban Water and Wastewater Project (closed in 2019). The World Bank team has conducted a project procurement risk assessment. This assessment identified the following key risks to project procurement: (a) the PMU still lacks knowledge and experience with the World Bank's Procurement Regulations, despite its good experience with the previous World Bank-financed project; (b) the large volume of project procurement activities (compared with the previous project) could lead to significant delays if the preparation of technical designs, specifications, cost estimates, and bidding documents is delayed due to lack of or untimely allocation of counterpart budget; (c) procurement of WWTP contracts, which account for a major proportion of the entire project, may face integrity concerns, as happened in procurement of similar contracts in other World Bank-financed projects; and (d) land acquisition



difficulties and prolonged ODA fund allocation procedures may cause substantial delays to contract implementation.

21. To mitigate the above risks, the following key measures will be implemented throughout project preparation and implementation: (a) conducting intensive training for the PMU on the World Bank's Procurement Regulations and contract management; (b) recruiting qualified external procurement and contract management support to the PMU; (c) increasing readiness for procurement by ensuring that technical designs, specifications, cost estimates, and bidding documents for at least 30 percent of project procurement activities are completed before project effectiveness; (d) carrying out enhanced due diligence throughout the procurement and contract management process, enforcing appropriate codes of conduct on avoidance of conflicts of interest and prevention of fraud and corruption for all PMU staff/officials and contractors, and applying e-bidding for all contracts that are procured using RFB method with national market approach; and (e) properly preparing budget plans and closely following up with relevant government agencies to ensure adequate fund allocation (both counterpart and World Bank funds) in a timely manner. The project procurement risk, after the above mitigation measures have been undertaken, is rated Moderate. The World Bank will conduct prior review with enhanced due diligence for high-risk, high-value procurement activities according to the mandatory procurement prior-review thresholds set forth in the 'Bank Procedure— Procurement in IPF and Other Operational Procurement Matters'. For other procurement activities not subject to prior review, the World Bank will carry out post review of at least 20 percent of procurement transactions. The World Bank will also provide hands-on procurement advice and intensive support during ad-hoc technical and regular supervision missions.

Implementation Support

22. **Approach.** The ISP provides the framework for the World Bank's operational approach to supporting implementation of the project and monitoring implementation progress. The ISP has been developed considering (a) the risks identified for the project, (b) the importance of large civil-works contracts in overall implementation and in the achievement of PDO, and (c) the importance of E&S safeguards. The ISP reflects these key considerations.

23. The ISP will involve (a) hands-on operational support, (b) close and ongoing communications with the PMU with respect to procurement and contract implementation issues, (c) appropriate M&E arrangements, and (d) semiannual implementation support missions involving World Bank staff and technical consultants. This approach will provide comprehensive support and oversight for project implementation and enable quick and responsive interactions between project officials and World Bank staff.

24. **Technical implementation support.** During the implementation phase, the task team will continue to engage experienced civil engineers to ensure the technical quality of outputs. Support will also include expert review of bidding documents and technical proposals, selection of wastewater treatment technologies, and recycling of sludge byproducts. During the construction phase, the engineer on the team will provide supervision support to ensure the quality of works and safety. Given the shortcomings in construction supervision observed in water supply and sanitation projects, attention will be paid to ensure that supervision systems are in place and are being followed closely. Technical implementation missions will take place three times a year during the first 18 months of project implementation, followed by semiannual missions. The engineer will carry out site visits where works are ongoing or where service has recently commenced. The task team will also provide expert support to the design and implementation of the IEC activities and questionnaires to evaluate the results.

25. **Institutional strengthening support.** The project focuses on strengthening water sector institutions at the local and central level for improved service delivery. The World Bank will offer technical support through this process by deploying specialized skills relevant to the planned reform activities. This will include an institutional specialist with experience in water sector reforms (planning and implementation) and a financial specialist with experience in utility



finances, tariff structuring, investment planning, and financial regulation. Institutional strengthening support will be implemented two times a year for the full project period.

26. **Fiduciary implementation support.** During project implementation, the task team will supervise the project’s FM arrangements in the following ways: (a) review the project’s quarterly interim financial reports as well as the project’s and entity’s annual financial statements, the auditor’s reports and Management Letters, and remedial actions recommended in the auditor’s Management Letters and (b) during the World Bank team’s on-site missions, review the following key areas: project accounting and internal control systems; budgeting and financial planning arrangements; disbursement arrangements and financial flows, including counterpart funds, as applicable; and any incidents of corrupt practices involving project resources. As required, a World Bank-accredited FM specialist will participate in the implementation support and supervision process. The procurement specialist will lead procurement-focused missions depending on the needs and as agreed with the PMUs. The FM specialist and procurement specialist will also help identify capacity-building needs to strengthen procurement and FM capacity. Formal FM and procurement supervision will be carried out semiannually as part of the overall project supervision. The World Bank will provide support to the PMU for the market analysis and reviewing the bidding documents to ensure that selection of a wastewater system operator will be based on efficiency and cost-effectiveness, following transparent and competitive principles.

27. **E&S risk and impact management implementation support.** The World Bank’s supervision team includes an environmental specialist and a social development specialist who will review the implementation of the project’s E&S instruments and provide guidance to the PMU and other implementation agencies to ensure the implementation of the project in compliance with the World Bank’s ESF and ESS. Similarly, the World Bank’s E&S specialists will supervise the implementation of mitigation measures of E&S risks and impacts related to the project.

28. In addition to regular implementation support, the World Bank will closely monitor the hiring process of the consultants for project implementation, design review, and construction supervision, who will have capacity-building and support functions. In addition, the World Bank team will provide guidance to the independent monitoring consultants, including reviewing their reports to minimize potential E&S risks. This arrangement, including close implementation support from the World Bank, will enable the provision of the necessary support throughout the implementation of the project and will build capacity of the PMU.

29. The following ISP (table 1.2) reflects estimates of the skills, timing, and resource requirements over the implementation period of the project. Keeping in mind the need to maintain flexibility over project activities from year to year, the ISP will be reviewed from time to time to ensure that it continues to meet the implementation support needs of the project.

Table 1.2. Annual Resource Estimates for Implementation Support

Skills Needed	Number of Weeks	Number of Trips	Comments
Task team leaders	10	6	Field-based staff
Wastewater/Civil engineer	6	4	Field-based staff/Consultant
Institutional specialist	4	2	HQ staff/International consultant
Financial specialist	4	2	HQ staff/International consultant
Environmental specialist	4	4	Field-based staff
Social development specialist	4	4	Field-based staff
FM specialist	2	2	Field-based staff



Procurement specialist	4	2	Field-based staff
M&E specialist	2	2	Field-based staff
Communication specialist	1	1	Field-based staff
Health specialist	1	1	Field-based staff
Gender specialist	1	1	Field-based staff



ANNEX 2: Detailed Project Description

COUNTRY: Viet Nam

Binh Duong Province's Water Environment Improvement Project

Context

Binh Duong Province

1. Binh Duong Province is in southeast Viet Nam, 30 km from the center of HCMC along Highway 13, within the SKER (which includes eight provinces: HCMC, Dong Nai, Binh Duong, Ba Ria— Vung Tau, Binh Phuoc, Tay Ninh, Long An, and Tien Giang). The province is located within the basin of the Dong Nai River,³⁰ with an area of 2,694.43 km² (accounting for about 0.83 percent of the national area and about 12 percent of the southeast area), and includes three cities (Thu Dau Mot, Thuan An, and Di An), two towns (Ben Cat and Tan Uyen) and four rural districts (Bau Bang, Dau Tieng, Phu Giao, and Bac Tan Uyen). Binh Duong is the road traffic hub of the region with the Asia Highway, National Highway 1K, and National Highway 1A, and it is the gateway of HCMC to the center and north of the country (see annex 5).

2. Binh Duong has experienced the highest economic growth and most dynamic industrial development in the country over the last 10 years. In 2021, the total provincial product increased by about 2.79 percent; average GDP per capita is VND 153.6 million (about US\$ 6,540) per person. The annual budget revenue increased by about 10 percent in 2018 to VND 46,500 billion (about US\$2 billion); the annual contribution to the central state budget is ranked fourth in the country (excluding the environmental resource tax).

3. The population as of April 1, 2019,³¹ was 2,426,561; by the end of 2019, it was estimated to be about 2,504,400. The population density is about 900 people per km². Binh Duong Province's population ranks 7th in Viet Nam and the province has a very high and consistent population growth rate from migration. According to statistics, the population of Binh Duong in 1999 was about 716,000; in 2009, it was about 1,482,000; and in 2019, it was about 2,426,561. The population growth rate in the period 1999–2009 was 7.5 percent and for 2010–2019, the growth rate was 5.1 percent. The population is projected to reach about 3,500,000 by 2030,³² with an average population growth rate of about 3.4 percent for 2020–2030. The province's population is forecast to be 4,300,000 by 2040 and 4,700,000 by 2050.

4. The southern part of Binh Duong includes five municipalities—Thu Dau Mot, Thuan An, Di An, Tan Uyen Cities and Ben Cat Towns—with an area of 688.8 km². While this southern part has only about 25 percent of the total area of the province, it has a population of 2.12 million, accounting for more than 82 percent of the province's population. This area experienced rapid urbanization and industrial development in the past 15 years and currently contributes more than 90 percent of the province's revenue.

Environmental Impacts of Wastewater in Binh Duong to Water Quality of Dong Nai and Sai Gon Rivers

5. Binh Duong Province is in the Dong Nai River system basin and sits between two large rivers—the Dong Nai River and the Sai Gon River (see figure 2.1). These rivers supply more than 3 million m³ of clean water every day for HCMC and

³⁰ The Sai Gon River is a tributary to the Dong Nai River.

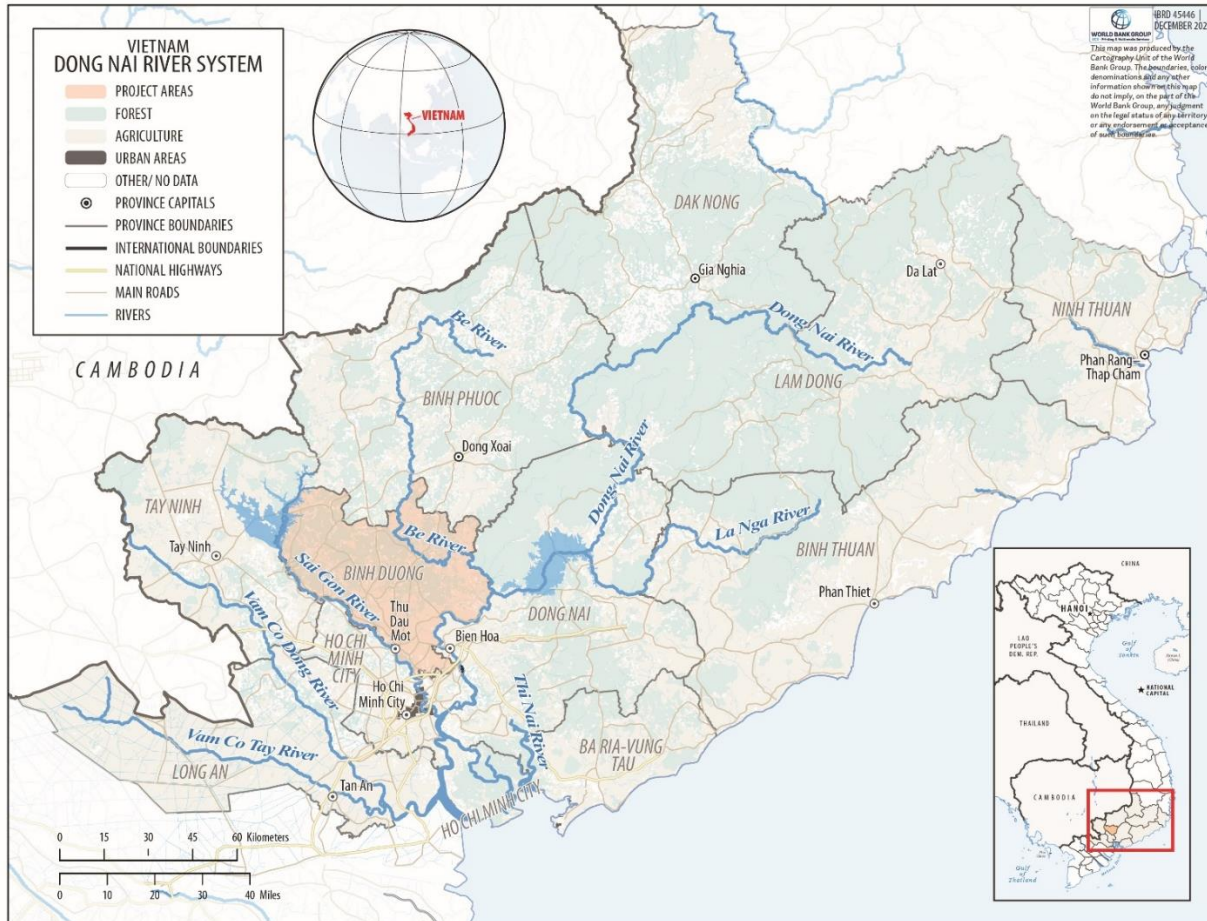
³¹ *Population Survey Report on April 01, 2019 of Binh Duong*. <https://www.binhduong.gov.vn/tin-tuc/2019/10/206-binh-duong-tong-ket-cong-tac-tong-dieu-tra-dan-dan-so-va-nha-nha-o-nam-2019>.

³² Decision No. 1701/QĐ-UBND dated June 26, 2012, of the Binh Duong PPC approving the General Master Planning Project on Urban Construction to 2020, Vision to 2030.



Binh Duong and Dong Nai Provinces. The Dong Nai River (originating from Lam Vien Plateau) flows through Binh Duong in Bac Tan Uyen District, Tan Uyen and Di An Cities; the Sai Gon River (originating from the highlands of Loc Ninh District, in Binh Phuoc Province) flows through Dau Tieng, Ben Cat, and Thuan An. The rivers converge downstream in HCMC before flowing into the sea.

Figure 2.1. Dong Nai River System



6. The formation of concentrated industrial parks in the south of Binh Duong Province has facilitated rapid economic development, but it has also elevated the risks of environmental pollution. Among those risks, pollution to the Dong Nai and Sai Gon Rivers is considered critical, as it affects water security for a large and economically important region of the country.

7. Currently, the wastewater generated from industrial zones/clusters of Binh Duong is collected, treated to standard, and closely monitored by the Binh Duong DONRE. However, only part of municipal wastewater generated from the cities/towns is collected and treated. According to data provided by Binh Duong DONRE,³³ the average total amount of municipal wastewater in Binh Duong is about 307,000 m³ per day (equivalent to 112 million m³ per year), of which the southern part of Binh Duong generates about 275,000 m³ per day. In this area, there are only four WWTPs, with a total capacity of 70,000 m³ per day. The result is that more than 70 percent of the generated municipal wastewater, with an

³³ Report to the Ministry of Natural Resources and Environment in Document No. 3097/UBND-KT dated 30/6/2020.



average BOD₅ pollution load of about 46 tons per day, remains uncollected and untreated; it is directly discharged into the urban drainage system and then flows into the Dong Nai and Sai Gon Rivers.

8. There are several water-quality monitoring stations managed by HCMC’s DONRE at the Sai Gon and Dong Nai Rivers. The monitoring data show that the water quality in both the Sai Gon and Dong Nai Rivers deteriorates as it moves downstream, with increases of total suspended solids (TSS), total ammonium, BOD₅, and coliform, which result mostly from untreated municipal wastewater. Although the water can still be used for water supply (with appropriate treatment), there is a trend of deteriorating water quality at critical sections of both rivers. Recorded water quality results at nearby stations of the Sai Gon and Dong Nai Rivers during 2018–2019, and the comparison with the Government’s requirements (MONRE’s QCVN 08-MT: 2008/BTNMT—Category A1 is for water supply and Category B1 is for irrigation) is presented in tables 2.1 and 2.2.

Table 2.1. Average Water Quality of the Sai Gon River

Monitoring Station	Year	pH	TSS (mg/l)	Ammonium (mg/l)	Phosphorus (mg/l)	COD (mg/l)	DO (mg/l)	BOD ₅ (mg/l)	Coliform (MPN/100 ml)
BL	2018	6.68	56	1.74	0.06	8.36	4.94	5.51	41.100
SG		6.84	103	1.87	0.12	8.46	5.08	6.02	12.189
BL	2019	6.80	47	0.20	0.03	5.96	4.71	3.14	6.541
SG		6.92	66	0.72	0.07	7.22	4.22	4.23	15.122
QCVN 08-MT:2008 /BTNMT cat A1		6.00–8.50	≤20	≤0.3	≤0.1	≤10	≥6	≤4	≤2.500

Note: COD = Chemical Oxygen Demand; DO = Dissolved Oxygen; MPN = Most Probable Number

Table 2.2. Average Water Quality of the Dong Nai River

Monitoring Station	Year	pH	TSS (mg/l)	Ammonium (mg/l)	Phosphorus (mg/l)	COD (mg/l)	DO (mg/l)	BOD ₅ (mg/l)	Coliform (MPN/100 ml)
CL	2018	6.81	104	0.24	0.04	6.78	4.66	3.81	34.881
NB		6.86	118	0.09	0.06	6.23	5.13	2.69	17.802
CL	2019	7.01	103	0.15	0.04	5.40	4.69	2.18	18.544
NB		7.13	169	0.05	0.04	7.01	5.17	2.42	5.585
QCVN 08-MT:2008/BTNMT cat A1		6.0–8.5	≤20	≤0.3	≤0.1	≤10	≥6	≤4	≤2.500

Binh Duong’s Efforts to Address Municipal Wastewater

9. In recent years, Binh Duong Province has placed greater emphasis on addressing pollution risks caused by municipal wastewater. At a policy level, Binh Duong established the ‘Environmental protection Plan of Binh Duong for the Period 2016–2020’, which was approved by Binh Duong PPC decision No. 3450/QD-UBND and dated December 28, 2015. This plan calls for “prioritization of investment resources in wastewater treatment projects, continue to speed up urban wastewater collection, expand projects of wastewater treatment systems in Thu Dau Mot city, and deploy new investment in wastewater treatment systems for Thuan An, Di An cities and Tan Uyen towns.”.

10. To implement the approved plan effectively, Binh Duong established a Steering Committee chaired by a Vice Chair of the PPC, with representatives from all line departments, agencies, and local governments. Starting from 2007, Binh Duong, with support from the Central Government and various development partners, has implemented investment projects for wastewater collection and treatment systems in Thu Dau Mot, Thuan An, and Di An Cities and is currently



expanding the system for Thu Dau Mot City and constructing wastewater collection and treatment system for Ben Cat Town. Further details of those projects are provided in table 2.3.

Table 2.3. Existing and Under Construction Wastewater Collection and Treatment Systems

No.	System	WWTP Designed Capacity (m ³ /day)	Year of Completion	Service Area
<i>System under Operation</i>				
1	Thu Dau Mot City - phase 1	17,650	2016	Core urban part of Thu Dau Mot City
2	Thuan An City - phase 1	17,000	2019	Core urban part of Thuan An City
3	Di An City - phase 1	20,000	2019	Core urban part of Di An City
4	Di An - Thuan An - Tan Uyen	15,000	2020	Adjacent area of Thuan An City, Di An City , and Tan Uyen Town
5	Thu Dau Mot City - phase 2	17,000	2022	Extended core urban part of Thu Dau Mot City
<i>System under Construction</i>				
1	Ben Cat Town - phase 1	15,000	2027	Ben Cat Town

11. The constructed systems have achieved their designed capacities, demonstrating the relevance and efficiency of the investments. In the Thuan An - Phase 1 system, after three years of operation (as of June 2020), the average operating capacity is about 11,690 m³ per day (or at 69 percent of designed capacity), with 10,862 customers connected from a planned 19,500 connection points. The Thuan An WWTP is forecast to operate at full capacity by 2023, so an increase of the plant’s capacity to meet the demand after 2023 is required.

12. In the Di An-- Phase 1 system, after one and a half years of operation (as of July 2020), the average operating capacity of the WWTP is about 9,200 m³ per day (or 46 percent of designed capacity), while the connection rate is about 10 percent of the design, with 5,309 customers connected from a planned 26,000 connections. According to the current connection progress, Di An WWTP is forecasted to operate at full capacity in year 2023–2024, so an increase of the plant’s capacity to meet demand after year 2024 is required.

13. The O&M of the current wastewater systems (in Thu Dau Mot, Thuan An, and Di An) is performed by BIWASE based on an order from Binh Duong PPC. BIWASE was originally a state-owned enterprise (SOE) and fully owned by Binh Duong PPC, but it has since been equitized (privatized) and became a publicly listed company in 2017. BIWASE is paid from the provincial state budget for the service provided based on the volume of treated wastewater, which is controlled by effluent water flowmeters at each WWTP, and a unit price that is jointly developed by the Binh Duong DOC and Department of Finance (DOF) under guidance from MOC and MOF and approved by the Binh Duong PPC. This unit price only covers the O&M cost of service and a regulated level of profit; the unit price does not consider asset depreciation and investment costs. For the last several years, BIWASE has successfully operated the wastewater systems and promoted new connections in the service areas. However, in accordance with new regulations from the Government (Decree 32/2019), the operating agreement will be terminated, and instead, Binh Duong PPC should procure such service through an open and transparent bidding process.

14. Binh Duong PPC does not explicitly charge wastewater customers for the cost-of-service provision; rather, it collects an environmental protection fee for discharged wastewater from the citizens of the province. This fee, which is 10 percent of the water bills for households with a connection to piped water supply systems or an amount based on the number of residents in households with non-piped water supply. This fee is transferred to the province’s state budget and is used for various environmental protection-related activities, including operations of the wastewater service. On a per-



m³ basis, the environmental protection fee only covers about 15 percent of the cost of wastewater collection and treatment operations, but due to the large number of people paying the fee compared to the limited number having access to the wastewater service, the cost of wastewater service has been fully covered with a cross-subsidy from the non-served population to the served population. However, with the increase in the number of people having access to the service, the cross-subsidy will be insufficient. Therefore, once a private operator is selected through bidding, which is currently planned for the end of 2021, Binh Duong PPC will charge a wastewater tariff to wastewater customers instead of an environmental protection fee (Decision 47/2019/QD-UBND dated December 31, 2019). To ensure that there is no radical change in the fee payable from wastewater customers at the transition, the wastewater tariff will be initially set at similar levels to the current environmental protection fee, that is, at 15 percent of the service cost, but will then increase thereafter, aiming to cover full O&M cost by 2030 and thereafter the gradual recovery of the investment costs.

Proposed Project

Project Objectives

15. The PDO is to reduce environmental pollution caused by urban wastewater in order to protect water quality and increase people's access to improved wastewater services in the Project Areas of Binh Duong Province.

Project Components

16. Project investments focus on expanding municipal wastewater collection and treatment capacity in the southern part of Binh Duong Province,³⁴ Thuan An City, Di An City, and Tan Uyen City. The current sewage collection and treatment systems cover only a small portion of the urban areas and there is a critical need for infrastructure expansion. In addition, the project includes targeted activities to strengthen institutional and financial capacity to support sustainable wastewater services.

17. The project areas of Thuan An City, Di An City, and Tan Uyen City cover an area of more than 33,000 ha, with a total population of around 1.4 million. The total investment is estimated at US\$310.796 million, of which a loan from IBRD will finance US\$230.763 million. The lending instrument is IPF, to be implemented over a six-year period. Selection of IPF was based on its flexibility and suitability to incorporate financing for a range of activities, including well-defined infrastructure investments, TA, and capacity enhancement measures.

18. The project is structured into two components. A summary of activities to be financed under each component is provided below.

Component 1: Wastewater infrastructure development (estimated cost: US\$246.402 million; IBRD loan: US\$224.002 million; counterpart fund: US\$22.400 million)

19. Component 1 supports the development of climate-resilient infrastructure by incorporating climate scenarios along with adaption and mitigation measures into the planning and engineering designs. This infrastructure will expand coverage and improve treatment capacity of the municipal wastewater management system in the project areas. The component will finance goods and works to enable the required municipal wastewater infrastructure developments. This will include civil and electrical/mechanical installations for sewerage collection, conveyance (including pumping stations and pressure lines), treatment, energy efficiency installations, and facilities for safe disposal and/or reuse of waste byproducts. Such investments will help the province adapt to anticipated impacts from climate change by reducing surface water and groundwater contamination, as well as reduce public health risks of uncollected and untreated wastewater

³⁴ Within the south of Binh Duong Province, it is estimated that about 75 percent of municipal wastewater is being discharged untreated into the Sai Gon and Dong Nai Rivers, with an average BOD₅ pollution load of about 46 tons of BOD₅ per day.



combining with floodwaters during climate change-induced flooding events.

20. This component will enable the scale-up of wastewater treatment facilities and sewerage coverage to increase the overall percentage of municipal wastewater being collected and treated across the south Binh Duong region. Specifically, the proposed infrastructure will increase coverage of improved wastewater services from less than 10 to 32 percent in Tan Uyen City, 19 to 45 percent in Thuan An City, and 17 to 45 percent in Di An City. The priority expansion areas target water quality 'hot-spots' identified through surveys, which are predominately high-density urban areas. The interventions will substantially reduce pollution loads to the Sai Gon and Dong Nai River systems, protecting surrounding areas and downstream communities. Circular economy principles along with energy efficiency measures will be applied in both existing and new WWTPs, including variable-speed motors, LED lighting, operational SCADA systems, solar panels, and facilities for the reuse of treated sludge and fit-for-purpose reuse of treated wastewater.

21. Specific investments under Component 1 include sewage collection and network expansion, including sewage pumping stations, and wastewater treatment plants for Tan Uyen, Thuan An, and Di An Cities. The main construction items are summarized in table 2.4.

Table 2.4. Main Construction Items

No	Construction Item	Unit	Quantity
I	Sub-component 1.1: Tan Uyen City		
1	Wastewater collection and transportation network	m	311,000
2	House connections	pcs	25,000
3	Pumping stations	pcs	6
4	Wastewater treatment plant with initial capacity of 20,000m3/day	pcs	1
5	Drainage canal for conveying treated wastewater from WWTP	m	1,400
II	Sub-component 1.2: Thuan An City		
1	Wastewater collection and transportation network	m	119,000
2	House connections	pcs	10,000
3	Pumping stations	pcs	1
4	Additional wastewater treatment unit with capacity of 20,000m3/day	pcs	1
III	Sub-component 1.3: Di An City		
1	Wastewater collection and transportation network	m	149,000
2	House connections	Pcs	12,000
3	Pumping stations	Pcs	4
4	Additional wastewater treatment unit with capacity of 20,000m3/day	pcs	1

22. The projected service areas in each city are presented in figures 2.2, 2.3 and 2.4.



Figure 2.2. Proposed Service Area for Tan Uyen City (from project FS report)

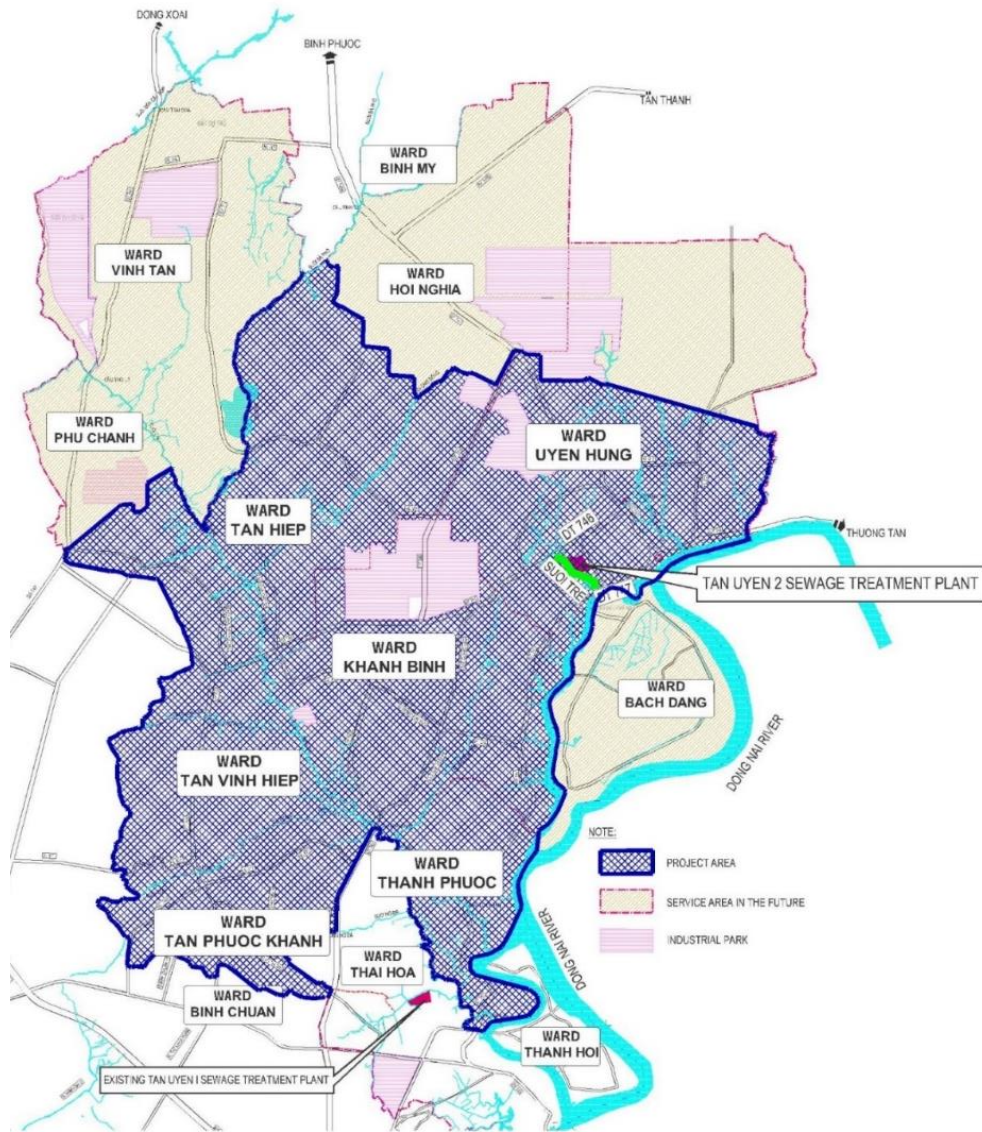




Figure 2.3. Proposed Service Area for Thuan An City (from project FS)

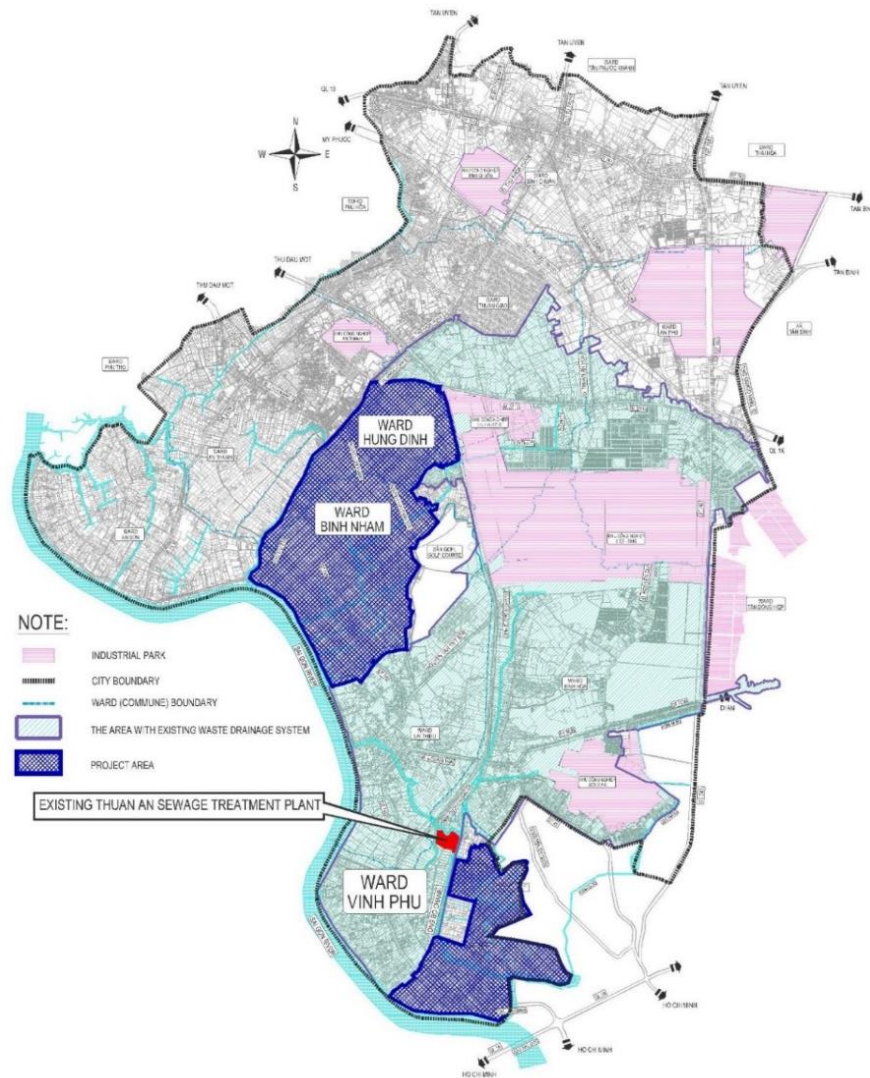
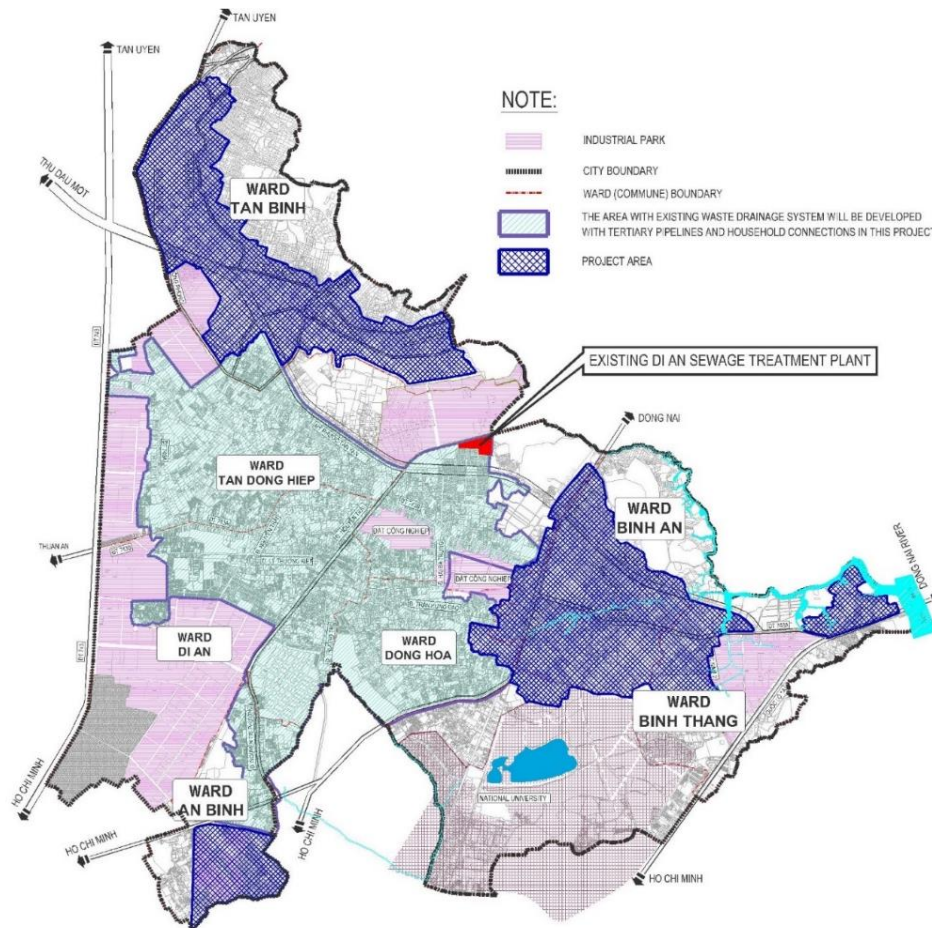




Figure 2.4. Proposed Service Area for Di An City (from project FS)



23. Considering the availability of the existing infrastructure in Thuan An and Di An Cities and the operational experience that Binh Duong has gained from operations of the existing systems, the technology selected for new WWTPs is ASBR. This technology is an updated version of the regular Sequencing Batch Reactor (SBR) technology, which is also widely used in Viet Nam. The ASBR helps shorten the time for each treatment cycle (batch) from 6–8 hours to 3.5–4.8 hours and therefore improves the efficiency of the treatment facility while still achieving level-A effluent water quality (Government standards QCVN14-MT:2008/BTNMT).

Component 2: Institutional strengthening and implementation support (estimated cost: US\$64.394 million; IBRD loan: US\$6.761 million; counterpart fund: US\$57.633 million)

24. Component 2 finances goods and services to enhance institutional and implementation capacity of the Binh Duong Provincial Management Board for Wastewater Projects (referred to as the WWMB) for effective project implementation and sustainability of infrastructure investments. This component will also help advance preventative measures, including increasing awareness of handwashing and hygienic practices and support for employment generation. Specific activities will be implemented under three subcomponents, as follows.



Subcomponent 2A: Preparation of orientation for wastewater management in Binh Duong province (counterpart fund: US\$0.823 million)

25. This subcomponent includes TA for preparation of a wastewater management orientation—a strategic document—for Binh Duong Province. This orientation will include a comprehensive review of the existing wastewater situation (including urban and rural areas), planning and growth scenarios, and wastewater management alternatives within the entire province, including infrastructure, financing, and institutional elements. It will involve an options analysis, consultations and prioritization processes, and preparation of a road map for implementation of cost-effective medium- and long-term investments, along with operational procedures and guidelines for wastewater asset management, and an institutional capacity improvement plan.

26. The strategic intention is to provide clear guidance on how to effectively achieve policy objectives under a holistic, cost-effective, and sustainable approach. The wastewater management orientation will be prepared with consideration of the construction master plans, with a view to reduce environmental impacts associated with rapid urbanization and to build resilience to increased exposure and vulnerability to climate change. The orientation will integrate relevant sector innovations, including newer concepts of nature-based solutions, along with the principles of a circular economy. Recommendations will include measures with gender-targeted community and citizen engagement.

Subcomponent 2B: Project implementation support (estimated cost: US\$38.741 million; IBRD loan: US\$6.761 million; counterpart fund: US\$31.980 million)

27. Subcomponent 2B includes financing for project management and implementation support activities, including PMU operating costs for technical, safeguards and fiduciary management, including grievance redress, gender and citizen's engagement, M&E, including beneficiary satisfaction surveys and stakeholder consultations, financial audits, independent monitoring for E&S safeguards, and other day-to-day project management and implementation costs.

28. It also includes consultancy activities to support infrastructure developments, including surveys, detailed designs, bidding documents, construction supervision, and contract management. In addition, the subcomponent will support IEC activities focused on (a) handwashing and hygienic practices, (b) promoting household connections to the municipal sewerage system, and (c) increasing willingness to pay for wastewater services. Some of these activities will be conducted in collaboration with municipal women's unions. The subcomponent will also provide trainings on gender and wastewater management for female provincial leaders, some of whom will be nominated for membership in BEPCC.

29. The WWMB will also be supported through TA to develop their capacity for asset management and complex procurement, including tendering processes for private sector participation. Specifically, this subcomponent will support Binh Duong Province to develop bidding documents, including a draft contract template, to facilitate the selection of the most cost-effective and qualified service provider.

Subcomponent 2C: Compensation and Site Clearance (counterpart fund: US\$24.830 million)

30. This subcomponent supports, through counterpart funding, all costs associated with resettlement, compensation, land acquisition, and site clearance required for project implementation.

Project Cost Summary

31. The total investment cost is estimated at US\$310.796 million, of which US\$230.763 million will be financed by the



IBRD loan as detailed below.

Table 2.5. Proposed Project Cost (US\$, millions)

COMPONENTS	IBRD	Counterpart	Total
Component 1: Wastewater Infrastructure Development	224.002	22.400	246.402
<i>Subcomponent 1.1: Construction of wastewater collection and treatment system for Tan Uyen City</i>	<i>122.012</i>	<i>12.201</i>	<i>134.213</i>
Network construction	92.185	9.219	101.404
Wastewater treatment plant construction	29.827	2.982	32.809
<i>Subcomponent 1.2: Expansion of wastewater collection and treatment system for Thuan An City</i>	<i>39.518</i>	<i>3.952</i>	<i>43.470</i>
Network expansion	27.751	2.775	30.526
Wastewater treatment plant expansion	11.767	1.177	12.944
<i>Subcomponent 1.3: Expansion of wastewater collection and treatment system for Di An City</i>	<i>62.472</i>	<i>6.247</i>	<i>68.718</i>
Network expansion	50.470	5.047	55.516
Wastewater treatment plant expansion	12.002	1.200	13.202
Component 2: Institutional Strengthening and Implementation Support	6.761	57.633	64.394
<i>Subcomponent 2A: Preparation of orientation for wastewater management in Binh Duong province</i>	—	0.823	0.823
<i>Subcomponent 2B: Project implementation support</i>	<i>6.761</i>	<i>31.980</i>	<i>38.741</i>
<i>PMU operating cost</i>		1.445	1.445
<i>Independent social safeguard monitoring</i>		0.187	0.187
<i>Independent environmental safeguard monitoring</i>		0.208	0.208
<i>Project monitoring and evaluation</i>		0.198	0.198
<i>Construction supervision, contract management and IEC conduction</i>	<i>6.761</i>	<i>0.677</i>	<i>7.438</i>
<i>Asset management improvement</i>		0.601	0.601
<i>Operation and maintenance contracting support</i>		0.099	0.099
<i>Project preparation activities</i>		0.627	0.627
<i>Technical surveys</i>		1.383	1.383
<i>Design and cost estimation</i>		3.801	3.801
<i>Bidding document preparation</i>		0.231	0.231
<i>Review and appraisal cost for design, cost estimation, and bidding documents</i>		1,477	1,477
<i>Project financial statement audits</i>		0.208	0.208
<i>Project audits</i>		0.343	0.343



COMPONENTS	IBRD	Counterpart	Total
<i>Front-end fee</i>		0.462	0.462
<i>Commitment fee</i>		1.002	1.002
<i>Interest during construction</i>		14.308	14.308
<i>Other costs (demining, project insurances, inspections, and so on)</i>		4.274	4.274
<i>Subcomponent 2C: Compensation and site clearance</i>	—	24.830	24.830
TOTAL	230.763	80.033	310.796



ANNEX 3: Economic and Financial Analysis

COUNTRY: Viet Nam

Binh Duong Province's Water Environment Improvement Project

Economic Analysis

Approach

1. A cost-benefit analysis was conducted to assess the net present value (NPV) and ERR of investments proposed under Component 1 and Subcomponent 2C (compensation and site clearance) of the project, which represents approximately 87 percent of the total project capital costs. Net benefits achieved with the project are driven by the number of connections and associated increase in volumes of wastewater treated. Without the project, it is assumed that communities continue to rely primarily on septic tanks. Future benefits and costs of the project, as established by the project team, have been analyzed to determine an NPV and an ERR. A discount rate of 6 percent is applied in a base-case analysis and a 10 percent rate is applied in a sensitivity analysis.

2. Annual project costs and benefits are evaluated separately for each facility to account for differences in rates of capital spending and timing of facility connections. Each project is evaluated over its own 20-year period of operations, which begins after the first connection is made to the facility. Capital costs begin in 2020 with counterpart funds that cover costs for land compensation, project preparation works, surveys, and designs.

3. Project costs and benefits are based on 2019/2020 prices. The evaluation has been conducted using US dollars as the unit of currency. The exchange rate used (VND 23,270 = US\$1) is close to the market rate, so no shadow foreign exchange rate is considered necessary. The analysis is conducted in real terms so forecasts of inflation are unnecessary.

Project Costs

4. Project costs include capital investments (including pre-construction and construction activities) and annual O&M costs. Total costs are determined for each facility separately and combined to determine a total program cost. In addition, residual values at each site have been estimated to account for the capacity in constructed facilities that would be underutilized by the end of a 20-year period of operations (that is, the end of the analytical period). The inclusion of residual values effectively reduces the initial capital cost, to account for those investments which are partly contributing to additional capacity that has not been used as a result of this project, but which is available for other investments to utilize and will likely be undertaken in the future under a phased approach.

5. All estimated implementation and operating costs are converted to economic costs using conversion factors (in table 3.1), which account for the resource value of an item to the country. Economic costs are converted to eliminate market factors from the financial costs. Capital costs and O&M costs are broken down into categories such as traded materials, non-traded materials, skilled labor, unskilled labor, transfer costs (taxes, subsidies, and levies), and other categories. Financial costs have been converted from domestic currency to US dollars and are multiplied by conversion factors to arrive at economic prices. Resulting conversion factors of 0.90 for investment costs and 0.95 for O&M costs for this analysis are shown in table 3.1.

Capital Costs

6. Total capital costs include construction costs and other costs incurred during preparation and implementation of construction, including design, supervision, environmental management, and other costs. Estimated construction costs



are adjusted by the conversion factors to produce economic costs for this analysis (see table 3.1). The conversion factors were adapted from a recent and similar project.

Table 3.1. Conversion Factors from Financial Costs to Economic Costs

Cost Item	Capital Cost		Maintenance Cost	
	Percentage (%)	Adjustment	Percentage (%)	Adjustment
Traded goods	30	1.00	10	1.00
Non-traded goods	20	0.93	25	0.93
Skilled labor	5	0.97	20	0.97
Unskilled labor	30	0.70	20	0.70
Energy	5	1.25	15	1.25
Taxes	10	0.00	10	0.00
Total	100		100	
Conversion factor (value added tax [VAT] excluded)	0.90		0.95	

Table 3.2. Estimated Economic Capital Costs per Project (US\$, millions)

Year	Di An	Tan Uyen	Thuan An	All	Cumulative Spending (%)
1 (2021)	0.02	0.03	0.01	0.06	0.03
2	0.09	0.18	0.06	0.34	0.20
3	0.06	0.12	0.04	0.22	0.31
4	3.05	5.97	1.93	10.95	5.91
5	9.54	18.63	6.03	34.20	23.39
6	16.92	33.05	10.70	60.67	54.41
7	13.34	26.06	8.44	47.85	78.87
8	7.91	15.46	5.01	28.38	93.37
9	3.61	7.06	2.29	12.96	100.00
Total	54.55	106.55	34.51	195.62	

Operation and Maintenance Costs

7. The annual economic O&M costs have been determined from a detailed cost analysis of activities for a range of daily treatment volumes (from 6,000 to 20,000 m³ per day). Table 3.3 provides a sample of operational costs. At the maximum level of operations, annual O&M costs are approximately 1.5 percent of total capital costs.

Table 3.3. O&M Cost Schedule (VND/m³), per Average Daily Volume

Cost Categories	Average Daily Volume (m ³)			
	≤6,000	≤12,000	≤18,000	20,000
Direct material costs	2,310	2,084	2,037	2,028
Labor cost	3,013	1,879	1,503	1,348
Machine costs	724	791	512	458
General costs	1,884	1,620	1,426	1,352
Management cost	1,968	1,209	845	754
Total cost	9,899	7,583	6,323	5,940



	Average Daily Volume (m ³)			
	≤6,000	≤12,000	≤18,000	20,000
Cost Categories				
Profit = 4.5%	445	341	285	267
O&M cost-recovery tariff	10,344	7,924	6,608	6,207
Environmental protection fee	858	858	858	858
Total service price	11,202	8,782	7,466	7,065
Economic cost of service price	10,642	8,343	7,092	6,712

Residual Value

8. Part of the capital investments in the wastewater collection system and treatment facility have remaining functional life-spans that last beyond the project evaluation period of 20 years. The part of the investment that provides a residual value relates to excess system capacity and durability that remain underutilized and functional at the end of the evaluation period. Investments in mechanical and electrical equipment do not share this characteristic and are eliminated from residual value computations. The additional life-span value becomes a cost savings in the model and is applied as a lump sum at the end of the operational period.³⁵

9. The residual value of the wastewater collection stems from a designed capacity in the pipe system that is built for current and future treatment system capacities that would only be fully utilized in year 2050. For each of the facilities, the remaining capacity (in percentage terms) in the piping network is multiplied by the original capital cost to determine the residual value. The remaining capacity for each subproject’s collection system is derived by dividing the estimated number of people connected by the project and the network system design at full capacity in terms of the number of people served in 2050. The residual value in remaining capacity is analytically handled as a cost savings from the original capital cost.

10. The residual value for the wastewater treatment facility is computed similarly but with a different rationale. In this case, it is assumed that civil works at project facilities can function for 50 years, assuming that the facilities are adequately and consistently maintained. However, the residual value analysis excludes mechanical and electrical equipment since these systems would not last that long. Accordingly, at the end of the 20-year project evaluation period, 30 additional years of useful life remain. In other words, the facilities have 60 percent of their useful capacity left. The residual value would then equal 60 percent of the original facility capital costs.

11. Residual value computations are summarized in table 3.4. The results in table 3.4 indicate that the facilities at Di An, Tan Uyen, and Thuan An would effectively have US\$37.40, US\$70.15, and US\$22.59 million in residual value in year 2046, respectively. These residual values can be accounted for as reduced costs in that year and are discounted to the present similar to all other costs and benefits.

³⁵ It is reasonable to consider a residual value as a cost savings since it arises as an artifact of an analytical period that is shorter than its useful life. The shorter analytical period means that less of the original capital cost has been utilized to generate benefits from the project. Benefits of a project are best defined as the principal reason for implementing a project and a residual value is not a reason to build a project. That said, a residual value surely is a benefit to the project and would be included in the numerator of a benefit-cost ratio, as well as a normal reduction in discounted costs in a calculation of NPV and IRR.



Table 3.4. Data and Assumptions to Compute Residual Values of Capital Costs (US\$, millions)

	Di An	Tan Uyen	Thuan An
Collection system - less M&E costs			
Collection system cost (with contingency)	50.37	91.78	27.81
% capacity remaining	71	68	73
Residual value	35.54	62.13	20.30
Treatment facility - less M&E costs			
Treatment facility (with contingency)	3.10	13.37	3.82
% Life-span remaining	60	60	60
Residual value	1.86	8.02	2.29
Total residual value	37.40	70.15	22.59

Present Value Costs

12. A discount rate of 6 percent has been chosen to evaluate the economic returns of the project. This rate—which is lower than the previously common discount rate of 10 percent—is based on research related to social discount rates,³⁶ the long-term nature of the project, in which benefits arise and continue in the long run (which would be too heavily discounted using traditional discount rates), and the very low cost of capital in Viet Nam, in which 25-year Vietnamese government bonds currently yield 3.2 percent annually. Combining initial capital, annual O&M costs, and the residual value cost adjustment, the present value costs at a 6 percent discount rate is about US\$176.77 million for the entire project. The project in Tan Uyen represents a large portion of the total project present value cost, at US\$77.33 million at a 6 percent discount rate.

Table 3.5. Present Value of Costs (US\$, millions)	Di An	Tan Uyen	Thuan An	Total
<i>Present value of costs</i>	56.45	77.33	42.99	176.76

Project Participation

13. Forecasts of connections, number of individual beneficiaries, and associated wastewater volumes are presented in table 3.6. The method used to determine project participation involves estimating the numbers of individual participants from the total volume treated, not the number of connections. Connected households can be assumed to generate the same volumes, if they have the same number of people per household. However, household sizes vary substantially in Binh Duong Province due to migrant worker residential characteristics, and connections to non-household facilities (for example, businesses, schools, or other government institutions) would certainly differ in wastewater volume generation rates, since their occupants would likely be much larger. Accordingly, the approach first determines total combined wastewater volumes from all types of connections and then estimates equivalent number of people who would have generated this volume.

14. In addition to the new connections in the project areas, the two subprojects at Di An and Thuan An include network construction in existing areas that enables connections to existing facilities that have not reached capacity. In addition, treatment capacity expansions under the project would also treat wastewater from new connections in areas with existing networks. The number of individual people (that is, beneficiaries) connected to the project facilities,

³⁶ World Bank. 2015. *Technical Note on Discounting Cost and Benefits in Economic Analysis of World Bank Projects*.



independent of how or where they are connected, are estimated for this analysis by dividing each year’s total wastewater volume by the average volume of wastewater generated per person. The average per capita volume of wastewater generated is a standard planning measure in Viet Nam and equals about 0.13 m³ per day.

15. The rationale behind focusing on estimated wastewater treatment volumes as the key measure for estimating impact, and ultimately, the value of treatment, stems principally from recognizing that significant benefits of treatment are the improved environmental and health conditions in the wider region downstream in the watershed. Moreover, once the project is completed, the clearest measure of project performance and a comparison of ‘with-project’ and ‘without-project’ conditions can be obtained from the actual difference in wastewater treatment volumes, since in the ‘without-project’ case, no treatment would have occurred. This approach avoids the variability in wastewater generation among individual households and non-households and focuses instead on the total impact on regional health and environmental improvement.

Table 3.6. Forecast of Program Participation over Time (Connections, Beneficiaries, and Additional Volumes Treated)

Year	Di An			Tan Uyen			Thuan An			Cumulative Total		
	# of Connections	# of Beneficiaries	Volumes Treated (m ³ /day)	# of Connections	# of Beneficiaries	Volumes Treated (m ³ /day)	# of Connections	# of Beneficiaries	Volumes Treated (m ³ /day)	# of Connections	# of Beneficiaries	Volumes Treated (m ³ /day)
2024	2,200	15,092	1,962	0	0	0	2,000	12,060	1,688	4,200	27,152	3,650
2025	3,000	20,580	2,675	0	0	0	2,200	13,266	1,857	9,400	60,998	8,183
2026	2,900	19,894	2,586	0	0	0	2,500	15,075	2,111	14,800	95,967	12,880
2027	4,000	27,440	3,567	6,000	42,780	5,561	4,000	24,120	3,377	28,800	190,307	25,385
2028	4,000	27,440	3,567	4,000	28,520	3,708	4,000	24,120	3,377	40,800	270,387	36,037
2029	1,000	6,860	892	4,000	28,520	3,708	3,000	18,090	2,533	48,800	323,857	43,169
Total	31,100	213,300	27,160	21,600	153,900	20,000	30,149	181,900	25,309			

Project Benefits

16. The economic value per capita can be derived from several separate and additive benefit categories. First, consider the out-of-pocket household costs for wastewater treatment service. Without the project, households currently pay an environmental fee associated with the environmental impact of septic tank use that is equal to 10 percent of the cost of their water consumption. After a connection to the project, households are expected to pay a tariff for wastewater service that is larger than the existing environmental fee. As a result, participating households would pay an increased out-of-pocket cost for wastewater treatment service that equals the difference between the existing environmental fee and the wastewater tariff. The annual average per capita cost increase is estimated by the project team to be US\$1.12.

17. Other economic values per capita in table 3.8 are derived from results of an analysis by the World Bank/Water and Sanitation Program (WSP) (2012) on the value of wastewater improvements across Viet Nam and elsewhere in Southeast Asia.³⁷ Health benefits computed in the WSP report include lower health care costs, improved productivity, and reduced mortality risk (the largest impact, in monetary terms). These elements capture the public health-related values of the project that accrue to a wider community of people—not just those who establish a connection to the wastewater

³⁷ World Bank/WSP. 2012. *Economic Assessment of Sanitation Interventions in Viet Nam*. May 2012



treatment facility. To compute these benefits on a per capita basis, households in the project area are assumed to be using septic systems. The WSP report does not provide an estimate for the annual health value per household for a conversion from septic to centralized treatment (that is, 'sewerage'). Instead, this value is derived from WSP results as the difference in value involved in converting from open defecation to septic and from open defecation to sewerage. The difference in these two separate conversion values is assumed to reasonably represent the value of converting from septic to sewerage and equals VND 758,000, in 2008 terms (as shown in the list below). This value applies to only those households connected to the project but could be a value that is realized by others downstream of the facility.

Table 3.7. Breakdown of Health Benefits from WSP 2012 Report

Health Benefits:	Annual Value (VND, thousands per household, 2008)		
	Treatment Improvement (OD to Septic)	Treatment Improvement (OD to Sewerage)	Estimated Treatment Improvement (Septic to Sewerage)
Health Care	159	208	49
Productivity	54	70	16
Mortality	2,235	2,928	693
Subtotal	2,448	3,206	758

18. In addition to health benefits, it is expected that property owners would also save on maintenance and regular replacement costs for their existing septic systems after they connect to the centralized wastewater system. The WSP report computes this savings in annualized ownership costs to be VND 766,000 per household, in 2008 terms. This level of cost savings is also applied to non-household connections since it is assumed that whatever wastewater management system exists for those connections, a proportionate level of maintenance costs could be saved from a connection to the treatment plant.

19. In table 3.8, all elements of value in health and cost savings from improving treatment are converted into 2019 terms. The total value of centralized treatment amounts to VND 3.42 million per household per year. After adjusting for inflation, exchange rates and the number of persons per household in the study area, the total annual per capita economic value of participating in the project is determined to be US\$40.47.

20. Also, consistent with other economic analyses on water and wastewater in Viet Nam, a real growth rate equal to 2.0 percent is assumed to apply to benefits of improved water quality over time to account for the widespread rise in incomes and populations. Note that other benefit categories are computed in the WSP report but are excluded in this analysis to represent a conservative value of improved sanitation.

Table 3.8. Benefit Categories and Average Annual Value of Wastewater Service Improvements

	Annual Value (VND, thousands per household, 2019)	Annual Value (US\$ per person, 2019)
Net environmental fee payments	-261	-1.12
Health benefits: health care, productivity, mortality	1,829	20.69
Water benefits: annual septic tank ownership costs	1,849	20.91
Total net benefit per capita	3,417	40.47



Cost-Benefit Analysis Results of Wastewater Benefits (only)

21. Table 3.9 summarizes the results of the economic analysis for each facility and the overall total with costs, benefits, NPV at a 6 percent discount rate, along with the ERR. The total project ERR of 11.68 percent indicates that the investments altogether are economically worthwhile. Two of the subprojects, Di An and Thuan An, comfortably achieve rates of return above 10 percent. The third project in Tan Uyen achieves lower returns because, as a new facility, its initial capital costs are significantly higher and a slower growth in the number of connections is anticipated. However, the higher up-front costs and lower economic returns at Tan Uyen do not fully account for the long-term transition to and higher benefits from a more modern wastewater treatment system. As testament to this observation, it is reasonable to expect that future facility expansions at Tan Uyen, just like in Di An and Thuan An, would be likely to achieve higher rates of return in the future. Moreover, considering that this type of infrastructure generates significant benefits (that is, health) for people who are not making the actual investment, the positive rate of return provides a strong justification for the investment.

22. Several potentially significant additional sources of benefits have not been captured in this analysis. For example, the WWTP will reduce BOD₅ concentrations in waters discharged into the Sai Gon and Dong Nai Rivers. According to a recent study by the World Bank³⁸ on water quality, increasing BOD₅ concentrations are associated with declining GDP. The project’s wastewater treatment investments will contribute to improved water quality over the short and long run. Since the project area is upstream from HCMC, and roughly 40 percent of that city’s water comes from the Dong Nai River, the scale of potential avoided economic costs from improved wastewater treatment are certainly magnified. In addition, reduced wastewater pollution in the rivers is likely to result in benefits to aquatic biodiversity in previously affected areas, as well as improved amenity, recreation, and tourism opportunities.

Table 3.9. Total Net Benefits by Component

Project Sites	Total Present Value Cost (US\$, millions), 6%	Total Present Value Benefits (US\$, millions), 6%	Total NPV (US\$, millions), 6%	ERR (%)
Di An	56.44	104.39	47.94	18.91
Tan Uyen	77.32	66.73	-10.60	4.84
Thuan An	42.98	93.32	50.34	33.16
Total	176.75	264.43	87.69	11.68

Cost-Benefit Analysis Results of Wastewater and GHG Reduction Benefits

23. Changes in GHG emissions resulting from the project have been estimated and incorporated into the base-case economic analysis. The wastewater collection and treatment activities under Component 1 have estimated net emissions savings of 1,089,066 tCO₂eq over the economic lifetime of the project. These reductions are allocated proportionally between the investments in Tan Uyen, Thuan An, and Di An. These reductions are valued using a high and low shadow price per tCO₂eq, according to World Bank guidelines.

24. Incorporating the net reductions in GHG emissions into the economic analysis results in higher NPVs and ERRs for each facility. The results below represent an increase in benefits discussed in table 3.9. As shown in table 3.10, all net benefits for all subprojects increase substantially when incorporating the value of GHG reductions. A sensitivity analysis is conducted to value CO₂eq emissions reductions using high and low shadow prices. With a high shadow price of US\$80 per tCO₂eq, the total project achieves an ERR of 11.70 percent, which is an increase over the 11.68 percent ERR based on only wastewater treatment benefits. A low shadow price of US\$40 per tCO₂eq results in a smaller increase in the project-level

³⁸ World Bank. May 2019. *Quality: Unknown. The Invisible Water Crisis*. Water Global Practice.



ERR, at 11.69 percent. At a 6 percent discount rate, the combined value of GHG emissions reductions, at an average price, plus the net benefits of wastewater treatment amounts to a NPV of US\$87.87 million.

Table 3.10. Total Net Benefits with GHG Reduction Benefits, by Component

Project Sites	Total Net Benefits without GHG Benefits		Total Net Benefits with High Shadow Price of GHG		Total Net Benefits with Low Shadow Price of GHG	
	Total NPV (US\$, millions), 6%	ERR (%)	Total NPV (US\$, millions), 6%	ERR (%)	Total NPV (US\$, millions), 6%	ERR
Di An	47.94	18.90	48.07	19.00	48.01	18.90
Tan Uyen	-10.60	4.80	-10.48	4.90	-10.54	4.80
Thuan An	50.34	33.20	50.47	33.30	50.40	33.20
Total	87.69	11.68	88.06	11.70	87.87	11.69

Sensitivity Analysis on Wastewater Treatment (only) Benefits

Demand Forecast

25. The project’s benefits are directly dependent on the number of connections. A sensitivity analysis has been conducted to assess how the project value changes with the rate of increasing connections. Several alternative rates of increasing connections are explored. In each alternative scenario, it is simply assumed that an equal number of connections is established each year until the capacity is reached. The difference between the scenarios is the number of years until capacity is reached. Results indicate that even with a five-year delay, the project ERR at 8.8 percent is still above the 6 percent discount rate threshold, even without accounting for GHG reduction benefits.

Table 3.11. Sensitivity Analysis Results

	2 Year Delay	3 Year Delay	5 Year Delay
NPV (US\$, millions)	74.53	71.10	64.19
EIRR (%)	9.6	9.3	8.8

Financial Analysis

26. The project financial analysis focuses on projecting the financial performance of the three wastewater operational units, considering assumed project-related connections and likely wastewater tariffs, in the context of the proposed increases in tariffs to meet the target of tariffs covering O&M costs by 2030. The financial projections provide a sense of the operating losses that the units are likely to incur before tariffs reaching O&M cost-recovery levels, and therefore, the subsidies that the provincial government will need to provide.

27. According to the current provincial regulations, households connected to the centralized sewerage system are expected to pay wastewater tariffs set at 15 percent of the O&M costs. A draft tariff road map prepared during project preparation envisions increasing tariffs such that they will cover (a) 100 percent of O&M expenses by 2030 and (b) O&M expenses plus depreciation (full cost recovery) gradually thereafter. The time horizon for transition to full cost recovery is yet to be determined by the province (for example, by 2035 or by 2040). Appropriate longer-term tariff adjustment



schedules to support a transition to sector financial sustainability and to increase private capital mobilization will be developed during the early stages of the project as part of the wastewater management strategy under Component 2.

28. Financial projections have been made for the three wastewater operating units based on utilization rates provided in the feasibility studies. The investment feasibility studies have estimated that the O&M cost is VND 6,207 per m³ (US\$0.27 per m³) at full utilization of the treatment capacity, while the full cost-recovery tariff, defined as all direct operating, maintenance, and administrative costs plus depreciation costs for all three systems is VND 20,642 per m³ (US\$0.89 per m³). For simplicity and to minimize errors or confusion that may arise when using projected inflation rates, the tariffs used in the financial projections are at current (2020) price levels and do not incorporate inflation expectations or other potential increases in input costs.

29. Assumptions regarding the effective number of individuals³⁹ connected to the new (Tan Uyen) and expanded (Di An and Thuan An) sewerage systems, wastewater discharge rates, capacity, and so on, for each of the systems are provided in table 3.12.

Table 3.12. Assumptions for Financial Analysis

	Di An	Thuan An	Tan Uyen
Existing sewage treatment capacity	20,000 m ³ /day	17,000 m ³ /day	0
Planned additional treatment capacity	20,000 m ³ /day	20,000 m ³ /day	20,000 m ³ /day
Service population (est. 2023)	510,100	474,000	347,800
Population growth rate	3% annually		
Estimated effective population receiving service in 2021 ^a	80,000	90,000	0
Estimated annual new individuals served due to network and treatment-plant expansion			
2023 (Project Year 0)	0	0	
2024 (Year 1)	0	0	0
2025 (Year 2)	14,800	12,600	0
2026 (Year 3)	17,100	15,500	0
2027 (Year 4)	23,500	17,200	0
2028 (Year 5)	29,500	20,200	15,500
2029 (Year 6)	28,000	28,200	30,600
2029 (residual infill) ^b	27,000	16,800	29,500
2030 (residual infill)	24,000	18,000	28,600
2031 (residual infill)	21,600	19,800	23,900
2032 (residual infill)	27,800	27,300	19,000
2033 (residual infill)		6,300	6,800
Estimated effective individuals receiving service due to the project (during and following project)	213,300	181,900	153,900
Service coverage projection, 2032	45%	43%	31%

³⁹ The assumptions for the financial analysis are the same as those for the economic analysis.



	Di An	Thuan An	Tan Uyen
Average water consumption	130 l/p/d		
Average wastewater discharge (100% of piped water consumption)	130 l/p/d		
Average daily treatment, 2032	40,000 m ³ /day	37,000 m ³ /day	20,000 m ³ /day
O&M expense at full operations	6,207 VND/m ³		

Note: a. Calculated using the number of household connections and an assumption of approximately 6 persons per household to calculate the number of individuals directly connected to the system, plus an additional 30 percent of individuals indirectly connected to the system (for example, through commercial and industrial connections).

b. Residual infill refers to sewerage connections to project-financed network, made after project completion, paid for by the households or connecting businesses.

30. O&M costs for wastewater treatment system in Binh Duong Province paid by the province's budget from 2016 to 2023 to the operators is as shown in table 3.13.

Table 3.13. Binh Duong Province Wastewater Service Unit Price, 2016–2023

Treatment Capacity (m ³ /day)	Wastewater Tariffs, 2016–2023 (VND/m ³)
Under 8,000	5,261
From 8,000 to under 10,000	5,558
From 10,000 to under 12,000	5,021
From 12,000 to under 14,000	4,810
From 14,000 to under 16,000	4,525
From 16,000	4,313

31. Domestic wastewater treatment service tariff in Binh Duong approved by the decision 47/2019/QD-UBND of Binh Duong PPC dated December 31, 2019, with the tariff at the level of 15 percent wastewater treatment price. But information reviewed up to 2023 indicate that this tariff has yet to be applied. Residents of Binh Duong do not pay for this service and the full costs are borne by the province. With the objective of reaching tariffs that cover O&M costs by 2031, the following tariff road map was prepared as part of the feasibility studies. As tariffs are currently very low, only meeting 15 percent of estimated O&M costs, the road map envisions relatively high percentage increases in the early years, with smaller percentage increases in the later years.

Table 3.14. Binh Duong Province Wastewater Tariffs, 2025–2031 (VND/m³)

	2025	2026	2027	2028	2029	2030	2031
Tariff	3,414	4,035	4,655	5,276	5,587	5,897	6,207
% Increase	22	18	15	13	6	6	5

*Note: The amounts and the rate of increase do not consider potential inflation, which would need to be included as well.

32. For the new and expanded systems supported under the project, the provincial government would need to cover the shortfall in O&M cost coverage until tariffs cover those costs. In addition, it is important to note that the projected O&M tariff (VND 6,207 per m³) assumes that operations are at full capacity; at lower capacities, O&M expenses on a per m³ basis are higher. Therefore, in practice, revenues from tariffs are likely to remain below total O&M costs even after 2030 if operations are not at full capacity. The assumption for these projections is that a significant number of connections will be made before commissioning of the new and/or expanded treatment facilities, and that the systems will be operating at or close to capacity shortly after commissioning. If household connections are slower than expected, the difference between actual per cubic meter costs and costs at full operations will be larger.

**Financial Projections, Operating Gaps, and Government Subsidies, 2025–2031**

33. The following tables summarize key operational information for each of the three systems, as well as estimated costs (given projected operations) and revenues (based on the tariff road map). Until tariffs reach a level that cover the direct O&M expenses of the operating units, the provincial government will need to provide operating subsidies.

Table 3.15. Di An Operational and Financial Projections, 2025–2031

	2025	2026	2027	2028	2029	2030	2031
Population served	131,000	160,500	188,500	215,500	239,500	261,100	288,900
Average daily sewage collection and treatment	17,000 m ³	20,900 m ³	24,500 m ³	28,000 m ³	31,150 m ³	33,950 m ³	37,550 m ³
O&M expenses per m ³ (VND)	6,608	8,921	7,924	7,270	7,270	7,002	6,608
Wastewater tariff (VND/m ³)	3,414	4,035	4,655	5,276	5,587	5,897	6,207
O&M expenses, annually (VND, millions)	41,072	67,941	70,877	74,340	82,619	86,743	90,578
Revenues (VND, millions)	21,221	30,728	41,640	53,952	63,487	73,058	85,092
Net income (Loss) (VND, millions)	(19,851)	(37,214)	(29,237)	(20,388)	(19,132)	(13,685)	(5,487)

Table 3.16. Thuan An Operational and Financial Projections, 2025–2031

	2025	2026	2027	2028	2029	2030	2031
Population served	135,000	155,200	183,400	200,200	218,200	238,000	265,300
Average daily sewage collection and treatment	17,550 m ³	20,200 m ³	23,800 m ³	26,000 m ³	28,400 m ³	30,900 m ³	34,500 m ³
O&M expenses per m ³ (VND)	6,608	8,921	8,921	7,924	7,270	7,002	6,608
Wastewater tariff (VND/m ³)	3,414	4,035	4,655	5,276	5,587	5,897	6,207
O&M expenses, annually (VND, millions)	42,326	65,698	77,635	75,276	75,271	79,069	83,179
Revenues (VND, millions)	21,869	29,713	40,513	50,121	57,841	66,595	28,141
Net income (Loss) (VND, millions)	(20,457)	(35,985)	(37,121)	(25,155)	(17,430)	(12,474)	(5,038)

Table 3.17. Tan Uyen Operational and Financial Projections, 2026–2031

	2026	2027	2028	2029	2030	2031
Population served	15,500	46,100	75,600	104,200	128,100	147,100



Average daily sewage collection and treatment	2,000 m ³	6,000 m ³	9,800 m ³	13,500 m ³	16,600 m ³	19,100 m ³
O&M expenses per m ³ (VND)	10,344	10,344	8,924	7,924	7,270	6,207
Wastewater Tariff (VND/m ³)	4,035	4,655	5,276	5,587	5,897	6,207
O&M expenses, annually (VND, millions)	7,608	22,628	32,002	39,180	44,190	43,326
Revenues (VND, millions)	2,967	10,184	18,927	27,622	35,844	43,326
Net Income (Loss) (VND, millions)	(4,641)	(12,444)	(13,075)	(11,558)	(8,346)	0

34. The summary of operating losses during the initial years of operation and the total amount of operating subsidies estimated to be required of the provincial government is provided in table 3.18.

Table 3.18: Net Operating Losses and Government Subsidy Required, 2025–2031, VND millions

	2025	2026	2027	2028	2029	2030	2031
Di An	19,851	37,214	29,237	20,388	19,132	13,685	5,487
Thuan An	20,457	35,985	37,121	25,155	17,430	12,474	5,038
Tan Uyen		4,641	12,444	13,075	11,558	8,346	0
Combined Government Subsidy Required	40,308	77,839	78,803	58,618	48,120	34,505	10,525
(approximately US\$, millions)	1.74	3.36	3.40	2.53	2.08	1.49	0.45

35. **Sensitivity analysis.** Sensitivity analyses have been performed to estimate the impact of slower-than-expected uptake in sewerage connections and an increase in operating costs. Two scenarios have been analyzed: (a) a three-year delay in the amount of time required until capacity is reached (for Tan Uyen, a two-year delay in both connections and treatment capacity) and (b) a 10 percent increase in operating costs. The results of the analyses are provided in tables 3.19 and 3.20.

Table 3.19. Sensitivity Scenario 1: Three-year Delay to Reach Capacity (Net Operating Losses and Government Subsidy Required, 2025 – 2031, VND millions)

	2025	2026	2027	2028	2029	2030	2031
Di An	34,232	29,621	23,386	13,613	26,566	37,468	23,536
Thuan An	24,701	21,848	16,987	34,625	34,525	34,153	21,614
Tan Uyen	—	—	—	3,728	10,408	10,849	8,489
Combined Government Subsidy Required	58,933	51,469	40,373	51,966	71,499	82,469	53,639
(Approximately US\$, millions)	2.54	2.22	1.74	2.24	3.08	3.56	2.31

Table 3.20. Sensitivity Scenario 2: 10% Increase in Operational Costs per m³ (Net Operating Losses and Government Subsidy Required, 2025–2031, VND millions)

	2025	2026	2027	2028	2029	2030	2031
Di An	23,958	44,008	36,325	27,822	27,394	22,359	14,544



Thuan An	24,690	42,555	44,885	32,683	24,957	20,381	13,356
Tan Uyen		5,401	14,707	16,275	15,473	12,765	4,333
Combined Government Subsidy Required	48,648	91,964	95,917	76,780	67,827	55,505	32,233
(Approximately US\$, millions)	2.10	3.97	4.14	3.31	2.93	2.40	1.39

Table 3.21. Summary Change in Operating Losses and Government Subsidy (Total Subsidy and Percentage Change from Base Case)

	Total Subsidy (VND, millions)	% Change
Base Case	348,718	n.a.
Scenario 1: Three-year delay to reach capacity	410,348	+ 18
Scenario 2: 10% increase in operating costs	468,873	+ 34

36. As indicated above, both sensitivity scenarios indicate a noticeable impact on the likely subsidies required from the provincial government compared with the base-case assumptions. In the case of delays in network expansion, and therefore, capacity usage, this is due to the costs of operating the expanded treatment plants at Di An and Thuan An at capacities that result in high per m³ costs. (In addition, operating subsidies would likely need to be paid by the Government for several years after 2030, which are not included in this analysis. In the case of increased operating costs, it is due to the assumption that it would not be possible to raise tariffs as quickly as necessary to meet the higher operating costs. The operating losses are greater for every year in operation, through 2031, as the customer tariff (according to the tariff road map) reaches the increased O&M cost only in 2032.

Fiscal Analysis

37. A fiscal analysis has been conducted to analyze Binh Duong Province's ability to borrow the proposed loan from the World Bank within the legal limits established under Vietnamese law. According to Article 7 of the 2015 Budget Law,⁴⁰ Binh Duong Province may not have an outstanding debt balance higher than 30 percent of its revenues (after required transfers to the Central Government). In addition, Decree 97/2018/ND-CP specifies that Binh Duong Province (among others) is responsible for repayment of 70 percent of loans made to the Central Government for investments within the province. The proposed project is expected to be financed with a World Bank loan of US\$230.76 million, of which Binh Duong will be responsible for US\$161.53 million.

38. **Project cost and financing plan.** The estimated cost of the project is US\$310.79 million, of which US\$230.76 million will be financed by the proposed World Bank loan, and US\$80.03 million will be financed by counterpart fund contributions by the PPC. Table 3.22 provides an overview of the preliminary project financing plan.

Table 3.22. Preliminary Project Cost and Financing Plan (US\$, millions)

World Bank Loan			Borrower	Total
On-lending	On-granting	Subtotal		
161.53	69.23	230.76	80.03	310.79

Note: According to Decree 97/2018/ND-CP and Decision 1164/QD-BTC.

⁴⁰ Decree 97/2018 / ND-CP and decision 1107/QD-BTC.



39. **Assessment of the current debt balance of Binh Duong Province.** Binh Duong Province has been engaged in significant technical infrastructure development in recent years, with simultaneous investments in transport, industrial park infrastructure, and water supply and drainage. Infrastructure investments have largely been financed through foreign direct investment, ODA funds on-granted from the budget, and the provincial budget.

Table 3.23. Data on Debt balance of Binh Duong Province's in the Years 2021, 2022 (VND, millions)⁴¹

Project Name	End of 2021	Payments 2022			End of the Year 2022
		Principal	Interest/Fees	Total	
Binh Duong Province's Water Environment Improvement Project - Phase II	234,386	6,347	1,805	8,152	228,039
Drainage and wastewater treatment systems in Di An Town	1,435,906	78,358	34,083	112,441	1,357,548
Total	1,670,292	84,705	35,888	120,593	1,585,587

40. Table 3.24, projects Binh Duong Province's debt capacity, based on a low-growth scenario, as well as its debt balance, based on its already existing liabilities.

Table 3.24. Binh Duong Province's Projected Debt Capacity (VND, billions)

	2023	2024	2025	2026	2027	2028
Revenue, post transfers to the Central Government, low-growth scenario	27,943	30,178	29,899	31,992	34,231	36,628
Debt balance ceiling with low-growth scenario	8,383	9,054	8,970	9,598	10,269	10,988
Debt balance forecast, excluding the proposed project	2,733	3,085	3,085	3,434	3,265	3,093
Ratio of outstanding debt to the public debt ceiling (%)	33	34	34	36	32	28

41. These figures indicate that Binh Duong's total outstanding debt—projected to be VND 2,733 billion in 2023—is estimated to be 33 percent of its 2023 debt ceiling of VND 8,383 billion. Given its existing liabilities, the province is projected to reach its highest ratio of debt to debt ceiling in 2026, when the ratio is expected to reach 36 percent.

42. Table 3.25 incorporates the province's liabilities expected as a result of the project, including both (a) expected operating subsidies (which make up a very small portion) and (b) the debt due to the project. Those amounts, combined with existing debt for 2023–2027, indicate that the ratio of debt to the debt ceiling is expected to increase from 39 percent in 2023 to 63 percent in 2027. The ratio of debt to the debt ceiling will decline after 2027. These debt projections remain within the legal limits throughout the implementation period of the project as well as after.

Table 3.25. Analysis of Binh Duong Province Borrowing Capacity (VND, billions)

Indicator	2023	2024	2025	2026	2027
Provincial revenues, post transfers to central government	27,943	29,899	31,992	34,231	36,628

⁴¹ Source: Decision No. 379/STC-QLN dated February 4, 2023, of DoF Binh Duong.



Indicator	2023	2024	2025	2026	2027
Less expected project-related operational subsidies		43	72	69	54
Revenues, net of operational subsidies	27,943	29,856	31,920	34,162	36,574
Debt ceiling	8,383	8,970	9,598	10,269	10,988
Debt balance forecast, without project	2,733	3,085	3,434	3,265	3,093
Project-related debt balance	574	1,148	1,913	3,060	3,825
Total annual debt balance, with project	3,307	4,233	5,347	6,325	6,918
Ratio of outstanding debt to debt balance ceiling (%)	39	47	56	62	63

43. The analysis indicates that Binh Duong Province has both fiscal space to borrow from the World Bank for the project and to manage its overall debt within the allowed limits, as well as to provide necessary subsidies during the initial operating periods.

Affordability Assessment

44. A Poverty and Social Impact Analysis (PSIA) reviewed household incomes and expenditures from the 2018 Viet Nam Household Living Standard Survey (VHLSS), analyzing them in conjunction with the estimated O&M tariffs for wastewater service, as well as, in the longer term, with potential full cost-recovery tariffs. The analysis indicates that at tariffs that cover O&M costs, wastewater treatment would remain highly affordable, demanding a relatively small proportion of household income even for the poorest quintile of households. Both household incomes and potential tariffs were reviewed using 2020 prices and, therefore, with one exception⁴² described below, are applicable regardless of the year in which analysis is applied.

45. As outlined above, the provincial government's policy calls for bringing wastewater tariffs in line with O&M costs in the medium term, with tariffs gradually increasing over time to full cost-recovery levels. Average household wastewater discharge is expected to be 10 m³ per month; this amount varies very little across income quintiles. At the O&M cost coverage rate of VND 6,207 per m³, monthly charges related to wastewater would be about VND 62,100 (US\$2.66) or 0.3 percent of average household income. At the lowest household income quintile, wastewater service at expected O&M cost coverage levels are estimated to be approximately 0.7 percent of household income, while the next three income quintiles would likely pay between 0.3 and 0.4 percent of household income. The projected O&M cost-recovery tariff would remain, therefore, highly affordable for the average household. The full cost-recovery tariff (VND 20,642 per m³ or US\$0.89 per m³) is estimated to cost approximately 2.5 percent of monthly income for the lowest quintile and between 1.0 percent and 1.4 percent for the next three income quintiles.

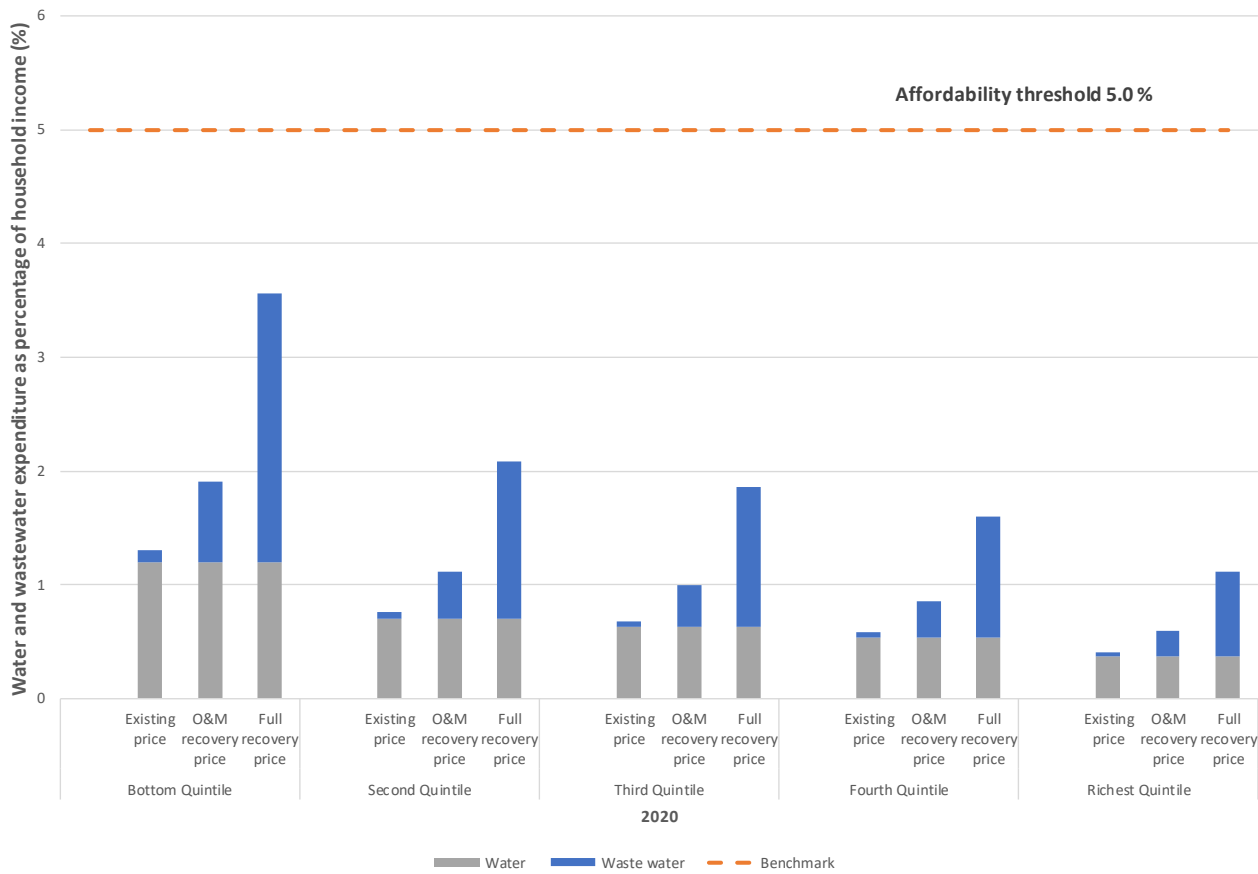
46. Figure 3.1 provides an overview of the percentage of household income that the projected, combined, monthly water and wastewater fees would require. Since households of all income quintiles pay between 0.3 and 0.4 percent of their income for water services, both the O&M tariff and the full cost-recovery tariff fall within benchmarks for water and wastewater service affordability for households of all income quintiles. It is important to note, however, that in the long term, income forecasts for the lowest-income households are not expected to increase in line with other costs. If general costs increase at a higher rate than expected, while household incomes do not increase at the same rate, the ability of the

⁴² This refers to the exception that the lowest incomes will not increase in line with inflation, and that the share of income required for sewerage (and water) services will increase slightly over time. In contrast, household incomes at all other quintiles are expected to rise in line with inflation.



lowest-income households to afford sewerage service may be affected. In that case, a targeted Government subsidy scheme to support the poor could be considered.

Figure 3.1. Tariff Affordability Results: Expenditures as Percentage of Household Income per Quintile

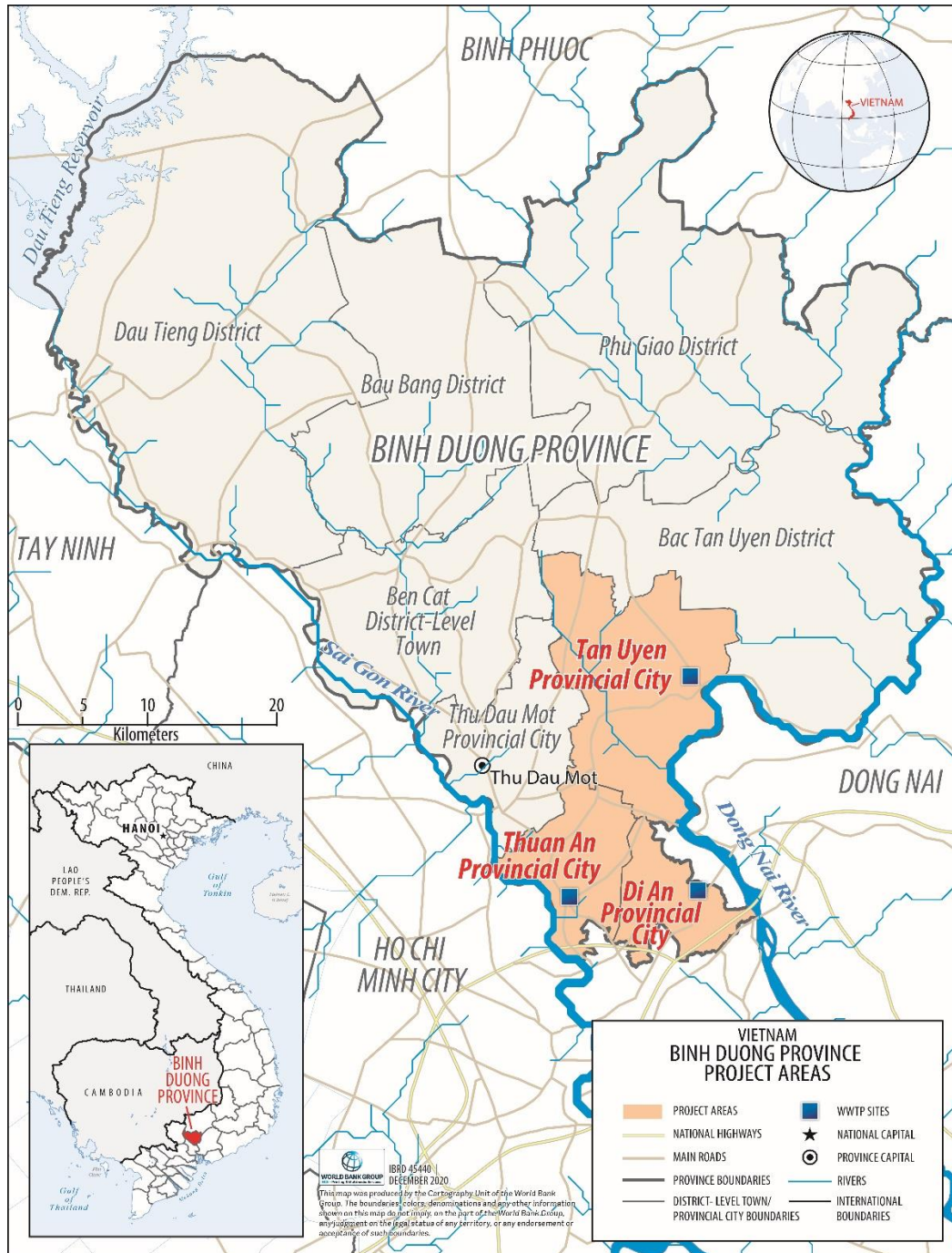




ANNEX 4: Project Map

COUNTRY: Viet Nam

Binh Duong Province's Water Environment Improvement Project



WORLD BANK GROUP
18180 45440
15 SEPTEMBER 2020

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